UNITED STATES TARIFF COMMISSION

SUMMARIES OF TRADE AND TARIFF INFORMATION

Prepared in Terms of the Tariff Schedules of the United States (TSUS)

Schedule 4

Chemicals and Related Products
(In 12 volumes)

Volume 4

Inorganic Chemicals III

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SUMMARIES OF TRADE AND TARIFF INFORMATION BY SCHEDULES

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FOREWORD

In an address delivered in Boston on May 18, 1917, Frank W. Taussig, distinguished first chairman of the Tariff Commission, delineated the responsibility of the newly established Commission to operate as a source of objective, factual information on tariffs and trade. He stated that the Commission was already preparing a catalog of tariff information--

> designed to have on hand, in compact and simple form, all available data on the growth, development and location of industries affected by the tariff, on the extent of domestic production, on the extent of imports, on the conditions of competition between domestic and foreign products.

The first such report was issued in 1920. Subsequently three series of summaries of tariff information on commodities were published--in 1921, 1929, and 1948-50. The current series, entitled Summaries of Trade and Tariff Information, presents the information in terms of the tariff items provided for in the eight tariff schedules of the Tariff Schedules of the United States (abbreviated to TSUS in these volumes), which on August 31, 1963, replaced the 16 schedules of the Tariff Act of 1930.

Through its professional staff of commodity specialists, economists, lawyers, statisticians, and accountants, the Commission follows the movement of thousands of articles in international commodity trade, and during the years of its existence, has built up a reservoir of knowledge and understanding, not only with respect to imports but also regarding products and their uses, techniques of manufacturing and processing, commercial practices, and markets. Accordingly, the Commission believes that, when completed, the current series of summaries will be the most comprehensive publication of its kind and will present benchmark information that will serve many interests. This project, although encyclopedic, attempts to conform with Chairman Taussig's admonition to be "exhaustive in inquiry, and at the same time brief and discriminating in statement."

This series is being published in 62 volumes of summaries, each volume to be issued as soon as completed. Although the order of publication may not follow the numerical sequence of the items in the TSUS, all items are to be covered. As far as practicable, each volume reflects the most recent developments affecting U.S. foreign trade in the commodities included.

SUMMARIES OF TRADE AND TARIFF INFORMATION

SCHEDULE 4

Volume 4

C O N T E N T S

Numerical List of TSUS Items in This Volume

INTRODUCTION

This volume (identified as volume 4:4) is the fifth in a series of 12 volumes on the chemicals and related products classified under schedule 4 of the Tariff Schedules of the United States (TSUS). Schedule 4 is divided into 13 parts, and this volume is the last of three that deal with the inorganic chemicals provided for in part 2 of that schedule. For the purposes of part 2, inorganic compounds (including salts) are compounds not containing carbon, except calcium carbide and such carbon-containing compounds as inorganic cyanides and cyanates, metallic carbonates, and oxides of carbon which are inorganic in nature. Volume 4:4 covers the following inorganic chemicals and mixtures in subpart C of part 2 of the chemical schedule (items 420.70-423.96): sodium compounds; strontium compounds; compounds of tellurium, thallium, thorium, tin, titanium, tungsten, uranium, vanadium, zinc, and zirconium; boron carbide; chromium carbide; sulfur dioxide; and inorganic compounds and mixtures not elsewhere enumerated. The complete list of products covered by these summaries is shown in appendix A to this volume. Volume 4:4 includes tungstic acid (416.40), ammonium tungstate (417.40), ammonium vanadate (417.42), calcium borate (418.12), calcium cyanide (418.20), calcium tungstate (418.30), copper cyanide (418.69), potassium cyanide (420.12), potassium tungstate (420.32), and potassium vanadate (420.34) because of the close relationship they bear to products discussed in this volume. On the other hand, sodium aluminate (420.68) and mixtures in chief value if bismuth (423.90) are discussed in Volume 4:2 and sodium bromide (420.82), sodium molybdate (421.10), and mixtures in chief value of mercury (423.86), molybdenum (423.88), and nickel oxide (423.90) are discussed in Volume 4:3 for the same reason.

U.S. consumption of the chemical compounds and mixtures covered by this volume is supplied principally by domestic production, which differed by about 4 percent from the value of domestic consumption in 1966. U.S. production was valued at more than $2.0 billion in 1966, although this value of production involves some duplication, particularly in the manufacture of various sodium compounds from salt, sodium carbonate, and caustic soda. Salt shipments in 1966 were valued at almost $230 million; shipments of caustic soda (sodium hydroxide) were valued at $254.5 million; soda ash (sodium carbonate) at almost $137 million; and sodium tripolyphosphate--the most important of the sodium phosphates--at $121.7 million.

In 1967 the value of U.S. imports of the chemical compounds and mixtures covered by this volume amounted to $54.3 million. The most important import commodity in 1967 was uranium oxide, imports of which were valued at $12.6 million. Sodium chloride or salt accounted for the second greatest value of imports--$8.5 million--in 1967; and mixtures of inorganic compounds, not specially provided for, was third, with a value of $4.6 million.

The distribution in 1967 of Volume 4:4 imports by principal sources was as follows:

Source	Value ($1 million)	Principal products
Canada	12.8	Sodium chloride, uranium compounds, sodium sulfates, cyanide compounds.
West Germany	10.5	Inorganic compounds not elsewhere enumerated, mixtures of two or more inorganic compounds not elsewhere enumerated, sodium compounds not elsewhere enumerated.
Republic of South Africa	8.6	Uranium compounds.
United Kingdom	3.7	Cyanide compounds, sodium compounds not elsewhere enumerated, mixtures of two or more inorganic compounds not elsewhere enumerated, inorganic compounds not elsewhere enumerated.
Belgium	2.5	Sodium sulfates.
Spain	2.5	Uranium compounds.
Mexico	2.0	Sodium chloride, zinc sulfate.
Japan	1.7	Inorganic compounds not elsewhere enumerated, sodium chromate and dichromate.
France	1.0	Sodium cyanide, hydrogen peroxide.
Bahamas	1.0	Sodium chloride.
Turkey	0.7	Calcium borate.
All other	7.3	Titanium compounds, sodium chromate.
Total	54.3	

Export statistics for many of the chemicals and mixtures covered by this volume are not available. In 1967, based on available statistics and estimates, the total value of U.S. exports covered by these summaries was approximately $125 million. In 1967, the more important export items included sodium and calcium borates, valued at $41 million (estimated); sodium hydroxide (caustic soda), valued at $23.5 million; sodium phosphates at $13.5 million; and synthetic sodium carbonate at $9.9 million. The Netherlands, Canada, Japan, and Mexico were the principal markets for these commodities and accounted for over one-third of the total value of these exports.

Commodity	TSUS item
Sodium arsenate	420.70

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

Sodium arsenate is one of the less-important arsenic compounds. Imports amounted to 252,970 pounds during 1967. Statistics on production and exports are not available.

Comment

Sodium arsenate is a colorless crystalline compound or white powder, obtained by treating arsenic pentoxide with caustic soda. It is a poisonous compound used in printing inks, as a mordant, as a constituent of wood preserving preparations, and in the manufacture of other arsenic compounds. It is produced in both technical and chemically pure grades.

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
420.70	Sodium arsenate	0.8¢ per lb.	0.4¢ per lb.

The rate effective January 1, 1972, represents the final stage of a concession granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reduction became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rate shown above as existing prior to January 1, 1968, remained unchanged under the TSUS from August 31, 1963 (the effective date of the TSUS) through the end of 1967. On sodium arsenate imported in 1967, the specific rate of duty in effect prior to January 1, 1968, was equivalent to 9.4 percent ad valorem.

Statistics on U.S. production and exports of sodium arsenate are not available. Domestic production is believed to be slightly larger

than imports (which averaged 304,000 pounds annually during the last five years) and exports are thought to be very small, if any.

There are two chemical companies in the United States which produce sodium arsenate, located in New Jersey and Missouri. One of these companies ia a producer of refined or chemically pure grades of chemicals.

U.S. imports of sodium arsenate for 1962-67 are shown in the accompanying table.

Sodium arsenate: U.S. imports for consumption, by principal sources, 1962-67

Source	1962	1963	1964	1965	1966	1967
	Quantity (pounds)					
United Kingdom	166,180	140,670	321,290	308,980	363,510	252,970
France	89,286	132,276	-	-	-	-
Total	255,466	272,946	321,290	308,980	363,510	252,970
	Value					
United Kingdom	$13,481	$11,755	$28,399	$27,023	$31,258	$21,576
France	6,460	12,760	-	-	-	-
Total	19,941	24,515	28,399	27,023	31,258	21,576

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Sodium bicarbonate	420.72

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

The United States is among the world's largest producer-consumers of sodium bicarbonate. In 1966, U.S. production was valued at $8.2 million. Seven percent of output was exported in 1964 (latest year export data available) and the remainder supplied 95 percent of domestic consumption. During 1962-64, the United States was a net exporter of sodium bicarbonate.

Description and uses

Sodium bicarbonate (baking soda) is a white crystalline compound usually made by treating a saturated solution of soda ash (item 420.84) with carbon dioxide. It is also obtained as a by-product in the making of soda ash by the Solvay process. Sodium bicarbonate is marketed in two grades, pharmaceutical and technical. The higher-priced pharmaceutical grade accounts for about two-thirds of the domestic output. It is used mainly in the manufacture of food products, pharmaceuticals, and inorganic chemicals. The technical grade is used in fire extinguishers and in the manufacture of leather, paper, rubber, and textiles.

U.S. tariff treatment

The duty-free status was provided for in the Tariff Act of 1930, as originally enacted, and in the TSUS, effective August 31, 1963, and was bound for the first time in the sixth round of negotiations under the General Agreement on Tariffs and Trade (GATT).

U.S. consumption

During the years 1962-64, U.S. annual consumption (table 1) of sodium bicarbonate increased from 299 million pounds in 1962 to 310.2 million pounds in 1964. Consumption data for 1965 and later years

are not available. Nearly all of the sodium bicarbonate consumed in the United States is supplied by domestic producers. Consumption is estimated to be distributed as follows: 39 percent for food; 17 percent for chemicals; 12 percent for pharmaceuticals; 10 percent for fire extinguishers; 5 percent for leather, paper, and textiles; 3 percent for rubber; and 14 percent for miscellaneous products and processes.

U.S. producers and production

Sodium bicarbonate is manufactured by five large multi-product companies with plants located in Michigan, New York, Ohio (2), and Virginia. Total capacity of the five producers is reported to be 442 million pounds per year. Production (table 1) during 1962-66 increased from 307 million pounds in 1962 to 359.2 million pounds in 1966, closely matching the absolute increase in consumption during 1962-64.

U.S. exports

Exports of sodium bicarbonate (table 2) during 1962-64 averaged about 22.7 million pounds annually, ranging from 20.1 million pounds in 1962 to 25.1 million pounds in 1963. Consistently, about 7 percent of production has been exported. Canada and Mexico have been the chief markets for U.S. exports, although in recent years, sales to Mexico have declined significantly. Guatemala, the Philippines and several South American countries have been steady secondary markets. Exports were not reported separately beginning with 1965.

U.S. imports

During 1962-67 imports (table 3) ranged between 11 and 15 million pounds annually, showing a general upward trend from the 12 million pounds, valued at $212,000 reported in 1962 to the 13 million pounds, valued at $255,000 recorded in 1967. In 1964, imports amounted to 4.5 percent of consumption. In 1962-67, the United Kingdom supplied about 99 percent of the imports; Canada, Belgium, Taiwan, Netherlands, Poland, and West Germany supplied small amounts. Canada and West Germany were the only consistent sources of the six small suppliers.

Foreign production and trade

The industrialized countries, such as Canada, Belgium, Netherlands,

United Kingdom and West Germany produce and export sodium bicarbonate. Their export markets are located chiefly in Africa, Asia, and South America.

New plants have been reported for Yugoslavia and Japan. The Yugoslavia plant is for the production of technical and medicinal sodium bicarbonate. The Japan plant has a reported capacity of 36,000 tons per year.

Table 1.--Sodium bicarbonate: U.S. production, imports for consumption, exports of domestic merchandise, and apparent consumption, 1962-67

(Quantity in thousands of pounds; value in thousands of dollars)

Year	Production	Imports	Exports	Apparent consumption	Ratio (percent) of imports to consumption
	Quantity				
1962	307,086	12,046	20,146	298,986	4.0
1963	311,892	11,941	25,092	298,741	4.0
1964	319,188	13,879	22,838	310,229	4.5
1965	338,450	14,798	1/	1/	1/
1966	359,186	14,358	1/	1/	1/
1967	1/	13,023	1/	1/	1/
	Value				
1962	7,000	212	520	6,692	3.2
1963	7,094	189	686	6,597	2.9
1964	7,236	235	590	6,881	3.4
1965	7,481	277	1/	1/	1/
1966	8,239	238	1/	1/	1/
1967	1/	255	1/	1/	1/

1/ Not available.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 2.--Sodium bicarbonate: U.S. exports of domestic merchandise, by principal markets, 1962-64

Market	1962	1963	1964
	Quantity (1,000 pounds)		
Canada	14,763	18,422	16,823
Philippine Republic	477	463	1,093
Venezuela	385	266	1,055
Guatemala	474	250	469
Mexico	1,464	231	533
Argentina	-	571	515
Colombia	106	148	271
Netherlands Antilles	14	240	218
All other	2,463	4,501	1,861
Total	20,146	25,092	22,838
	Value (1,000 dollars)		
Canada	370	455	404
Philippine Republic	13	15	38
Venezuela	10	7	28
Guatemala	18	10	18
Mexico	35	7	15
Argentina	-	18	14
Colombia	3	5	9
Netherlands Antilles	-	10	9
All other	71	159	55
Total	520	686	590

1/ Not separately classified in 1965 and later years.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 3.--Sodium Bicarbonate: U.S. imports for consumption, by sources, 1962-67

Source	1962	1963	1964	1965	1966	1967
	Quantity (1,000 pounds)					
United Kingdom	11,910	11,796	13,850	14,179	14,246	12,916
Belgium	-	-	-	249	-	-
West Germany	134	11	11	235	12	107
Canada	2	-	18	35	-	-
Netherlands	-	-	-	100	-	-
Poland	-	134	-	-	-	-
Taiwan	-	-	-	-	100	-
Total	12,046	11,941	13,879	14,798	14,358	13,023
	Value (1,000 dollars)					
United Kingdom	208	184	233	256	236	250
Belgium	-	-	-	9	-	-
West Germany	4	1/	1/	7	1	5
Canada	1/	-	2	4	-	-
Netherlands	-	-	-	1	-	-
Poland	-	5	-	-	-	-
Taiwan	-	-	-	-	1	-
Total	212	189	235	277	238	255

1/ Less than $500.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Sodium bisulfate (niter cake)----------	420.74

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume.

U.S. trade position

U.S. production is estimated to be about 50,000 tons annually. U.S. exports and imports are practically nil.

Description and uses

Sodium bisulfate is a white crystalline compound obtained as a byproduct in the manufacture of hydrochloric and nitric acids. It is used as a flux for decomposing minerals, as a substitute for sulfuric acid in dyeing, and in the manufacture of sodium sulfate, soda alum, paper, and soap.

U.S. tariff treatment

The duty-free status was provided for in the Tariff Act of 1930, as originally enacted, and in the TSUS, effective August 31, 1963, and effective January 1, 1968, was bound for the first time in the sixth round of negotiations under the General Agreement on Tariffs and Trade (GATT).

U.S. production and consumption

Sodium bisulfate is produced by four domestic concerns in plants located in Massachusetts, Ohio, Pennsylvania, and Wisconsin. The annual output is estimated to be about 50,000 tons. The producers' list price for bulk sales is $40 per ton. Domestic consumption is virtually all supplied by domestic producers. Transportation costs limit international shipments of sodium bisulfate. U.S. exports, if any, are believed to be negligible. Imports during 1962-67 amounted to 232 pounds valued at $350 from West Germany in 1967.

Capacity to produce sodium bisulfate exists in foreign countries wherever nitric or hydrochloric acids are produced, which includes all the more industrialized nations.

Commodity	TSUS item
Calcium borate, crude	418.12
Sodium borate, crude	420.76
Sodium borate, refined	420.78

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

The United States is the world's largest producer and consumer of the boron compounds covered herein, with production totaling 955 thousand short tons, valued at $74 million in 1967. Imports have been insignificant but exports accounted for about one-half of domestic output.

Description and uses

Crude sodium borate and crude calcium borate are mined from bedded and vein deposits. Crude sodium borate is also recovered as a coproduct from natural brines. These minerals are the only commercial source of borates and from them the other borates, such as refined sodium borate, are manufactured in various grades and particle sizes.

Crude and refined sodium borate are used principally in the manufacture of glass products, ceramics, and porcelain enamel. These compounds are also used in lesser amounts in fertilizers, herbicides, and as raw materials for producing other boron chemicals. Crude calcium borate is used in forest-fire fighting and as a raw material for producing other boron chemicals.

U.S. tariff treatment

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
418.12	Calcium borate, crude------	Free	Free 1/
420.76	Sodium borate, crude-------	Free	Free 1/
420.78	Sodium borate, refined-----	0.125¢ per lb.	0.06¢ per lb.

1/ Not a staged rate.

The duty-free status of crude calcium borate and crude sodium borate was provided for in the Tariff Act of 1930 as originally enacted, and in the TSUS, effective August 31, 1963; effective January 1, 1968, the duty-free rates were bound for the first time in the sixth round of negotiations under the General Agreement on Tariffs and Trade (GATT).

The rate effective January 1, 1972, on refined sodium borate represents the final stage of a concession granted by the United States in the sixth round of trade negotiations under the GATT. The first of five annual stages of the reduction became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rate shown above as existing prior to January 1, 1968, remained unchanged under the TSUS from August 31, 1963 (the effective date of the TSUS), through the end of 1967. The ad valorem equivalent of the specific rate of duty in effect prior to January 1, 1968, is not representative as imports have been negligible in recent years.

U.S. consumption and production

The apparent consumption of boron minerals and compounds has been generally increasing and is estimated to have amounted to about 470,000 short tons in 1967. Production of primary boron minerals and compounds as measured by quantity sold or used by producers totaled 955,000 short tons in 1967 (table 1), 10 percent more than in 1966. In 1967, production of crude and refined sodium borate, the bulk of U.S. output of borates, was reported by three large diversified chemical corporations; production of a very small amount of crude calcium borate was reported by one of the above concerns at two small mines and by a medium-size mining and chemical company at one mine. All the sodium and calcium borate was produced in California.

U.S. exports and imports

Since January 1, 1965, refined sodium borate is the only boron compound covered by the summary that is separately classified in export statistics. Prior to 1965, the export class included all boron compounds, both crude and refined, providing data to enable calculation of apparent consumption.

For several years, prior to the export classification change, exports of boron compounds had been increasing and in 1964 totaled over 383,000 short tons, a 13-percent increase over 1963 (table 2). European countries were the major market for exports, receiving 68 percent of 1964 exports. Shipments in bulk from California to a storage depot in the Netherlands was begun in 1964, with the material being distributed to various European countries from this depot. About 17 percent of total exports was exported to Asia; 8 percent to other North American countries; 5 percent to Oceania; 2 percent to South America; and 1 percent to Africa. Exports of refined sodium borate since 1965 have exceeded 150,000 tons annually (table 2) but are believed to have amounted to less than half the total exports of boron compounds from the United States.

Inasmuch as the United States is the world's leading supplier of boron minerals and compounds, imports of the compounds covered by this summary have been insignificant. The imports of calcium borate, crude, mainly from Turkey, and primarily for use by the fiber-glass industry totaled 6,000 short tons, valued at $202,000 in 1965; 12,000 tons, valued at $450,000 in 1966; and 27,000 tons valued at $690,000 in 1967.

World production and trade

There is no significant production of crude sodium borate outside the United States. The second largest boron-mineral producing country was Turkey, where three companies produced crude calcium borate mainly for export. Output totaled 248,000 short tons in 1966. Argentina and Chile also reported production of calcium borate minerals, totaling less than 50,000 tons in 1966. Small quantities of boric acid have been recovered from volcanic steam vents in Italy.

Table 1.--Sodium borate and calcium borate: U.S. production, imports for consumption, exports of domestic merchandise, and apparent consumption, 1962-67

(In thousands of short tons)

Year	Production 1/	Imports 2/	Exports 3/	Apparent consumption
1962	647	4/	292	355
1963	700	4/	339	361
1964	776	4/	383	393
1965	807	6	152	5/
1966	866	12	179	5/
1967	955	27	163	5/

1/ As measured by total quantity of marketable boron minerals and compounds sold or used by producers.

2/ Consists largely of crude calcium borate.

3/ Includes boric acid; borates, crude and refined; and boron compounds (including borate esters) not elsewhere classified, 1962-64; includes only refined sodium borate, 1965-67.

4/ Less than 500 tons.

5/ Not available.

Source: Compiled from official statistics of the U.S. Bureau of Mines and the U.S. Department of Commerce.

Table 2.--Boron minerals, and compounds 1/: U.S. exports by major markets, 1962-67

Market	1962	1963	1964	1965	1966	1967
	Quantity (1,000 short tons)					
Netherlands	16	35	139	59	63	63
Japan	30	35	37	22	31	34
Canada	16	19	20	8	11	10
United Kingdom	46	50	30	7	8	7
France	35	43	30	9	15	3
West Germany	56	64	28	5	4	2
All other	93	93	99	43	47	44
Total	292	339	383	153	179	163
	Value (1,000 dollars)					
Netherlands	1,432	2,562	8,462	5,761	6,500	6,755
Japan	2,793	3,179	3,379	1,827	2,673	3,027
Canada	1,875	1,992	2,001	781	926	859
United Kingdom	3,909	3,944	2,932	645	666	617
France	2,798	3,395	2,823	874	1,518	348
West Germany	4,053	4,259	2,478	438	379	217
All other	7,876	8,188	9,214	3,649	4,336	4,063
Total	24,736	27,519	31,289	13,975	16,998	15,886

1/ 1962-64 classified by the Bureau of the Census as boric acid and borates, crude and refined, and compounds (including borate esters and other boron compounds) not elsewhere classified; 1965-67--refined sodium borate only.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Sodium carbonate, calcined (soda ash)----------	420.84

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

Domestic production of soda ash, which has been increasing, totaled 13.7 billion pounds in 1966. The United States is on a net export basis with respect to soda ash, having exported from 2.7 to 5.1 percent of production in recent years. Exports in 1967 amounted to 608 million pounds. Imports have been nil or negligible in recent years.

Description and uses

Sodium carbonate, calcined, also known as soda ash, is a grayish-white powder made by the ammonia-soda (Solvay) process, or recovered from trona deposits (natural sodium sesquicarbonate deposits) in Wyoming and natural brines in California. The Solvay process is the manufacture of synthetic soda ash from salt, ammonia, carbon dioxide, and limestone. Operations include the heating of limestone to produce lime and carbon dioxide. The carbon dioxide is dissolved in water containing ammonia and salt, resulting in precipitation of sodium bicarbonate. The sodium bicarbonate is separated by filtration, dried, and heated to form synthetic soda ash.

Soda ash is one of the most important industrial alkalies produced in the United States. Excluding natural products, such as common salt (sodium chloride), the volume of synthetic soda ash produced in 1966 was exceeded only in the cases of sulfuric acid, anhydrous ammonia, caustic soda, chlorine, and aluminum oxide. If soda ash from natural sources is added to the synthetic output, this volume was exceeded in 1966 by only sulfuric acid, anhydrous ammonia, and caustic soda.

Soda ash is marketed in two grades, finished dense soda ash and finished light soda ash; both grades are used in large quantities. The principal use of dense ash is in the manufacture of glass; smaller quantities are used in the manufacture of aluminum. Light ash is used mainly in the manufacture of chemicals; smaller quantities are consumed

in the manufacture of pulp and paper, soap and detergents, and in water treatment. Current demand is strong throughout the end-use pattern although competition from caustic soda in aluminum production, glass manufactures, and chemical production could restrict the amounts of soda ash consumed in these uses.

U.S. tariff treatment

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
420.84	Sodium carbonate, calcined (soda ash).	0.25¢ per lb.	0.12¢ per lb.

The rate effective January 1, 1972, represents the final stage of a concession granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reduction became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rate shown above as existing prior to January 1, 1968, remained unchanged under the TSUS from August 31, 1963 (the effective date of the TSUS), through the end of 1967.

The ad valorem equivalent of the specific rate of duty in effect prior to January 1, 1968, based on imports in 1966, was 0.56 percent.

U.S. consumption, producers, and production

Domestic consumption rose from about 10.9 billion pounds in 1962 to 12.9 billion pounds in 1966, an increase of about 19 percent (table 1). The bulk of the increase has been for the manufacture of glass. While no important new end-uses have been developed recently, consumption throughout the established use pattern has been uniformly above that of previous years. Virtually all soda ash consumed domestically has been supplied by domestic producers.

Soda ash is produced in the United States by 9 large integrated chemical companies. Six of the companies produce soda ash by the ammonia-soda process in plants situated in Louisiana, Michigan, New York, Ohio, Texas, and Virginia. These synthetic plants have been in operation since before World War II; the last synthetic plant went on

stream in 1934. Four of the companies (including one that produces soda ash synthetically) recover soda ash from natural brines in California and from trona deposits in Wyoming. Two of the synthetic producers and three non-soda ash producers have indicated an interest in producing soda ash from the Wyoming trona deposits.

Domestic production of soda ash increased from 11.2 billion pounds in 1962 to about 13.6 billion pounds in 1966, or by about 22 percent (table 1). Increased demands all through the end-use pattern plus more than a doubling of exports during the period account for the increase in production. More than one-half the increase is due to the growth of soda ash production from natural brines and trona deposits.

U.S. exports and imports

Exports of soda ash increased steadily from 303 million pounds in 1962 to 608 million pounds in 1967 (table 2). During this period from 2.7 to 5.1 percent of annual production was exported. Canada and Mexico were the principal markets. Other important markets included the Republic of Korea, Venezuela, New Zealand, and Argentina.

Imports of soda ash have been nil or negligible during 1962-67 (table 3). There were no imports reported for 1967; 141,000 pounds valued at $1,830, in 1962, values of less than $500 a year for 1963-65, and 3,000 pounds valued at $1,208, in 1966. Canada, Japan, and the United Kingdom were the only sources during the period. Imports in 1962 and 1966 amounted to less than 0.05 percent of consumption.

Foreign production and trade

Soda ash is produced in all industrialized nations of the world. The United States is the largest producer and the U.S.S.R. probably ranks second, Among non-communist countries, West Germany, the largest producer in Western Europe, ranks second to the United States in volume of production. France, Japan, Italy, Poland, and Canada follow West Germany in order. Production has been reported from or is known to exist in Argentina, Austria, Belgium, Brazil, Chile, Colombia, Egypt, India, Israel, Kenya, Mexico, the Netherlands, Norway, Pakistan, Portugal, Rumania, Spain, Republic of South Africa, Taiwan, the United Kingdom, and Venezuela.

A substantial amount of soda ash moves in international trade from the industrialized nations to the less developed countries of the world. The smaller and poorer nations have requirements for soda ash they cannot meet due to a lack of such indigenous resources as the capital to build the necessary plants, the technical know-how, or one of the basic raw materials, such as salt.

Table 1.--Sodium carbonate, calcined (soda ash): U.S. production, imports for consumption, exports of domestic merchandise, and apparent consumption, 1962-67

(Quantity in thousands of pounds; value in thousands of dollars)

Year	Production	Imports	Exports	Apparent consumption
1962	11,169,326	141	303,227	10,866,240
1963	11,601,530	-	367,362	11,234,168
1964	12,445,802	-	551,497	11,894,305
1965	12,840,842	-	554,207	12,286,635
1966	13,655,410	3	691,326	12,964,087
1967	1/	-	608,242	1/
	Value			
1962	1/	2	4,693	1/
1963	1/	2/	5,722	1/
1964	1/	2/	8,535	1/
1965	1/	2/	9,030	1/
1966	1/	1	12,249	1/
1967	1/	-	9,914	1/

1/ Not available.
2/ Less than $500.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 2.--Sodium carbonate, calcined (soda ash): U.S. exports of domestic merchandise, by principal markets, 1962-67

Market	1962	1963	1964	1965	1966	1967
	Quantity (1,000 pounds)					
Canada	42,189	102,092	223,856	218,286	256,852	290,645
Argentina	30,475	32,215	50,493	15,784	54,355	99,007
Mexico	155,617	153,038	175,407	197,575	210,746	96,550
Venezuela	19,810	22,489	35,428	36,052	38,730	39,092
Republic of Korea	13,422	15,503	4,961	37,428	45,706	18,992
New Zealand	411	2,952	9,928	15,380	12,603	12,741
South Viet-Nam	882	3,900	7,377	11,156	20,036	4,672
Colombia	4,674	1,869	9,803	7,291	17,486	50
All other	35,747	33,304	34,244	15,255	34,812	46,493
Total	303,227	367,362	551,497	554,207	691,326	608,242
	Value (1,000 dollars)					
Canada	796	1,755	3,571	3,679	4,560	4,958
Argentina	379	325	615	212	938	1,512
Mexico	2,366	2,280	2,640	3,177	3,261	1,443
Venezuela	301	333	426	387	383	396
Republic of Korea	157	193	97	689	711	313
New Zealand	5	40	308	238	346	222
South Viet-Nam	11	47	93	156	518	93
Colombia	66	28	124	98	402	3
All other	612	721	661	394	1,130	974
Total	4,693	5,722	8,535	9,030	12,249	9,914

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 3.--Sodium carbonate, calcined (soda ash): U.S. imports for consumption, by sources, 1962-67

Source	1962	1963	1964	1965	1966	1967
	Quantity (1,000 pounds)					
Canada	100	-	-	-	3	-
United Kingdom	19	1/	1/	1/	2/	-
Japan	22	-	-	-	-	-
Total	141	-	-	-	3	-
	Value					
Canada	$235	-	-	-	$664	-
United Kingdom	1,149	$312	$214	$218	544	-
Japan	446	-	-	-	-	-
Total	1,830	312	214	218	1,208	-

1/ Quantity not reported.
2/ Less than 500 pounds.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Sodium carbonate, hydrated, and sesquicarbonate	420.86

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

Domestic production is estimated to be about 80,000 tons annually. Imports and exports are small relative to domestic production. Domestic consumption is supplied almost entirely by U.S. producers.

Comment

Sodium carbonate, monohydrate, also known as crystal carbonate of soda monohydrate, is used in medicine, photography, and in the manufacture of cleaning and boiler compounds. Sodium carbonate, decahydrate, also known as sal soda or washing soda, is used in washing textiles, in bleaching linen and cotton, and as a general cleaner. Sodium sesquicarbonate is used in laundering, tanning, silk degumming, general cleaning, and as an ingredient in bath crystals.

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
420.86	Sodium carbonate, hydrated, and sesquicarbonate.	0.25¢ per lb.	0.1¢ per lb. 1/

1/ This rate, as well as those for 1970 and 1971, is contingent; see footnote 1 to Staged Rates and Historical Notes to Pt. 2 of schedule 4 of the TSUSA-1968, as shown in appendix A to this volume.

The rate effective January 1, 1972, represents the final stage of a concession granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reduction became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rate shown above as existing prior to January 1, 1968, remained unchanged under the TSUS from August 31, 1963 (the effective date of the TSUS), through the end of 1967.

The ad valorem equivalent of the specific rate of duty in effect prior to January 1, 1968, based on imports in 1966, was 0.46 percent.

These sodium carbonates are produced in the United States by six large integrated chemical companies chiefly from natural brines (Searles Lake, California) and trona deposits (natural sodium sesquicarbonate) in Wyoming. Domestic production is not reported in official statistics but it is estimated to range from 70,000 to 90,000 tons annually.

U.S. imports (see accompanying table) varied between 9,000 and 19,000 pounds per year from 1962 to 1967. Virtually all of such imports were from the United Kingdom. U.S. exports have been negligible. Domestic consumption is supplied almost entirely by U.S. producers.

Capacity to produce these sodium carbonates exists in Canada, the Netherlands, the United Kingdom, and West Germany. The limited uses for these low value compounds, however, prevent their becoming important items in international trade.

Sodium carbonate, hydrated, and sesquicarbonate: U.S. imports for consumption, by sources, 1962-67

Source	1962	1963	1964	1965	1966	1967
	Quantity (1,000 pounds)					
United Kingdom	9	17	16	10	14	1/
Japan	-	-	-	-	5	1/
Total	9	17	16	10	19	1/
	Value					
United Kingdom	$1,114	$926	$1,518	$1,015	$3,993	$1,395
Japan	-	-	-	-	6,528	340
Total	1,114	926	1,518	1,015	10,521	1,735

1/ Less than 500 pounds.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Sodium chlorate----------	420.88

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

In 1966, domestic production (308.4 million pounds, valued at $20.6 million) supplied an estimated 99 percent of the sodium chlorate consumed in the United States. Probably less than 1 percent of output has been exported.

Description and uses

Sodium chlorate is a colorless crystalline compound which is made by the electrolysis of sodium chloride (common salt). Electrolytic production of sodium chlorate from a water solution of sodium chloride in a typical process involves four main steps. Step one--chlorine produced at anode combines with water to form sodium hypochlorite and hypochlorous acid. Step two--sodium hypochlorite and hypochlorous acid solution is sent to a degasser where hydrogen is removed. Step three--sodium hypochlorite and hypochlorous acid solution is cooled. Step four--solution is sent to a reactor where hypochlorous acid is converted into sodium chlorate. The main use for sodium chlorate is in the bleaching of paper pulp. It has other important uses in the manufacture of perchlorates and other chlorates, matches and explosives; in ore processing; in leather tanning and finishing; and as a herbicide and defoliant.

U.S. tariff treatment

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
420.88	Sodium chlorate----------	0.75¢ per lb.	0.37¢ per lb.

The rate effective January 1, 1972, represents the final stage of a concession granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT).

The first of five annual stages of the reduction became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rate shown above as existing prior to January 1, 1968, remained unchanged under the TSUS from August 31, 1963 (the effective date of the TSUS), through the end of 1967.

The ad valorem equivalent of the specific rate of duty in effect prior to January 1, 1968, based on imports in 1967 was 11.8 percent.

U.S. consumption, production, exports and imports

The consumption of sodium chlorate is estimated to be distributed as follows: 40 percent for paper manufacture, 26 percent for perchlorates and other chlorates, 20 percent for herbicides, and 14 percent for other products and processes.

Sodium chlorate is produced by five large (multiproduct) chemical companies, with plants situated in Kentucky, Louisiana, Mississippi, Nevada, New York, and Oregon. The industry capacity is reported to be 341 million pounds per year. Production has increased steadily during 1962-66 from 223.6 million pounds, valued at $17.9 million, in 1962 to 308.4 million pounds, valued at $20.6 million in 1966, as shown in the following tabulation (compiled from official statistics of the U.S. Department of Commerce):

Sodium chlorate: U.S. production 1962-66

Year	Quantity (1,000 pounds)	Value (1,000 dollars)
1962	223,596	17,945
1963	248,596	19,686
1964	272,502	21,486
1965	268,628	19,638
1966	308,382	20,617

Exports are not reported separately in official statistics, but it is estimated that they have amounted to less than one million pounds annually. Imports of sodium chlorate (see accompanying table), predominantly from Canada and France, have varied during 1962-67. They totaled 7.9 million pounds, valued at $494,000 in 1962. From 1962 to 1965 the trend was downward, reaching 4.8 million pounds, valued at $335,000, in 1965. Imports increased in 1966-67, totaling 8.9 million pounds, valued at $572,000, in 1967. Imports in 1966 constituted 2.1 percent of total supply.

Foreign production and trade

In addition to the countries shown in the import table, plants producing sodium chlorate have been reported located in the Belgian Congo, East Germany, Mexico, the United Kingdom, and West Germany. Production in Canada is increasing, stimulated by the expansion of the paper pulp industry. A portion of the increased production in Canada is contributed by subsidiaries of U.S. producers. The bulk of the foreign production is in the highly industrialized countries.

Sodium chlorate: U.S. imports for consumption, by sources, 1962-67

Source	1962	1963	1964	1965	1966	1967
	Quantity (1,000 pounds)					
Canada	1,709	3,484	2,923	4,251	6,250	8,965
France	6,173	4,359	1,909	510	299	-
Total	7,882	7,843	4,832	4,761	6,549	8,965
	Value (1,000 dollars)					
Canada	134	263	220	302	445	572
France	360	244	116	33	18	-
Total	494	507	336	335	463	572

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Sodium chloride:	
In brine	420.92
In bulk	420.94
Other	420.96

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

Sodium chloride (salt) is one of the most important industrial chemicals. The United States is the largest producing and consuming country of sodium chloride in the world. In 1967, U.S. apparent consumption was over 41 million short tons, with imports supplying about 7 percent of the total. Exports were less than 2 percent of production.

Description and uses

Sodium chloride occurs in nature as a brine and in crystalline salt beds. The mineral may be almost any color due to minute quantities of various impurities or physical properties. Sodium chloride in solution (brine) occurs as ocean water, lake water, and ground water, in various salt concentrations. Sodium chloride in brine may be used as such after concentration by evaporation and purification or may be recovered as crystalline material by further evaporation. Bedded sodium chloride deposits are exploited by conventional mining methods or by solution mining. Sodium chloride recovered by solution mining may be used as brine or recovered by evaporation and crystallization. Sodium chloride from either brine or bedded deposits can be packaged in various forms, including pressed blocks, or sold in bulk. Evaporated salt is produced by evaporation and crystallization of both natural brines and brines produced from solution mining. Rock salt is produced by conventional hard rock mining of massive salt deposits.

The main use of sodium chloride is as a raw material in the production of a large number of chemicals such as chlorine, caustic soda, soda ash, hydrochloric acid, and bleaches. Other important uses are in snow and ice removal and roadbed stabilization. Additional uses include food and water processing, tanning, textile dyeing, soap making, oil refining, and as table salt.

U.S. tariff treatment

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
	Sodium chloride:		
420.92	In brine	10% ad val.	5% ad val.
420.94	In bulk	1.7¢ per 100 lb.	0.8¢ per 100 lb.
420.96	Other	3.5¢ per 100 lb.	Free

The rates effective January 1, 1972, represent the final stage of concessions granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reductions became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rates shown above as existing prior to January 1, 1968, remained unchanged under the TSUS from August 31, 1963 (the effective date of the TSUS), through the end of 1967. The ad valorem equivalent of the specific rates of duty in effect prior to January 1, 1968, on sodium chloride in bulk and other sodium chloride, based on imports in 1967, were 10.0 percent and 3.4 percent, respectively.

U.S. consumption

The annual apparent consumption of sodium chloride has been increasing since 1962 and in 1967 totaled 41.1 million short tons (table 1). In 1967, production of chlorine accounted for 42 percent of domestic salt consumption; production of soda ash accounted for 18 percent; and that of all other chemicals, 5 percent. Thus, the chemical industry consumed two-thirds of the domestically produced sodium chloride used, and of this, 85 percent was consumed as brine. Snow and ice removal and road stabilization accounted for 14 percent of domestic output, while household table use totaled about 3 percent.

Data on consumption of imported material are incomplete. The imported salt in brine, which totaled 657,000 short tons in 1966 and 443,000 tons in 1967, was consumed in the manufacture of chemicals. The use of imports of the other two classes of salt is believed to have followed generally the use pattern of the domestic material.

U.S. producers

In 1966, sodium chloride was produced by 58 companies at 102 plants located in 18 States. Louisiana was the leading producing State in 1967 and plants located there supplied 25 percent of the total output; Texas was second (21 percent); Ohio was third (14 percent); New York was fourth (13 percent); and Michigan was fifth (12 percent). Other States reporting production included Alabama, California, Colorado, Hawaii, Kansas, New Mexico, Nevada, North Dakota, Oklahoma, Utah, Virginia, and West Virginia.

Ten companies, each producing more than one million tons, operated 39 plants, which, in the aggregate, accounted for 84 percent of the total U.S. output of sodium chloride; 14 companies, each producing from 100,000 to 1 million tons, operated 27 plants and together supplied 14 percent of the total; and 33 companies, each producing less than 100,000 tons, operated 36 plants and accounted for the remaining 2 percent of the total U.S. sodium chloride production.

U.S. production

The production of sodium chloride in the United States, as measured by the quantity sold or used by producers, has been increasing since 1962 and totaled 38.9 million short tons in 1967 (table 2). Production of sodium chloride in brine has accounted for from 56 percent to 58 percent of the total output each year during this period.

U.S. exports

Exports of sodium chloride from the United States during the period 1962-67 have ranged from a high of 781,000 tons to a low of 594,000 tons and totaled 678,000 tons in 1967 (table 3). Japan has been the major market, taking 55 percent or more each year. Canada, the only other significant market, accounted for about 30 percent of the 1967 exports.

U.S. imports

Total imports of sodium chloride into the United States in 1967 amounted to 2.8 million tons (table 4). Imports of sodium chloride in brine were not separately classified until August 31, 1963, and no data are available for estimating earlier imports; thus, the total import statistics beginning with 1964 are not comparable with import statistics of previous years. Imports

of sodium chloride in bulk have been increasing since 1962 and totaled 2.4 million tons in 1967. Imports of sodium chloride not elsewhere enumerated have ranged from 15,000 to 10,000 tons annually during this period.

Canada has been the major source of imports and supplied 50 percent in 1967. Mexico was the second largest source, supplying 29 percent of imports; the Bahamas were third, with 9 percent. Other sources importing in 1967 included Tunisia and the United Arab Republic.

World production and trade

Sodium chloride is produced in nearly every country of the world. Largely because of the low unit value of sodium chloride, relatively small amounts enter international trade. World production, as published by the Bureau of Mines, totaled 122 million short tons in 1967. The major producing countries, in addition to the United States, include Mainland China, the U.S.S.R., the United Kingdom, West Germany, India, France, and Canada.

Table 1.--Sodium chloride: U.S. production, imports for consumption, exports of domestic merchandise, and apparent consumption, 1962-67

Year	Production	Imports	Exports	Apparent consumption	Ratio of imports to consumption
	1,000 short tons	1,000 short tons	1,000 short tons	1,000 short tons	Percent
1962	28,807	1/ 1,374	671	29,510	4.7
1963	30,641	1/ 1,377	781	31,237	4.4
1964	31,623	2,261	594	33,290	6.8
1965	34,687	2,410	688	36,409	6.6
1966	36,463	2,480	663	38,280	6.5
1967	38,946	2,844	678	41,112	6.9

1/ Does not include an unknown quantity of imported salt in brine.

Source: Compiled from official statistics of the U.S. Bureau of Mines and U.S. Department of Commerce.

Table 2.--Sodium chloride: U.S. production by methods of recovery, 1962-67

Year	Evaporated	Rock	Brine	Total
	Quantity (1,000 short tons)			
1962	4,643	7,726	16,438	28,807
1963	4,771	8,345	17,525	30,641
1964	4,702	8,554	18,367	31,623
1965	4,925	9,810	19,952	34,687
1966	5,035	10,080	21,348	36,463
1967	5,289	11,661	21,996	38,946
	Value (1,000 dollars)			
1962	75,075	46,874	52,892	174,841
1963	77,020	51,648	55,921	184,589
1964	80,052	52,290	68,364	200,706
1965	82,737	57,710	75,252	215,699
1966	88,754	61,118	80,113	229,985
1967	95,846	71,953	83,411	251,210

Source: Compiled from official statistics of the U.S. Bureau of Mines.

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Table 3.--Sodium chloride: U.S. exports of domestic merchandise, by principal markets, 1962-67

Market	1962	1963	1964	1965	1966	1967
	Quantity (1,000 short tons)					
Japan	506	563	349	379	429	461
Other Asia	4	9	6	1/	1	2
Canada	120	152	196	163	177	205
Other North America	12	17	6	1/	6	5
South America	5	8	9	1/	46	1
Europe	11	12	18	1/	2	1
Africa	6	12	5	1/	1	1
Oceania	7	8	5	1/	1	2
Total	671	781	594	688	663	678
	Value (1,000 dollars)					
Japan	2,148	2,395	1,457	1,601	1,890	2,099
Other Asia	52	88	105	1/	119	121
Canada	921	1,057	1,370	1,414	1,637	1,739
Other North America	279	257	171	1/	286	289
South America	53	71	72	1/	263	80
Europe	92	91	105	1/	142	123
Africa	33	144	48	1/	52	37
Oceania	60	37	45	1/	83	95
Total	3,638	4,140	3,373	4,285	4,472	4,583

1/ Further country detail not available.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 4.--Sodium chloride: U.S. imports for consumption, by classes, 1962-67

Year	In brine	In bulk	Other	Total
	Quantity (1,000 short tons)			
1962	1/	1,359	15	1,374
1963	1/	1,367	10	1,377
1964	590	1,661	10	2,261
1965	645	1,751	14	2,410
1966	657	1,811	10	2,478
1967	443	2,387	14	2,844
	Value (1,000 dollars)			
1962	1/	4,843	254	5,097
1963	1/	4,916	158	5,074
1964	162	5,358	158	5,678
1965	179	6,085	241	6,505
1966	204	6,052	208	6,464
1967	129	8,130	282	8,541

1/ Imports of sodium chloride in brine not separately classified; no data available for estimates.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 5.--Sodium chloride: U.S. imports for consumption, by principal sources, 1962-67

Source	1962	1963	1964	1965	1966	1967
	Quantity (1,000 short tons)					
Canada 1/	678	645	1,280	1,432	1,320	1,436
Mexico	407	353	527	480	636	830
Bahamas	203	218	292	344	330	270
Tunisia	-	26	84	109	124	169
United Arab Republic	-	8	24	-	27	48
Spain	45	116	27	45	43	-
Dominican Republic	29	-	23	-	-	-
Jamaica	11	10	4	-	-	-
All other	1	1	2/	2/	-	91
Total 1/	1,374	1,377	2,261	2,410	2,480	2,844
	Value (1,000 dollars)					
Canada 1/	3,558	3,344	3,434	4,017	3,502	4,859
Mexico	511	492	679	744	982	1,724
Bahamas	784	843	1,155	1,305	1,234	1,005
Tunisia	-	55	222	303	371	542
United Arab Republic	-	18	57	-	66	159
Spain	126	296	72	135	305	-
Dominican Republic	88	-	46	-	-	-
Jamaica	30	26	10	-	-	-
All other	3/	3/	3	1	4	252
Total 1/	5,097	5,074	5,678	6,505	6,464	8,541

1/ Includes salt in brine for 1964-67.
2/ Less than 500 tons.
3/ Less than 500 dollars.

Source: Compiled from official statistics of the U.S. Department of Commerce.

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Commodity	TSUS item
Sodium chromate and dichromate----------	420.98

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

Sodium chromate and dichromate are made from imported chrome ore (chromite). Domestic production was about 283 million pounds in 1966, and consumption, about 326 million pounds. The United States, normally a net exporter of sodium chromate and dichromate, became a net importer in 1965-67. In 1965-66, imports amounted to 36.0 million and 48.3 million pounds, respectively.

Description and uses

Sodium chromate is a yellow, crystalline compound whose main use is in the manufacture of chromium metal and chrome compounds; other uses include dyeing, leather tanning, paint pigments, and as a wood preservative. Sodium dichromate, the more important of the two compounds, is a brilliant orange-to-red crystalline compound. The most important use for sodium dichromate, also known as sodium bichromate, is in the manufacture of pigments. Other uses include leather tanning, manufacture of chromic acid, metal treating, wool dyeing, and chrome plating.

U.S. tariff treatment

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
420.98	Sodium chromate and dichromate.	1.75¢ per lb.	0.87¢ per lb.

The rate effective January 1, 1972, represents the final stage of a concession granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT).

The first of five annual stages of the reduction became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rate shown above as existing prior to January 1, 1968, remained unchanged under the TSUS from August 31, 1963 (the effective date of the TSUS), through the end of 1967.

The ad valorem equivalent of the specific rate of duty in effect prior to January 1, 1968, based on imports in 1967 was 20.0 percent.

U.S. consumption

During the years 1962-66, U.S. annual consumption (table 1) of sodium chromate and dichromate increased from 250 million pounds in 1962 to 326 million pounds in 1966. The bulk of the sodium chromate and dichromate consumed in the United States has been supplied by domestic producers.

U.S. producers and production

Sodium chromate and dichromate are produced by five large (multiproduct) chemical companies with plants located in Maryland, Missouri, New Jersey, New York, Ohio, and Texas. Domestic production (table 1), during 1962-66, increased from 255 million pounds in 1962 to 283 million pounds in 1966. Total capacity of the industry is reported to be 412 million pounds annually (hydrous sodium bichromate equivalent). Expansions now in progress are expected to raise the annual capacity to 480 million pounds by the end of 1968.

U.S. exports

Exports of sodium chromate and dichromate (table 2) during 1962-67 have averaged about 9 million pounds annually, ranging from 5.2 million pounds in 1966 to 13.3 million pounds in 1964. In 1966, exports amounted to 1.8 percent of production. Canada, Mexico, and South America have been the chief markets for U.S. exports. The United States was a net exporter through 1964. A huge increase in imports in 1965 plus a decrease in exports advanced imports ahead of exports for the first time during the period covered.

U.S. imports

During 1962-67, imports (table 3), consisting chiefly of sodium dichromate, showed an upward trend through 1966, increasing from 5.1 million pounds in 1962 to 48.3 million pounds in 1966. In 1967, imports

decreased to 16.4 million pounds, valued at $1.4 million. The huge increase of imports in 1965-66 reportedly was largely the result of increased demand for chrome plating by the automobile industry. The Republic of South Africa, where one large domestic chemical company has a chrome ore mining facility, has been the most consistent source. Japan has been a regular source since 1962. France, Italy and the U.S.S.R. became suppliers for the first time in 1965.

Foreign production and trade

In addition to the countries shown in table 3, production of sodium dichromate has been reported for India, Rumania, and Turkey. Economic deposits of chromite (raw material from which sodium chromate and dichromate are produced) are located mainly in non-industrial countries. With the exception of the U.S.S.R., the industrial countries import chromite ore for processing into sodium chromate, dichromate, and other products.

Table 1.--Sodium chromate and dichromate: U.S. production, imports for consumption, exports of domestic merchandise, and apparent consumption, 1962-67

(Quantity in thousands of pounds; value in thousands of dollars)

Year	Production	Imports	Exports	Apparent consumption	Ratio (percent) of imports to consumption
	Quantity				
1962	254,956	5,065	9,995	250,026	2.0
1963	267,744	6,937	10,154	264,527	2.6
1964	275,742	6,909	13,339	269,312	2.6
1965	282,016	36,000	8,032	309,984	11.6
1966	292,956	48,271	5,237	325,990	14.8
1967	1/	16,448	6,618	1/	1/
	Value				
1962	32,557	388	1,162	31,783	
1963	32,191	562	1,117	31,636	
1964	31,759	671	1,459	30,971	
1965	32,916	3,205	862	35,279	
1966	35,861	4,142	569	39,434	
1967	1/	1,438	684	1/	

1/ Not available.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 2.--Sodium chromate and dichromate: U.S. exports of domestic merchandise, by principal markets, 1962-67

Market	1962	1963	1964	1965	1966	1967
	Quantity (1,000 pounds)					
Canada	6,112	6,177	8,540	5,723	4,017	5,486
Colombia	401	882	718	473	198	616
Chile	405	128	352	466	128	46
Mexico	1,773	1,285	2,415	715	326	-
Argentina	506	463	637	231	-	-
Iran	-	-	-	87	156	-
All other	798	1,219	677	337	412	470
Total	9,995	10,154	13,339	8,032	5,237	6,618
	Value (1,000 dollars)					
Canada	707	669	909	623	432	574
Colombia	49	95	79	54	24	50
Chile	46	14	38	43	12	4
Mexico	205	148	278	77	28	-
Argentina	62	52	73	20	-	-
Iran	-	-	-	10	23	-
All other	93	139	82	35	50	56
Total	1,162	1,117	1,459	862	569	684

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 3.--Sodium chromate and dichromate: U.S. imports for consumption, by principal sources, 1962-67

Source	1962	1963	1964	1965	1966	1967
	Quantity (1,000 pounds)					
Republic of South Africa	4,430	3,002	3,188	3,991	4,537	5,810
U.S.S.R. 1/	-	-	-	3,287	8,809	4,808
Japan	635	3,935	3,670	9,844	13,631	2,645
Italy	-	-	-	9,920	11,667	2,204
France	-	-	-	551	1,545	220
West Germany	-	-	-	6,594	5,953	-
Denmark	-	-	-	-	960	-
United Kingdom	-	-	-	1,592	-	-
All other	-	-	51	221	1,169	761
Total	5,065	6,937	6,909	36,000	48,271	16,448
	Value (1,000 dollars)					
Republic of South Africa	327	221	356	357	344	494
U.S.S.R. 1/	-	-	-	282	725	430
Japan	61	341	310	822	1,114	221
Italy	-	-	-	936	1,101	206
France	-	-	-	50	129	23
West Germany	-	-	-	594	544	-
Denmark	-	-	-	-	89	-
United Kingdom	-	-	-	144	-	-
All other	-	-	5	20	96	64
Total	388	562	671	3,205	4,142	1,438

1/ Imports from all countries for the years shown were subject to the same rates of duties; imports, however, from the U.S.S.R. after Jan. 1, 1968, are subject to the column 2 rate of TSUSA while imports from non-communist countries are dutiable at the GATT rate.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Calcium cyanide	418.20
Copper cyanide	418.69
Potassium cyanide	420.12
Sodium cyanide	421.02
Zinc cyanide	422.73
Inorganic mixtures in chief value of the foregoing or of mercury cyanide	423.82

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

U.S. consumption of calcium cyanide is supplied entirely by imports, which were 33 million pounds, valued at $1.35 million, in 1967. Domestic production of the remaining cyanide compounds and mixtures is estimated at 35 to 40 million pounds annually and imports were 24.38 million pounds, valued at $3.44 million, in 1967. Exports of sodium cyanide were 10.25 million pounds, valued at $1.41 million, in 1967.

Description and uses

This summary deals with several inorganic cyanide compounds and mixtures that are free of duty under the TSUS. Principal among these are calcium cyanide, potassium cyanide, and sodium cyanide. Inorganic cyanide compounds other than those discussed herein are included in the summaries pertaining to the positive ion (cation) of the compound. Mercury cyanide (item 419.53), for example, is included in the summary on inorganic mercury compounds, and silver cyanide (in item 420.60) is included in the summary on inorganic silver compounds.

All inorganic cyanide compounds and mixtures are extremely poisonous. Commercially, the most important of these is sodium cyanide, a white deliquescent crystalline substance produced chiefly by reacting elemental sodium with ammonia and charcoal or by absorbing hydrocyanic acid in a solution of sodium hydroxide; it is used mainly in electroplating, in heat treating metals, in extracting gold and silver from their ores, as a pesticide, and as a chemical intermediate. Potassium cyanide, also a white deliquescent substance, is produced from potassium carbonate, ammonia, and carbon, or recovered

as a byproduct of beet-sugar manufacture; its uses are similar to those of sodium cyanide, and it is also used in process engraving and lithography. Calcium cyanide is a gray-black material produced by reacting calcium cyanamide and sodium chloride in an electric furnace; it is used in lieu of sodium cyanide where high purity is not essential. Copper cyanide, a green powder produced from potassium cyanide and copper sulfate, is used in electroplating and as a chemical intermediate. Zinc cyanide, a white powder produced from zinc sulfate and potassium cyanide, is used in electroplating and in the purification of illuminating gas. The cyanide mixtures dealt with herein consist predominantly of special formulations used in heat-treating metals and in electroplating.

U.S. tariff treatment

Imports of the inorganic cyanides and mixtures covered here are duty free. The duty-free status was provided for in the Tariff Act of 1930, as originally enacted, and in the TSUS, effective August 31, 1963, and has been bound since January 1, 1948, for sodium cyanide and since October 1, 1951, for the remaining items as concessions granted by the United States in the General Agreement on Tariffs and Trade (GATT).

U.S. consumption, production, and producers

U.S. consumption of inorganic cyanides and mixtures is supplied by domestic output complemented by substantial imports. Statistics on domestic production of cyanides, individually or collectively, are not available. Trade information indicates that annual U.S. production of sodium cyanide approximates 35 million pounds, and that of potassium cyanide approximates 2 million pounds. Calcium cyanide is not produced in the United States; the domestic output of each of the other cyanide compounds and mixtures is believed to be small.

The cyanide compounds and mixtures dealt with in this summary are produced domestically by some six companies having plants in California, Louisiana, New York, New Jersey, Missouri, Ohio, Pennsylvania, Tennessee, and Texas. These producers manufacture a variety of other chemicals; the chemicals discussed herein are not the principal source of income for any of them.

U.S. exports and imports

Except for sodium cyanide, U.S. exports are not separately reported in official statistics. Exports of sodium cyanide (table 1) ranged from 5.7 million pounds, valued at $897,000, in 1963, to 10.25 million pounds valued at $1.4 million, in 1967. Latin American countries have been the principal foreign markets.

Before September 1963, only imports of potassium and sodium cyanide were separately reported in official statistics. Annual U.S. imports of potassium cyanide ranged from a low of 1.7 million pounds in 1963 to a high of 2.3 million pounds in 1966 (see table 1). Annual imports of sodium cyanide (also in table 1) varied from 17.1 million pounds in 1963 to 21.5 million pounds in 1965. Imports of the remaining cyanides dealt with herein are indicated in table 2; imports of calcium cyanide (33 million pounds in 1967) are the sole source of domestic consumption. U.S. imports of the cyanides and mixtures originate principally in Canada, the EEC countries, Japan, the United Kingdom, and to a lesser extent in Czechoslovakia and the U.S.S.R.

Table 1.--Potassium and sodium cyanide: U.S. imports for consumption of potassium and sodium cyanide and exports of domestic sodium cyanide, 1962-67

(Quantity in thousands of pounds; value in thousands of dollars)

Year	Imports		Exports
	Potassium cyanide	Sodium cyanide	Sodium cyanide
	Quantity		
1962	2,117	19,728	7,090
1963	1,735	17,091	5,712
1964	2,109	20,516	7,932
1965	2,213	21,532	8,514
1966	2,330	20,928	8,055
1967	1,859	21,386	10,251
	Value		
1962	516	2,492	1,000
1963	445	2,116	897
1964	504	2,391	1,153
1965	506	2,625	1,289
1966	542	2,461	1,154
1967	439	2,642	1,413

Source: Compiled from official statistics of the U.S. Department of Commerce.

Note.--Exports of potassium cyanide are not separately reported in official statistics.

Table 2.--Selected cyanide compounds and mixtures: U.S. imports for consumption, 1964-67

(Quantity in thousands of pounds; value in thousands of dollars)

Year	Calcium cyanide	Copper cyanide	Zinc cyanide	Inorganic cyanide mixtures
	Quantity			
1964	35,790	368	118	300
1965	35,780	210	120	508
1966	35,270	172	200	612
1967	33,007	136	91	908
	Value			
1964	1,387	147	42	77
1965	1,463	95	46	140
1966	1,441	111	73	232
1967	1,353	97	35	229

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Sodium hydrosulfite	421.06
Zinc hydrosulfite	422.74
Hydrosulfite mixtures	423.84 (pt.)

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

The United States ranks among the world's largest producers of the hydrosulfites covered herein. Virtually all domestic requirements --about 80 million pounds in 1966--have been filled from U.S. production; in 1967 only 114,000 pounds were imported. During 1962-67 an average of about 5 percent of annual production was exported; in 1967 exports amounted to about 2.2 million pounds.

Description and uses

Sodium hydrosulfite, by far the most important item covered here, is used mainly in the vat dyeing of cotton and other textile fibers, and in many bleaching, reducing, and stripping operations, especially in reducing indigo and other vat dyes. Zinc hydrosulfite is used mainly in bleaching textiles, vegetable oils, straw, and hemp. Inorganic mixtures of hydrosulfites (item 423.84) consist mainly of either sodium hydrosulfite or zinc hydrosulfite and are used as indicated above according to which of these two compounds is the principal ingredient.

U.S. tariff treatment

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
421.06	Sodium hydrosulfite	35% ad val.	17.5% ad val.
422.74	Zinc hydrosulfite	35% ad val.	17.5% ad val.
423.84	Mixtures in chief value of hydrosulfite compounds, sulfoxylate compounds, or both.	35% ad val.	17.5% ad val.

The rates effective January 1, 1972, represent the final stage of concessions granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reductions became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rates shown above as existing prior to January 1, 1968, remained unchanged under the TSUS from August 31, 1963 (the effective date of the TSUS), through the end of 1967.

U.S. consumption and production

In 1966, consumption of sodium hydrosulfite was 77 million pounds, which is estimated to approximate the consumption of all products herein covered. Production of sodium hydrosulfite (table 1) increased from 60.5 million pounds to 79.7 million pounds during the years 1962-66. The U.S. capacity to produce sodium hydrosulfite is reported to be 82 million pounds per year.

Production data on zinc hydrosulfite are not reported in official statistics, but production is estimated to be about 5 million pounds annually.

Sodium hydrosulfite is produced by six (4 large and 2 small) chemical manufacturing concerns with plants located in New Jersey (3), Pennsylvania, Tennessee, and Virginia. The four large companies manufacture numerous chemicals and chemical products with sodium hydrosulfite representing a small portion of their total output. In the case of the two small companies, the production of sodium hydrosulfite represents a substantial part of their annual output.

Zinc hydrosulfite is produced by three (two large and one small) chemical producers with plants located in New Jersey, Pennsylvania,

and Virginia. The annual output of this product is estimated to be a small part of the producers' total annual production.

U.S. exports and imports

Annual exports of sodium hydrosulfite (table 2) varied during the years 1962-67 but showed a generally downward trend from 3.9 million pounds in 1962 to 2.2 million pounds in 1967. Canada was the most important market while South Viet-Nam, Iran, the Republic of the Philippines, Venezuela, and Pakistan were also important markets during this period. In 1964 the Congo and Argentina became markets for the first time during the period covered. Exports of zinc hydrosulfite are not reported separately in official statistics; they are estimated to be negligible or nil.

U.S. imports of sodium hydrosulfite (table 3) were first reported separately in September 1963. In 1967, they amounted to 114,000 pounds, valued at $17,000. Switzerland and West Germany have been the only sources. Imports of zinc hydrosulfite have been nil since they were first reported separately in September 1963.

Foreign production and trade

Capacity to produce sodium hydrosulfite is known to exist in the United Kingdom, Switzerland, Spain, and West Germany. Construction of plants to produce this product has been reported for Argentina, Brazil, Colombia, France, India, and the Netherlands.

Table 1.--Sodium hydrosulfite: U.S. production, 1962-66

Year	Quantity	Value
	1,000 pounds	1,000 dollars
1962	60,484	13,816
1963	59,240	13,226
1964	62,770	14,095
1965	70,104	16,414
1966	79,692	20,084

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 2.--Sodium hydrosulfite: U.S. exports of domestic merchandise, by principal markets, 1962-67

Market	1962	1963	1964	1965	1966	1967
	Quantity (1,000 pounds)					
South Viet-Nam	909	272	701	870	1,586	1,251
Canada	2,008	1,054	1,932	1,425	484	487
Republic of the Philippines	191	20	123	104	86	130
Iran	106	72	68	146	50	110
Pakistan	417	615	56	37	64	27
Venezuela	47	60	62	111	144	18
Congo	-	-	170	223	110	-
Argentina	-	-	175	83	-	-
All other	276	574	384	143	78	154
Total	3,954	2,667	3,671	3,142	2,602	2,177
	Value (1,000 dollars)					
South Viet-Nam	163	47	120	145	315	244
Canada	416	213	368	278	104	103
Republic of the Philippines	39	5	26	21	19	33
Iran	22	16	13	29	10	24
Pakistan	82	94	10	9	5	3
Venezuela	9	12	12	21	18	2
Congo	-	-	39	48	31	-
Argentina	-	7	38	17	-	-
All other	53	97	72	35	15	16
Total	784	484	698	603	517	425

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 3.--Sodium hydrosulfite: U.S. imports for consumption, by sources, 1964-67

Source	1964	1965	1966	1967
	Quantity (1,000 pounds)			
Switzerland	44	133	201	75
West Germany	38	31	49	39
Total	82	164	250	114
	Value (1,000 dollars)			
Switzerland	6	18	18	11
West Germany	6	4	7	6
Total	12	22	25	17

Source: Compiled from official statistics of the U.S. Department of Commerce.

Note.--Imports of hydrosulfite mixtures, not included in the above table, amounted to 9,000 pounds, valued at $2,000, in 1964, and 44,000 pounds, valued at $12,000, in 1965, all from West Germany.

Commodity	TSUS item
Sodium hydroxide	421.08

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

Domestic production of caustic soda, which has been increasing, amounted to 15.2 billion pounds in 1966, supplying virtually all U.S. consumption. The United States is on a net export basis with respect to caustic soda, having exported from 4 to 8 percent of production in recent years. Exports totaled about 1.1 billion pounds in 1967 and reported imports were about 45 million pounds.

Description and uses

Sodium hydroxide, also known as caustic soda, is one of the most important alkalies produced in the United States. It is a white crystalline compound, made primarily by the electrolysis of melted salt or salt solutions; a small amount is made by the lime-soda process. Produced at the same time by the electrolysis method is a co-product, chlorine, which is discussed in a separate summary (item 415.20). For every pound of sodium hydroxide produced, about 0.9 of a pound of chlorine is obtained. The problem of keeping the supply and demand in balance for these two chemicals is a continuing one for the producers. The fact that both chemicals are in demand at about the same annual rate greatly simplifies production planning.

Sodium hydroxide is marketed in both liquid and solid forms, the solid form being obtained by evaporation of the liquid. Descriptions of the liquid and solid forms for which quotations appear in trade publications are as follows:

Soda, caustic, flake, 76%
Soda, caustic 50%, papermakers
Soda, caustic, 50%, rayon type
Soda, caustic, 73%, rayon type
Soda, caustic, solid, 76%, rayon type
Soda, caustic, liquid, 50%
Soda, caustic, liquid, 73%, rayon type

Excluding natural products, such as common salt (sodium chloride), the volume of sodium hydroxide produced in 1966 was exceeded only in the cases of sulfuric acid and anhydrous ammonia. Sodium hydroxide has a multitude of uses, the chief ones being in the manufacture of chemicals, rayon, pulp and paper, textiles, aluminum, petroleum, soap and detergents, and cellophane. Lesser but still important uses are associated with refining vegetable oil, reclaiming rubber, and glass manufacture.

U.S. tariff treatment

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
421.08	Sodium hydroxide--	0.25¢ per lb.	0.1¢ per lb. 1/

1/ This rate, as well as those for 1970 and 1971, is contingent; see footnote 1 to Staged Rates and Historical Notes to Pt. 2 of Schedule 4 of the TSUSA-1968, as shown in appendix A to this volume.

The rate effective January 1, 1972, represents the final stage of a concession granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reduction became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rate shown above as existing prior to January 1, 1968, remained unchanged under the TSUS from August 31, 1963 (the effective date of the TSUS), through the end of 1967.

The ad valorem equivalent of the specific rate of duty in effect prior to January 1, 1968, based on imports in 1967, was 13.4 percent.

U.S. consumption, producers, and production

Domestic consumption rose from about 10.6 billion pounds in 1962 to 14.4 billion pounds in 1966, or by about 36 percent (table 1). Increases in the output of chemicals requiring sodium hydroxide in their manufacture, plus increased demands by the aluminum, glass, and pulp and paper industries, account for the bulk of the increase in consumption. Virtually all of the quantity consumed domestically has

been supplied by domestic producers.

Sodium hydroxide is produced in the United States by about 32 chemical companies operating 63 plants situated in 26 States. Most of the plants are in States east of the Mississippi River. The producing concerns carry on multiproduct operations and manufacture a large variety of other chemicals. The importance of sodium hydroxide to total operations varies greatly between plants, and for some of them it is an important source of income.

Domestic production of sodium hydroxide increased from 11.0 billion pounds in 1962 to about 15.2 billion pounds in 1966, or by about 39 percent (table 1). Increased demands throughout the end-use pattern, plus more than a doubling of exports during the period, generated the increase in production.

U.S. exports and imports

Exports of sodium hydroxide increased from about 404 million pounds in 1962 to 1.1 billion pounds in 1967 (table 2). Exports amounted to between 4 and 8 percent of annual production during this period. Canada, Mexico, Jamaica, and Brazil were the principal markets. Other important markets included Colombia, Venezuela, and Surinam.

Imports of sodium hydroxide, which totaled 1.2 million pounds in 1962, increased to 45.2 million pounds in 1967 (table 3). Imports have supplied less than 0.2 percent of consumption annually. Sweden and Canada have been the chief sources of imports. West Germany became a source for the first time in recent years in 1967.

Foreign production and trade

Sodium hydroxide is produced in all the industrialized nations of the world. Japan, second to the United States in volume of production, is the largest Asian producer. West Germany, the largest producer in Western Europe, has a volume that is not much less than that for Japan. France, Italy, the United Kingdom, Canada, and Sweden follow West Germany in order. Production has been reported or is known to exist in Argentina, Australia, Austria, Belgium, Brazil, Denmark, Egypt, Finland, Greece, India, the Netherlands, Norway, Portugal, Romania, Spain, Switzerland, Taiwan, and Turkey. Brazil is the largest producer in South America.

A substantial amount of sodium hydroxide moves in international trade from the industrialized nations to the less developed countries of the world, chiefly in the solid form. The smaller and poorer nations have requirements for sodium hydroxide that they cannot meet due to a lack of capital to build the necessary plants or the know-how, or both.

Table 1.--Sodium hydroxide (caustic soda): U.S. production, imports for consumption, exports of domestic merchandise, and apparent consumption, 1962-67

(Quantity in thousands of pounds; value in thousands of dollars)

Year	Production	Imports	Exports	Apparent consumption
	Quantity			
1962	10,971,456	1,211	403,757	10,568,910
1963	11,628,806	1,208	642,083	10,987,931
1964	12,777,974	1,978	992,196	11,787,756
1965	13,684,086	6,324	839,497	12,850,913
1966	15,232,988	18,750	858,552	14,393,186
1967	1/	45,155	1,108,729	1/
	Value			
1962	1/	153	10,466	1/
1963	1/	152	16,845	1/
1964	1/	187	27,926	1/
1965	1/	336	23,010	1/
1966	1/	611	22,088	1/
1967	1/	836	23,480	1/

1/ Not available.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 2.--Sodium hydroxide (caustic soda): U.S. exports of domestic merchandise, by principal markets, 1962-67

Market	1962	1963	1964	1965	1966	1967
	Quantity (1,000 pounds)					
Canada	117,079	164,851	220,847	202,598	99,164	230,218
Brazil	62,713	64,780	105,143	58,690	113,621	120,310
Jamaica	13,133	89,095	149,598	105,055	147,103	123,459
Surinam	18	96	30	73,259	153,318	151,435
Mexico	37,188	31,480	52,131	66,650	50,191	68,283
Venezuela	7,224	13,528	21,044	16,911	24,294	37,827
Colombia	20,715	40,972	90,356	23,776	42,205	36,452
Netherlands Antilles	10,968	15,006	12,870	41,482	17,642	16,200
Turkey	7,280	185	47,241	23,454	9,633	5,086
Netherlands	-	-	17,695	26,661	21,128	55
India	9,304	37,602	47,993	54,457	8,819	14
British Guiana	36,243	32,235	87,847	70,150	-	-
All other	81,892	152,253	139,401	76,354	171,434	319,390
Total	403,757	642,083	992,196	839,497	858,552	1,108,729
	Value (1,000 dollars)					
Canada	3,081	4,547	5,641	4,426	2,438	5,276
Brazil	1,520	1,711	3,993	1,974	3,055	2,569
Jamaica	283	1,621	2,423	2,383	2,957	2,473
Surinam	1	16	2	1,454	3,163	2,464
Mexico	1,169	1,027	2,024	2,662	2,058	2,323
Venezuela	180	363	694	501	601	622
Colombia	400	910	2,080	822	1,644	544
Netherlands Antilles	242	373	284	855	434	262
Turkey	171	7	1,700	813	319	250
Netherlands	-	-	594	453	296	4
India	186	867	1,625	1,895	301	2
British Guiana	795	718	1,687	1,762	-	-
All other	2,438	4,685	5,179	3,010	4,822	6,691
Total	10,466	16,845	27,926	23,010	22,088	23,480

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 3.--Sodium hydroxide (caustic soda): U.S. imports for consumption, by principal sources, 1962-67

Source	1962	1963	1964	1965	1966	1967
	Quantity (1,000 pounds)					
Canada	88	80	568	4,230	17,134	14,533
West Germany	-	-	-	-	-	29,217
Sweden	1,087	1,123	1,313	1,333	1,516	1,353
Japan	25	5	97	759	100	52
All other	11	-	1/	2	-	-
Total	1,211	1,208	1,978	6,324	18,750	45,155
	Value (1,000 dollars)					
Canada	4	3	13	133	398	359
West Germany	-	-	-	-	-	290
Sweden	147	149	165	180	204	182
Japan	2	2/	9	22	9	5
All other	2/	-	2/	1	-	-
Total	153	152	187	336	611	836

1/ Less than 500 pounds.
2/ Less than $500.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Sodium nitrite	421.14

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

Domestic production, estimated to be about 30 million pounds annually, has supplied virtually all of the U.S. requirements for sodium nitrite. Exports are estimated to be negligible or nil, while imports during the years 1962-67, totalled only 182,000 pounds, valued at about $11,000.

Comment

Sodium nitrite is a slightly yellowish or white crystalline compound, which is made by the oxidation of ammonia. The nitrogen oxides formed in the oxidation process are absorbed by a soda ash solution. Ample supplies of the basic raw materials are domestically available. The principal use of sodium nitrite is in the manufacture of azo dyes, and for this use there is no known substitute. Other important uses are in the production of rubber, detinning of steel, anti-corrosion treatment of metals, as a reducing agent in organic syntheses and photographic processes, and in the manufacture of unsymmetrical dimethylhydrazine, an ingredient in rocket fuels.

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
421.14	Sodium nitrite	3.6¢ per lb.	1.8¢ per lb.

The rate effective January 1, 1972, represents the final stage of a concession granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reduction became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rate shown above as existing prior to January 1, 1968, remained unchanged under the TSUS from August 31, 1963 (the effective date of the TSUS), through the end of 1967.

The ad valorem equivalent of the specific rate of duty in effect prior to January 1, 1968, based on imports in 1967, was 41.8 percent.

Sodium nitrite is produced by two large chemical companies with plants located in New Jersey and New York. Their combined output is estimated to be about 30 million pounds annually, the bulk of which is consumed within their own plants in the production of dyestuffs and other chemical products. Consumption of sodium nitrite has been approximately the same as domestic production, since exports are estimated to have been negligible or nil and imports have been small.

Exports of sodium nitrite have not been published in official statistics but it is estimated that they are negligible or nil. Imports during the years 1962-67 were nil in 1962; totalled 182,000 pounds during 1963-67, valued at $11,000; and the United Kingdom and West Germany (see accompanying table) were the only sources.

Foreign production of sodium nitrite exists in all countries that produce azo dyes, such as the United Kingdom and West Germany. It is estimated that foreign trade in sodium nitrite is small.

Sodium nitrite: U.S. imports for consumption, by sources, 1962-67

Source	1962	1963	1964	1965	1966	1967
	Quantity (1,000 pounds)					
United Kingdom	-	10	-	-	20	50
West Germany	-	20	40	22	-	20
Total	-	30	40	22	20	70
	Value (1,000 dollars)					
United Kingdom	-	1/	-	-	2	5
West Germany	-	1	1	1	-	1
Total	-	1	1	1	2	6

1/ Less than $500.

Source: Compiled from official statistics of the U.S. Department of Commerce.

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Commodity	TSUS item
Sodium compounds:	
Phosphate, except pyrophosphates	
Containing by weight not over 45% of water of crystallization	421.16
Containing by weight over 45% of water of crystallization	421.18
Pyrophosphates	421.22

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

U.S. production of sodium phosphates was 2.6 billion pounds, valued at $176 million, in 1966. Exports during the same year were 162 million pounds, valued at $12.9 million, or about 6 percent of the domestic output. Imports in 1966 amounted to only 1,236,000 pounds, valued at $196,000, and were less than one-tenth of 1 percent of consumption.

Comment

This summary covers the various sodium phosphates and includes, in the order of their commercial importance: sodium tripolyphosphate, tetrasodium pyrophosphate, sodium metaphosphate, trisodium (ortho) phosphate, acid sodium pyrophosphate, disodium (ortho) phosphate, and monosodium (ortho) phosphate. They are all colorless crystalline compounds or white powders.

Monosodium and disodium phosphates are made by the reaction of phosphoric acid with sodium carbonate (soda ash). Trisodium phosphate (TSP) is produced by further treating a disodium phosphate slurry with caustic soda. Acid sodium pyrophosphate and sodium metaphosphate are made by the heating and vitrifying, respectively, of monosodium phosphate. Tetrasodium phrophosphate is made by calcining disodium phosphate, and sodium tripolyphosphate results from heating a mixture of two parts of disodium and one part of monosodium phosphate above 300°C. Of the various commercial forms of sodium phosphates, only the dodecahydrates of disodium phosphate ($Na_2HPO_4.12H_2O$) and trisodium phosphate ($Na_3PO_4.12H_2O$) contain more than 45 percent of water of crystallization.

The main use of the sodium phosphates considered here are as detergents, principally as ingredients in detergent formulations. In fact most of the synthetic detergents on the market contain about 50 percent of sodium tripolyphosphate or of tetrasodium pyrophosphate. Monosodium phosphate and acid sodium pyrophosphate are used as leavening agents in baking powders and cake mixes. Disodium phosphate is used in the processing of cheese, in the preparation of ceramic glazes and enamels, and as an antiacid and laxative in medicine. Trisodium phosphate and sodium metaphosphate are employed as water softeners and boiler-cleaning compounds.

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
	Sodium compounds:		
	Phosphate, except pyrophosphate,		
421.16	Containing by weight not over 45% of water of crystallization---	0.5¢ per lb.	0.2¢ per lb. 1/
421.18	Containing by weight over 45% of water of crystallization----------	0.25¢ per lb.	0.1¢ per lb. 1/
421.22	Pyrophosphates--------	10.5% ad val.	5% ad val.

1/ This rate, as well as those for 1970 and 1971 is contingent; see footnote 1 to Staged Rates and Historical Notes to Pt. 2 of schedule 4 of the TSUSA-1968, as shown in appendix A to this volume.

The rates effective January 1, 1972, represent the final stage of concessions granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reductions became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rates shown above as existing prior to January 1, 1968, remained unchanged under the TSUS from August 31, 1963 (the effective date of the TSUS), through the end of 1967. The ad valorem equivalent of 0.5 cents per pound rate of duty in effect prior to January 1, 1968, based on imports of sodium phosphates, containing not over 45 percent of water of crystallization, in 1967, was 5.1 percent. The ad valorem equivalent of the 0.25 cent per pound rate of duty in effect prior to January 1, 1968, on imports of sodium phosphates containing over 45 percent of water of crystallization is not representative as imports have been negligible in recent years.

U.S. consumption of the sodium phosphates considered have increased from almost 2 billion pounds, valued at $143 million, in 1962, to nearly 2.5 billion pounds, valued at $163.3 million, in 1966, virtually all of which was of domestic origin. Production increased steadily from 2.09 billion pounds in 1962 to 2.65 billion pounds in 1966, an increase of over 25 percent (see accompanying table). In 1966, sodium tripolyphosphate accounted for 75 percent of the total domestic output of the phosphates considered here.

Sodium phosphates are produced by 13 companies in 29 plants. One company has six plants; one company has five plants; one, four plants; four have two plants each; and six companies have one plant each. There are five plants located in New Jersey, four in California, three in Illinois, two each in Michigan and Missouri, and the other 13 are in widely scattered States. Sodium tripolyphosphate is produced in 19 of these plants, trisodium phosphate in 11 plants, sodium metaphosphate in 10 plants, tetrasodium pyrophosphate in 9 plants, and acid sodium pyrophosphate in five plants.

Exports of sodium phosphates far exceed imports. During the period 1962-67, exports ranged from a low of 106 million pounds, valued at $8.5 million, in 1963, to a high of 165 million pounds, valued at $13.5 million, in 1967. Exports usually amount to 5 or 6 percent of the domestic output. Sodium tripolyphosphate exports account for more than half of our total exports, which go to numerous countries, no one of which is a predominant market.

During the years 1962-67 imports of sodium phosphates ranged from 473,000 pounds, valued at $76,000, in 1962, to 1.27 million pounds, valued at $125,000, in 1967. The imports consist chiefly of sodium phosphates containing less than 45 percent of water, smaller quantities of sodium pyrophosphates, and almost no shipments of sodium phosphates containing more than 45 percent of water of crystallization. West Germany has been the principal source of imports.

Sodium phosphates: U.S. production, imports for consumption, exports of domestic merchandise, and apparent consumption, 1962-67

(Quantity in thousands of pounds; value in thousands of dollars)

Year	Production	Imports	Exports	Apparent consumption
	Quantity			
1962	2,089,264	473	110,855	1,978,882
1963	2,213,824	795	106,283	2,108,336
1964	2,393,664	667	160,292	2,234,039
1965	2,458,228	758	145,535	2,313,451
1966	2,647,388	1,236	162,070	2,486,554
1967	1/	1,270	164,611	1/
	Value			
1962	151,803	76	8,820	143,059
1963	158,688	127	8,508	150,307
1964	164,611	109	12,275	152,445
1965	163,612	126	11,635	152,103
1966	176,007	196	12,900	163,303
1967	1/	125	13,547	1/

1/ Not available.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Sodium silicates	421.34

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

Domestic production of sodium silicates was 1.8 billion pounds, valued at $65 million, in 1966. Imports in the same year were 4.8 million pounds, valued at $258,000. Export statistics were not available for 1965 or 1966 but exports were 5.8 million pounds, valued at $339,000, in 1964.

Comment

Sodium silicates are colorless, white, or grayish-white crystals or powders made by fusing sand with soda ash. The principal kinds of sodium silicates are soluble sodium silicate (water glass), sodium metasilicate ($Na_2SiO_3.5H_2O$), sodium orthosilicate (Na_4SiO_4), and sodium sesquisilicate ($Na_3HSiO_4.5H_2O$). Water glass or soluble sodium silicate is available commercially in both solid and liquid forms and with varying ratios of sodium oxide (Na_2O) to silica (SiO_2).

Sodium silicates are used in the manufacture of silica gel, which is an important industrial dehydrating agent and a catalyst in the cracking of crude petroleum; as detergents in bar soap, soap powders, and synthetic detergents; as adhesives in the manufacture of corrugated paper boxes and other products; and in the production of paints and pigments. They also have many other industrial uses, such as a binder for abrasive wheels, in metal cleaning, for weighting textiles, and for water treatment.

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
421.34	Sodium silicates---------	0.3¢ per lb.	0.15¢ per lb.

The rate effective January 1, 1972, represents the final stage of a concession granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reduction became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rate shown above as existing prior to January 1, 1968, remained unchanged under the TSUS from August 31, 1963 (the effective date of the TSUS), through the end of 1967. The ad valorem equivalent of the specific rate of duty in effect prior to January 1, 1968, based on imports in 1967, was 6.8 percent.

The annual consumption of sodium silicates in the United States during recent years has approximated the annual production. Domestic production increased from slightly more than 1.6 billion pounds (dry basis) in 1962 to about 1.8 billion pounds in 1966 (table 1). In 1962, 34 percent of U.S. production of sodium silicates was used in the manufacture of silica gel; 15 percent in the production of detergents; 13 percent in the manufacture of adhesives for boxboard and other products; 9 percent for pigments; and the remainder for miscellaneous uses. The consumption use pattern has probably not changed greatly since that year.

Most of the 15 domestic producers of sodium silicates are large chemical companies. Their plants are located near the consuming areas mainly because the low unit value of the silicates (3.4 to 3.6 cents per pound in 1962-66) will not permit long hauls. In 1965, sodium silicates were produced in 44 plants in 17 States. There were five plants each in New Jersey, California, and Illinois; four each in Ohio and Indiana; three each in Georgia, New York, and Michigan; two each in Massachusetts, Pennsylvania, Texas, and Kansas; and one each in Oregon, Maryland, Missouri, and Washington. One company has 12 sodium silicate plants, another has eight plants, and a third has five plants, while several other companies have two or three plants each.

U.S. exports of sodium silicates ranged from 5.3 million pounds to 5.9 million pounds in the period 1962-64 and the value of exports varied from $289,000 to $339,000 during the same period (table 2). Canada,

Mexico, and Japan have been the principal markets for U.S. exports. Statistics on exports have not been reported since 1964.

Imports of sodium silicates ranged between 254,000 and 270,000 pounds during the period 1962-64, but in subsequent years have increased by ten fold (table 3). Canada was the principal source of U.S. imports in 1967, and the United Kingdom second, but West Germany has been the most consistent country of origin.

Table 1.--Sodium silicates: U.S. production, imports for consumption, exports of domestic merchandise, and apparent consumption, 1962-67

(Quantity in thousands of pounds; value in thousands of dollars)

Year	Production	Imports	Exports	Apparent consumption
	Quantity			
1962	1,616,960	254	5,903	1,611,311
1963	1,650,742	260	5,332	1,645,670
1964	1,668,788	270	5,808	1,663,250
1965	1,762,668	3,843	1/	1/
1966	1,795,878	4,831	1/	1/
1967	1/	2,535	1/	1/
	Value			
1962	55,769	6	289	55,486
1963	57,868	8	301	57,575
1964	57,619	15	339	57,295
1965	60,516	223	1/	1/
1966	64,935	258	1/	1/
1967	1/	112	1/	1/

1/ Not available.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 2.--Sodium silicates: U.S. exports of domestic merchandise, by principal markets, 1962-64

Market	1962	1963	1964
	Quantity (1,000 pounds)		
Canada	3,579	2,955	3,553
Mexico	686	559	535
Japan	431	473	390
All other	1,207	1,345	1,330
Total	5,903	5,332	5,808
	Value (1,000 dollars)		
Canada	163	165	201
Mexico	36	39	37
Japan	31	29	26
All other	59	68	75
Total	289	301	339

Source: Compiled from official statistics of the U.S. Department of Commerce.

Note.--Exports were not separately reported for 1965-67.

Table 3.--Sodium silicates: U.S. imports for consumption, by principal sources, 1962-67

Source	1962	1963	1964	1965	1966	1967
	Quantity (1,000 pounds)					
Canada	-	1	163	3.605	3,550	1,349
United Kingdom	-	4	5	2	984	1,040
West Germany	158	250	96	138	264	87
France	50	-	-	54	-	-
All other	46	5	6	44	33	59
Total	254	260	270	3,843	4,831	2,535
	Value (1,000 dollars)					
Canada	-	1/	11	207	209	74
United Kingdom	-	2	1	2	37	34
West Germany	3	5	3	5	9	2
France	2	-	-	8	-	-
All other	1	1	1/	1	3	2
Total	6	8	15	223	258	112

1/ Less than $500.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Sodium silicofluoride----------	421.36

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

Domestic production of sodium silicofluoride amounted to 96 million pounds, valued at $6.4 million, in 1966. U.S. imports in the same year were 7.7 million pounds, valued at $340,000. Export statistics are not available and exports are probably fairly small.

Comment

Sodium silicofluoride or fluosilicate is a poisonous white granular powder produced as a byproduct in the manufacture of superphosphate fertilizer. It is used in the fluoridation of drinking water, as a souring agent in laundries, and in the manufacture of opal glass and vitreous enamel frits. Sodium silicofluoride is also used for acid proofing bricks and cement, as a fluxing agent for light metals, and for the moth-proofing of woolens.

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
421.36	Sodium silicofluoride	0.625¢ per lb.	0.3¢ per lb.

The rate effective January 1, 1972, represents the final stage of a concession granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reduction became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rate shown above as existing prior to January 1, 1968, remained unchanged under the TSUS from August 31, 1963 (the effective date of the TSUS), through the end of 1967. For products of Rumania, which accounted for about 10 percent of the imports entered under item 421.36 in 1967, the current rate of duty is (as indicated in Pt. e of general headnote 3 mentioned above) the column 2 rate, i.e., 1.5 cents per pound.

The specific rate of duty in effect prior to January 1, 1968, was equivalent to 13 percent ad valorem based on the total imports under item 421.36 that were dutiable at the reduced rate of 0.625 cents. For the 2.3 million pounds, valued at $57,000, imported from communist countries in 1967, the ad valorem equivalent of the 1.5-cent rate was 60 percent.

U.S. apparent consumption (production plus imports) increased from 83.9 million pounds in 1962 to 103.7 million pounds in 1966 (table 1). More than 90 percent of the consumption is supplied by domestic producers.

Sodium silicofluoride is produced in 26 plants in the United States, five of which are in Florida, three each in Ohio, Illinois, and Georgia, two each in Maryland and Michigan, and one each in Delaware, New York, South Carolina, North Carolina, Alabama, Pennsylvania, New Jersey, and Texas. One company has 16 sodium silicofluoride plants, two companies have two plants each, and six other companies operate one plant each. Most of these producing companies are large diversified chemical or fertilizer concerns.

Exports are not separately classified in official statistics but are believed to be very small. U.S. imports of sodium silicofluoride increased irregularly from 6.8 million pounds, valued at $262,000, in 1962, to 15.6 million pounds, valued at $693,000, in 1967. The ratio of imports to consumption averaged 8.0 percent during the 5-year period, 1962-66. Denmark was the principal supplier throughout this period, followed by the Netherlands and Spain. Rumania and Poland were important suppliers in 1967 (table 2). Imports from most countries are of the same quality and grade as that produced in the United States. In general, imports are consumed in the seaboard areas, as inland transportation costs on such a low-unit-value commodity tends to limit its movement.

Table 1.--Sodium silicofluoride: U.S. production, imports for consumption, and apparent consumption, 1962-67

(Quantity in thousands of pounds; value in thousands of dollars)

Year	Production	Imports	Apparent consumption	Ratio (percent) of imports to consumption
	Quantity			
1962	77,088	6,816	83,904	8.1
1963	80,134	5,598	85,732	6.5
1964	79,360	7,316	86,676	8.4
1965	92,936	9,591	102,527	9.4
1966	95,996	7,740	103,736	7.5
1967	1/	15,600	1/	1/
	Value			
1962	4,012	262	4,274	6.1
1963	4,564	246	4,810	5.1
1964	4,866	358	5,224	6.9
1965	6,115	426	6,541	6.5
1966	6,377	340	6,717	5.1
1967	1/	693	1/	1/

1/ Data not available.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Note.--Exports are not separately classified in official statistics; they are believed to be very small.

Table 2.--Sodium silicofluoride: U.S. imports for consumption, by principal sources, 1962-67

Source	1962	1963	1964	1965	1966	1967
	Quantity (1,000 pounds)					
Denmark	3,248	3,095	4,795	4,833	4,394	4,094
Netherlands	1,209	875	915	1,422	1,056	3,035
Spain	304	242	187	952	1,158	1,949
Poland	-	-	-	-	-	1,574
Rumania	-	-	-	-	-	1,653
Japan	30	-	1,058	2,350	860	460
United Kingdom	1,952	1,300	295	-	-	-
All other	73	86	66	34	272	2,835
Total	6,816	5,598	7,316	9,591	7,740	15,600
	Value (1,000 dollars)					
Denmark	130	137	251	230	206	204
Netherlands	49	44	47	75	49	126
Spain	10	8	6	32	40	73
Poland	-	-	-	-	-	57
Rumania	-	-	-	-	-	37
Japan	1	-	40	88	34	18
United Kingdom	69	53	11	-	-	-
All other	3	4	3	1	11	178
Total	262	246	358	426	340	693

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Sodium sulfate, crude (salt cake)----------	421.42

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

Domestic production, which was about 1.0 million short tons in 1966, has been increasing in recent years. Domestic exports are estimated to have been about 15,000 short tons annually. Imports, chiefly from Belgium and Canada, amounted to 273,000 short tons, valued at $4.3 million, in 1967; in 1966, they represented about 18 percent of domestic consumption.

Description and uses

Crude sodium sulfate, also known as salt cake, is obtained mainly as a byproduct in the manufacture of other chemical products, such as cellophane, formic acid, hydrochloric acid, phenol, rayon, and sodium dichromate; lesser but increasing amounts are obtained from natural brines. Both the manufactured product and the natural product contain, in addition to sodium sulfate, varying amounts of impurities such as iron, calcium, and magnesium compounds, depending upon the source from which they are obtained. The Bureau of Customs has ruled that imports of sodium sulfate products which contain not more than 98.5 percent of sodium sulfate are classifiable as salt cake and those imports which contain more than 98.5 percent sodium sulfate are classifiable as anhydrous sodium sulfate (item 421.44).

About 70 percent of the total output of salt cake is used in the Kraft paper and paperboard industries. Other uses are as a raw material in the manufacture of anhydrous sodium sulfate and Glauber's salt (see separate summaries, items 421.44 and 421.46, respectively) and other chemicals. Lesser quantities are used in the manufacture of detergents, flat glass, and ceramic glazes.

U.S. tariff treatment

The duty-free status was provided for in the Tariff Act of 1930 as originally enacted, and in the TSUS, effective August 31, 1963, and has been bound since January 1, 1948, as a concession granted by the United States in the General Agreement on Tariffs and Trade (GATT).

U.S. consumption and production

Domestic consumption in 1966 is estimated to have been about 1.2 million short tons. Production of salt cake (table 1) increased from 826,000 short tons in 1962 to about 1.0 million short tons in 1966. Annual capacity is reported to be about 1.7 million short tons.

The Bureau of the Census reported that salt cake was produced by 26 establishments during 1966, situated in California (4), Pennsylvania (3), Ohio (3), Texas (3), Illinois (2), New Jersey (2), Tennessee (2), and one each in Delaware, Louisiana, Maryland, Missouri, New Mexico, New York, and Virginia. The bulk of the production in California and Texas was from natural brines.

U.S. exports and imports

Domestic exports of salt cake are not reported separately in official statistics but are estimated to have been about 15,000 short tons annually. Imports of salt cake (table 2) fluctuated during the years 1962-67 but increased from 181,000 short tons, valued at $3.6 million, in 1962, to 273,000 short tons, valued at $4.3 million, in 1967. Belgium and Canada were the chief sources while Mexico, the Netherlands, the United Kingdom, and West Germany supplied small amounts.

Foreign production and trade

In addition to the countries listed in table 2, salt cake can be produced in countries that produce such products as cellophane, formic acid, hydrochloric acid, phenol, rayon, and sodium dichromate. France, Italy, and Japan are some of the countries that should be considered as producers of salt cake.

Table 1.--Sodium sulfate, crude (salt cake): U.S. production, (100% Na_2SO_4), 1962-66

Year	Quantity	Value
	1,000 short tons	1,000 dollars
1962 1/	826	17,934
1963 1/	837	18,459
1964 1/	926	22,280
1965 1/	976	20,525
1966 1/	1,009	20,487

1/ Includes Glauber's salt, which averaged annually 30,000 short tons, valued at $623,000, during 1958-61.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 2.--Sodium sulfate, crude (salt cake): U.S. imports for consumption, by sources, 1962-67

Source	1962	1963	1964	1965	1966	1967
	Quantity (1,000 short tons)					
Belgium	92	84	154	128	104	133
Canada	75	66	117	116	103	119
West Germany	9	3	17	14	14	21
United Kingdom	5	3	-	3	-	-
Mexico	-	-	1/	1/	-	-
Netherlands	-	3	-	-	2	-
Total	181	159	288	261	223	273
	Value (1,000 dollars)					
Belgium	2,142	1,855	3,217	2,561	1,963	2,353
Canada	1,222	1,066	1,511	1,628	1,465	1,527
West Germany	167	71	300	290	308	432
United Kingdom	115	39	-	41	-	-
Mexico	-	-	7	1	-	-
Netherlands	-	53	-	-	33	-
Total	3,646	3,084	5,035	4,521	3,769	4,312

1/ Less than 500 tons.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Anhydrous sodium sulfate----------	421.44

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

Domestic production in 1966 amounted to 390,000 long tons, valued at $11.5 million. Exports are estimated to range between 10,000 and 15,000 long tons, annually. U.S. imports in 1967, chiefly from West Germany, totaled 13,000 long tons, valued at $190,000.

Description and uses

Anhydrous sodium sulfate (Na_2SO_4) is a white amorphous powder, made by refining and dehydrating crystallized sodium sulfate ($Na_2SO_4.10\ H_2O$)(item 421.46) and by refining salt cake (crude sodium sulfate)(item 421.42). The principal use for anhydrous sodium sulfate is in the manufacture of detergents. Lesser amounts are used as a leveling agent in textile dyeing, as a diluent in standardizing coal-tar dyes and in the manufacture of glass. Crude sodium sulfate (salt cake) and crystallized sodium sulfate (Glauber's salt) are covered by separate summaries, items 421.42 and 421.46, respectively.

The Bureau of Customs has ruled that imports of sodium sulfate products which contain not more than 98.5 percent of sodium sulfate are classifiable as salt cake (item 421.42) and those imports which contain more than 98.5 percent sodium sulfate are classifiable as anhydrous sodium sulfate.

U.S. tariff treatment

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
421.44	Anhydrous sodium sulfate--	50¢ per ton	25¢ per ton 1/

1/ This rate, as well as those for 1970 and 1971, is contingent; see footnote 1 to Staged Rates and Historical Notes to Pt. 2 of schedule 4 of the TSUSA-1968, as shown in appendix A to this volume.

The rate effective January 1, 1972, represents the final stage of a concession granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reduction became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rate shown above as existing prior to January 1, 1968, remained unchanged under the TSUS from August 31, 1963 (the effective date of the TSUS), through the end of 1967.

The ad valorem equivalent of the specific rate of duty in effect prior to January 1, 1968, based on imports in 1967, was 3.4 percent.

U.S. consumption and production

Domestic consumption approximates U.S. production plus imports; in 1966 this approximated 402,000 long tons. Domestic production during the years 1962-66 increased from 329,000 long tons in 1962 to 390,000 long tons in 1966 (table 1).

The Bureau of the Census reported that anhydrous sodium sulfate was produced by 17 establishments during 1966, situated in Alabama (2), California (2), Pennsylvania (2), Tennessee (2), Virginia (2), West Virginia (2), and one each in Illinois, Maryland, New York, North Carolina, and Texas. The bulk of the production in California was from natural brines.

U.S. exports and imports

Domestic exports of anhydrous sodium sulfate are not reported separately in official statistics but are estimated to range between 10,000 and 15,000 long tons, annually.

Imports of anhydrous sodium sulfate (table 2) fluctuated during the years 1962-67 but increased from 6,113 long tons, valued at $122,000 in 1962, to 13,003 long tons valued at $190,000 in 1967. West Germany has been the only consistent source and the chief source, except for 1965 when Belgium supplied 5,919 long tons in its first appearance during the period. Canada, the Netherlands, and Mexico supplied small amounts in various years.

Foreign production and trade

In addition to the countries listed in table 2, production facilities have been reported for Argentina, Colombia, and Mexico. Production facilities can also be expected to exist in industrialized countries, such as Italy and Japan.

Table 1.--Anhydrous sodium sulfate: U.S. production, 1962-66

Year	Production	
	Quantity	Value
	1,000 long tons	1,000 dollars
1962	329	10,200
1963	353	10,412
1964	348	10,307
1965	382	11,710
1966	390	11,536

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 2.--Anhydrous sodium sulfate: U.S. imports for consumption, by sources, 1962-67

Source	1962	1963	1964	1965	1966	1967
	Quantity (long tons)					
West Germany	6,047	1,186	1,414	5,087	11,493	12,659
Canada	66	-	-	-	85	300
Belgium	-	-	-	5,919	-	44
Mexico	-	-	-	-	364	-
Netherlands	-	-	22	80	-	-
Total	6,113	1,186	1,436	11,086	11,942	13,003
	Value (1,000 dollars)					
West Germany	121	26	29	120	198	185
Canada	1	-	-	-	1	4
Belgium	-	-	-	121	-	1
Mexico	-	-	-	-	6	-
Netherlands	-	-	1/	2	-	-
Total	122	26	29	243	205	190

1/ Less than $500.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Crystallized sodium sulfate (Glauber's salt)---------	421.46

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

U.S. production supplies virtually all domestic requirements of crystallized sodium sulfate. The most recently reported production figure was 25,000 long tons in 1961. Exports are estimated to range between 2,000 and 5,000 long tons, annually. Imports have been small or nil.

Comment

Crystallized sodium sulfate ($Na_2SO_4.10H_2O$, sodium sulfate decahydrate), also known as Glauber's salt, is a refined form of sodium sulfate containing ten molecules of water. It is obtained from natural mineral deposits and natural brines. That portion which is not refined is dehydrated and processed into anhydrous sodium sulfate (item 421.44) and salt cake (item 421.42). Glauber's salt can also be made from salt cake. The main use of crystallized sodium sulfate is in the textile-dyeing industry to facilitate the even distribution of dye. A small amount is used in medicine.

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
421.46	Crystallized sodium sulfate.	$1 per ton	50¢ per ton

1/ This rate, as well as those for 1970 and 1971, is contingent; see footnote 1 to Staged Rates and Historical Notes to Pt. 2 of schedule 4 of the TSUSA-1968, as shown in appendix A to this volume.

The rate effective January 1, 1972, represents the final stage of a concession granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT).

The first of five annual stages of the reduction became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rate shown above as existing prior to January 1, 1968, remained unchanged under the TSUS from August 31, 1963 (the effective date of the TSUS), through the end of 1967.

The ad valorem equivalent of the specific rate of duty in effect prior to January 1, 1968, based on imports in 1967, was 62.5 percent.

Domestic consumption approximates domestic production, which has been declining in recent years. The decline is believed to be in large part the result of replacement by anhydrous sodium sulfate. During the years 1958-61, domestic production declined from about 65,000 long tons, valued at $606,000, in 1958, to 25,000 long tons, valued at $565,000, in 1961 (table 1).. Beginning with 1962, annual production data of crystallized sodium sulfate have been combined with production data for salt cake.

In 1966, the Bureau of the Census reported two establishments engaged in the manufacture of crystallized sodium sulfate, situated in North Carolina and Wyoming.

Exports of crystallized sodium sulfate are not reported separately in official statistics, but are estimated to range between 2,000 and 5,000 long tons, annually. Imports of crystallized sodium sulfate were nil in 1962 and consisted of only small amounts from Canada and the Netherlands and West Germany in 1963-67 (table 2).

The U.S.S.R. has a crystallized sodium sulfate plant in operation at the Kara-Bogas Gulf of Turkmenia, near Caspian Lake, the location of a rich deposit of Glauber's salt. The plant is reported to be the country's largest producing this commodity.

Table 1.--Crystallized sodium sulfate (Glauber's salt): U.S. production (100% Na_2SO_4), 1958-61

Year	Production	
	Quantity	Value
	long tons	1,000 dollars
1958	64,719	606
1959	27,622	672
1960	28,484	645
1961	25,103	568

Source: Compiled from official statistics of the U.S. Department of Commerce.

Note.--Effective with 1962, production data of crystallized sodium sulfate have been combined with production data for salt cake.

Table 2.--Crystallized sodium sulfate (Glauber's salt): U.S. imports for consumption, by sources, 1962-67

Source	1962	1963	1964	1965	1966	1967
	Quantity (long tons)					
Canada	-	-	-	-	537	336
West Germany	-	-	-	1	1	2,205
Netherlands	-	3	4	-	-	-
Total	-	3	4	1	538	2,541
	Value					
Canada	-	-	-	-	$6,554	$3,743
West Germany	-	-	-	$262	427	326
Netherlands	-	$285	$355	-	-	-
Total	-	285	355	262	6,981	4,069

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Sodium sulfide----------	421.52

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. tariff position

Domestic production, which approximates U.S. consumption, amounted to about 171 million pounds in 1966. Exports and imports (except for 1967) have been either nil or small in recent years.

Comment

Sodium sulfide is a yellow or brick-red compound, marketed in lumps, flakes, or deliquescent crystals. It is usually made directly from sodium bisulfate (TSUS item 420.74), but it is also obtained as a byproduct in the manufacture of some barium chemicals. Sodium sulfide is used mainly in the manufacture of organic chemicals, sulfur dyes, paper pulp, rubber, and soap. Lesser amounts are used in the manufacture of rayon and leather, and in engraving and lithography.

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
421.52	Sodium sulfide----------	0.75¢ per lb.	0.37¢ per lb.

The rate effective January 1, 1972, represents the final stage of a concession granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reduction became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rate shown above as existing prior to January 1, 1968, remained unchanged under the TSUS from August 31, 1963 (the effective date of the TSUS), through the end of 1967.

The ad valorem equivalent of the specific rate of duty in effect prior to January 1, 1968, based on imports in 1967 was 19.7 percent.

Sodium sulfide is produced by 10 chemical companies (8 large and 2 small) in plants situated as follows: two each in New Jersey and New York, and one each in California, Georgia, Illinois, Pennsylvania, Texas, and West Virginia. Production of concentrated (60-62 percent) sodium sulfide (table 1) during 1962-66 varied between 45.5 million pounds, valued at $2.4 million, in 1964, and 53.8 million pounds, valued at $2.9 million, in 1963. Production of all types of sodium sulfide amounted to about 104 million pounds in 1963, and increased to 170.8 million pounds in 1966.

Domestic consumption approximates total U.S. production. U.S. exports are not separately reported in official statistics but are estimated to have been small in recent years. In 1962, U.S. imports (table 2) were only 14,000 pounds (all from the United Kingdom), and nil in 1963-66. In 1967, imports amounted to 1.3 million pounds (all from the United Kingdom), by a domestic producer to supplement the company's production, which temporarily was unable to supply the company's needs.

Sodium sulfide is produced in India in a plant situated at Eloor, near Ernaculam, South India. In addition to the United Kingdom, sodium sulfide is probably produced in most of the industrialized nations, such as Belgium, France, Italy, Japan, Switzerland, and West Germany.

Table 1.--Sodium sulfide: U.S. production, 1962-66

(Quantity in thousands of pounds; value in thousands of dollars)

Year	Total		Concentrated (60-62% Na_2S)		Other	
	Quantity	Value	Quantity	Value	Quantity	Value
1962	1/	1/	46,258	2,402	1/	1/
1963	104,362	3,743	53,840	2,878	50,522	865
1964	102,974	3,409	45,512	2,384	57,462	1,025
1965	140,318	3,796	46,666	2,327	93,652	1,469
1966	170,796	4,141	45,600	2,353	125,196	1,788

1/ Data withheld to avoid disclosing figures for individual companies.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 2.--Sodium sulfide: U.S. imports for consumption, 1962-67

Year	Quantity	Value
	1,000 pounds	
1962 1/	14	$140
1963	-	-
1964	-	-
1965	-	-
1966	-	-
1967 1/	1,330	50,656

1/ All from the United Kingdom.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Note: In 1962 imports were reported as "Not more than 35% sodium sulfide" and as "More than 35% sodium sulfide". Imports in 1962 consisted wholly of "More than 35% sodium sulfide".

Commodity	TSUS item
Sodium compounds:	
Sulfite, bisulfite, metabisulfite, and thiosulfate	421.54

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

U.S. production of sodium sulfite was 425 million pounds, valued at $10.6 million, in 1966. Imports of sodium sulfite, bisulfite, metabisulfite, and thiosulfate were 2.3 million pounds, valued at $76,000, in 1966 and 1.8 million pounds, valued at $157,000, in 1967. Statistics on domestic production of sodium bisulfite, metabisulfite, and thiosulfate are not available for recent years and neither are export data reported separately for any of the sodium compounds considered in this summary.

Comment

Sodium sulfite, sodium bisulfite, sodium metabisulfite, and sodium thiosulfate (hyposulfite) are all related white crystalline compounds or powders. Sodium sulfite and sodium bisulfite are made by treating soda ash (or caustic soda) with sulfur dioxide to produce the sulfite requiring twice as much soda as the bisulfite. Sodium bisulfite or sodium acid sulfite is not an important article of commerce as it readily looses water to form sodium metabisulfite or sodium pyrosulfite. The commercial product, which is called sodium bisulfite by the trade, is actually sodium metabisulfite. Sodium thiosulfate is produced by boiling a solution of sodium sulfite with sulfur. Sodium sulfite and thiosulfate are available commercially in both anhydrous and hydrated forms, but sodium bisulfite (metabisulfite) is usually sold only in the anhydrous state.

Sodium sulfite is used mainly in the manufacture of pulp and paper. It is also used to remove free chlorine in the bleaching of textiles and in mineral separation, for the manufacture of sodium thiosulfate, and in the preparation of photographic developers. Sodium thiosulfate is used principally in photography as an acid fixer or "hypo" for films and plates. It is also used in chrome leather tanning and in the manufacture of certain organic compounds such as tetramethyl lead and thioglycolic acid. Sodium bisulfite (metabisulfite) is used as a preservative or bleaching agent in foods, tanning, textiles, pulp

and paper, and photography.

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
	Sodium compounds:		
421.54	Sulfite, bisulfite, metabisulfite, and thiosulfate.	0.188¢ per lb.	0.09¢ per lb. 1/

1/ This rate, as well as those for 1970 and 1971, is contingent; see footnote 1 to Staged Rates and Historical Notes to Pt. 2 of schedule 4 of the TSUSA-1968, as shown in appendix A to this volume.

The rate effective January 1, 1972, represents the final stage of a concession granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reduction became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rate shown above as existing prior to January 1, 1968, remained unchanged under the TSUS from August 31, 1963 (the effective date of the TSUS) through the end of 1967.

The ad valorem equivalent of the specific rate of duty in effect prior to January 1, 1968, based on imports entered during 1967 , was 2.2 percent.

U.S. production of sodium sulfite increased from 402 million pounds, valued at $8.2 million, in 1962, to 446.5 million pounds, valued at $9 million, in 1964, and then declined to 376 million pounds, valued at $8.7 million, in 1965, but rose to 425 million pounds, valued at $10.6 million, in 1966 (see accompanying table). Domestic output of sodium thiosulfate was 64 million pounds, valued at $2.7 million, in 1962, but no production data for sodium thiosulfate have been available since 1962. Also, no statistical data on production of sodium bisulfite (metabisulfite) are reported; however, the output is believed to be considerably less than U.S. production of sodium thiosulfate. Consumption of the sodium compounds covered by this summary are probably about 500 million pounds annually, but exact statistics are not available.

Sodium sulfite is produced by 8 companies in 11 plants, which are located 2 each in California, Pennsylvania, and Illinois and 1 each in New Jersey, Delaware, Missouri, Alabama, and Washington. Sodium thiosulfate is produced by three companies in five plants, located two each in Illinois and California, and one in New Jersey. Sodium bisulfite (metabisulfite) is produced by five companies in five plants, one each in Delaware, New Jersey, Missouri, Massachusetts, and Virginia. One of these producing companies manufactures all three of these chemical products; four of the companies make two of these products; and the remaining five companies only make a single item each.

Statistics on exports of the compounds covered by this summary are not available; however, exports are probably larger than imports. U.S. imports of the sodium compounds considered here have ranged between 1.7 million and 2.3 million pounds in 1962-67. Recent imports have come principally from the United Kingdom and West Germany.

Sodium sulfite, bisulfite, metabisulfite, and thiosulfate: U.S. production, imports for consumption, and apparent consumption, 1962-67

(Quantity in thousands of pounds; value in thousands of dollars)

Year	Production 1/	Imports	Apparent consumption	Ratio (percent) of imports to consumption
	Quantity			
1962	401,590	1,716	403,306	0.4
1963	414,748	2,039	416,787	0.5
1964	446,504	2,111	448,615	0.5
1965	376,212	2,158	378,370	0.6
1966	424,748	2,327	427,075	0.5
1967	2/	1,803	2/	2/
	Value			
1962	8,189	75	8,264	0.9
1963	8,501	81	8,582	0.9
1964	9,077	77	9,154	0.8
1965	8,244	68	8,312	0.8
1966	10,573	76	10,649	0.7
1967	2/	157	2/	2/

1/ Production data are for sodium sulfite only. Production of sodium thiosulfate amounted to 63,772 thousand pounds, valued at 2,690 thousand dollars, in 1962. No more recent data for sodium thiosulfate and and no data for sodium bisulfite or metabisulfite are available.
2/ Not available.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Note.--Statistics on exports are not available.

Commodity	TSUS item
Sodium compounds not elsewhere enumerated	421.62

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

Annual domestic production of these sodium compounds in recent years is estimated to have ranged from 500 million to 1 billion pounds, and annual exports, from 25 million to 50 million pounds. Imports in 1967 amounted to 22.3 million pounds, valued at $3.1 million.

Description and uses

This summary deals with the approximately one hundred commercially traded inorganic sodium compounds that are not provided for by name in the TSUS. About 45 of these compounds are produced on a commercial scale in the United States, but the majority are of minor industrial importance. The inorganic sodium compounds provided for by name in the TSUS are discussed in separate summaries (items 420.68 through 421.60 and 480.25).

The following tabulation lists the principal uses for a number of the significant domestic sodium compounds included in this summary:

Compound	Principal use
Chlorinated trisodium phosphate	Dish washing compounds and scouring powders
Sodium bromate	Gold ore processing
Sodium chlorite	Bleaching agent
Sodium fluoride	Fluoridation of municipal water supplies
Sodium hydrosulfide	Chemical intermediate for dyestuffs and various organic chemicals
Sodium perborate	Bleaching agent
Sodium peroxide	Oxidizing agent
Sodium persulfate	Bleaching agent

U.S. tariff treatment

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
421.62	Sodium compounds not elsewhere enumerated.	10.5% ad val.	5% ad val.

The rate effective January 1, 1972, represents the final stage of a concession granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reduction became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rate shown above as existing prior to January 1, 1968, remained unchanged under the TSUS from August 31, 1963 (the effective date of the TSUS), through the end of 1967.

U.S. consumption, production, and exports

Domestic consumption of the inorganic sodium compounds included here is supplied principally by U.S. producers. About 75 chemical companies, including both large and small firms, make these products. The large producers generally make more than one, whereas the small firms tend to specialize in one or two. Producing plants are dispersed among 30 States, with all major regions of the United States represented.

In recent years U.S. production of the inorganic sodium compounds covered herein is estimated to have ranged from 0.5 billion to 1 billion pounds per year. Production data are reported in official statistics only for sodium fluoride (table 1) and sodium hydrosulfide (table 2). The output of sodium fluoride increased from 10.8 million pounds in 1962 to 11.8 million pounds in 1966 with a peak of 14.1 million pounds in 1964. There are four producers of this compound, operating plants in Delaware (1), Illinois (2), and Maryland (1). The total annual capacity is reported to be 18 million pounds. The production of sodium hydrosulfide increased from 48.0 million pounds in 1962 to 91.1 million pounds in 1966. This compound is produced by six companies, operating plants in California (1), Delaware (2), Georgia (1), New Jersey (1), New York (1), Tennessee (1), and West Virginia (1). The total annual capacity is reported to be 66.4 million pounds.

U.S. exports of inorganic sodium compounds are not reported separately in official statistics; however, they are estimated to have been between 25 million and 50 million pounds annually in recent years.

U.S. imports

Before September 1963, imports of the sodium compounds considered here were combined in the official statistics with certain organic sodium salts. Imports of sodium compounds not elsewhere enumerated aggregated 18.1 million pounds, valued at $3.0 million, in 1967 (see table 3). They included azide from Canada; bromate from Israel, Japan, the Netherlands, and the United Kingdom; chlorite from Belgium, Japan, Switzerland, and West Germany; fluoride from Japan and West Germany; perborate from Austria, Belgium, France, Japan, the Netherlands, the United Kingdom, and West Germany; peroxide from France, West Germany, and the United Kingdom; persulfate from the Netherlands, Switzerland, and the United Kingdom; and chlorinated trisodium phosphate from Canada.

Foreign production and trade

In addition to the 10 countries shown in table 3, the other industrialized countries, such as Italy and Spain, produce sodium compounds (including those discussed in other summaries in this volume). International trade in the inorganic sodium compounds provided for in part 2C of schedule 4 is probably sizeable because of the large number of uses for these products and the almost universal demand for them throughout the world.

Table 1.--Sodium fluoride (100% NaF): U.S. production, 1962-66

Year	Production	
	Quantity	Value
	1,000 pounds	1,000 dollars
1962	10,836	1,381
1963	11,652	1,477
1964	14,120	2,120
1965	12,324	1,645
1966	11,764	1,619

Source: Compiled from official statistics of the U.S. department of Commerce.

Table 2.--Sodium hydrosulfide (sodium sulfhydrate) (100% NaSH): U.S. production, 1962-66

Year	Production	
	Quantity	Value
	1,000 pounds	1,000 dollars
1962	47,988	2,909
1963	50,304	3,069
1964	60,558	3,658
1965	89,072	3,960
1966	91,092	4,111

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 3.--Sodium compounds not elsewhere enumerated: U.S. imports for consumption, by principal sources, 1964-67

Source	1964	1965	1966	1967
	Quantity (1,000 pounds)			
West Germany	6,496	6,422	8,597	10,134
United Kingdom	3,984	4,256	5,062	6,566
Netherlands	646	797	1,344	1,085
Belgium	942	986	1,184	1,565
Switzerland	315	426	609	499
France	262	3,727	3,503	1,173
Japan	328	219	352	596
Canada	772	302	37	67
Austria	583	686	568	437
Sweden	164	248	166	1/
All other	3	28	149	227
Total	14,495	18,097	21,571	22,349
	Value (1,000 dollars)			
West Germany	985	841	1,310	1,374
United Kingdom	493	523	539	697
Netherlands	166	146	188	180
Belgium	97	99	122	160
Switzerland	94	132	185	150
France	29	381	378	144
Japan	75	48	87	105
Canada	53	38	26	100
Austria	69	79	64	51
Sweden	30	56	39	2
All other	7	18	70	102
Total	2,098	2,361	3,008	3,065

1/ Less than 500 pounds.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Strontianite (mineral strontium carbonate)	421.70
Celestite (mineral strontium sulfate)	421.82

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

Imports supply U.S. requirements for strontium minerals. The domestic strontium-mining industry has been inactive since 1959. Exports, if any, are negligible.

Comment

Strontianite is mineral strontium carbonate ($SrCO_3$) and celestite is mineral strontium sulfate ($SrSO_4$). The principal use for both minerals is the production of strontium compounds. Celestite is the preferred raw material due to its greater availability and ease of processing. A common method of processing celestite is to digest finely powdered ore in a hot soda ash solution to produce strontium carbonate, which is treated with the appropriate acid to make the desired strontium compound; hydrochloric acid, for example, to make strontium chloride.

Strontium carbonate (item 421.72), strontium nitrate (item 421.74), strontium oxide (item 421.76), strontium sulfate (item 421.84) and strontium compounds not elsewhere enumerated (item 421.86) are discussed in separate summaries in this volume.

The duty-free status for strontianite and celestite was provided for in the Tariff Act of 1930, as originally enacted, and in the TSUS, effective August 31, 1963, and has been bound since January 1, 1948, as a concession granted by the United States in the General Agreement on Tariffs and Trade (GATT).

Domestic consumption is supplied wholly by imports. Due to our dependence on foreign sources of strontium minerals, celestite was placed on the list of materials to be acquired for the national stockpile.

Three domestic chemical companies convert imported strontium

minerals to strontium compounds in plants situated in California, New Jersey, and Pennsylvania. There has been no domestic production of strontium minerals since 1959; however, deposits of strontianite and celestite occur in Arizona, California, Texas, and Washington. If foreign strontium mineral supplies were cut off, the United States could become self-sufficient but at the cost of higher prices. Just how much domestic material could be made available to equal the specifications of the currently available foreign material is unknown as is the cost at which this could be done.

U.S. exports, if any, are estimated to be negligible. U.S. imports, consisting chiefly of celestite from Mexico and the United Kingdom, as reported in the official statistics of the U.S. Department of Commerce, are shown in the following tabulation for the years, 1962-67.

	Quantity 1,000 pounds	Value 1,000 dollars
1962-------	14,978	189
1963-------	32,464	372
1964-------	43,235	507
1965-------	19,481	221
1966-------	23,034	268
1967-------	11,223	118

The United Kingdom and Mexico are probably the leading producers of strontium minerals among non-communist countries of the world; production has also been reported in recent years from Argentina, Italy, and Pakistan. Free-world production of strontium minerals, as reported in the official statistics of the U.S. Bureau of Mines, is shown in the following tabulation for the years, 1962-66.

Country	1962	1963	1964	1965	1966
	Quantity (1,000 pounds)				
Mexico----------	9,108	12,952	10,556	6,448	12,868
United Kingdom----------	14,432	20,204	38,154	21,390	10,132
Italy----------	1,322	1,442	1,008	1,410	1,318
Pakistan----------	646	848	594	994	1,180
Argentina----------	-	1,190	66	1,318	-
Total----------	25,708	36,636	50,378	31,560	25,498

Production of strontium minerals is known to exist also in Morocco, and West Germany (as well as in Poland and the U.S.S.R.), but the data have not been reported. Strontium minerals are known to occur in many countries throughout the world but the demand is too small or the production costs too high to warrant exploitation of these deposits. The requirements in most countries, usually small, are satisfied by the importation of strontium compounds and products.

Commodity	TSUS item
Strontium compounds:	
Carbonate, precipitated	421.72
Nitrate	421.74
Oxide	421.76
Sulfate, other	421.84
Other	421.86

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

U.S. consumption, about 20 million pounds annually, approximates domestic production, which is provided chiefly by the processing of imported strontium minerals. Exports and imports are either small or nil.

Comment

This summary deals with precipitated strontium carbonate, nitrate, oxide, sulfate (other than mineral strontium sulfate), and about 45 inorganic strontium compounds not specifically named in the TSUS but provided for under item 421.86. About one-third of the unnamed strontium compounds are produced on a commercial scale in the United States. Included in this group are strontium bromide, chlorate, chloride, fluoride, hydroxide, iodide, and peroxide.

Strontium compounds are used principally in pyrotechnics, such as tracer bullets, distress signal rockets and flares, transportation warning fuses, and fireworks (carbonate, chlorate, chloride, nitrate, oxide, peroxide, and sulfate). There are no satisfactory substitutes for strontium compounds in pyrotechnic uses. The brilliant crimson color that strontium compounds impart to a flame is the property that makes them important in this type of application. Less important uses are in medicines, in the production of sugar, in bleaching, and in the manufacture of iridescent glass, paper, and other strontium compounds: bromide, carbonate, chloride, hydroxide, iodide, oxide, peroxide, and sulfate.

Mineral strontium carbonate (strontianite) and mineral strontium sulfate (celestite) are discussed in a separate summary on items 421.70 and 421.82 in this volume.

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
	Strontium compounds:		
421.72	Carbonate, precipitated.	12.5% ad val.	6% ad val.
421.74	Nitrate----------	12.5% ad val.	6% ad val.
421.76	Oxide----------	12.5% ad val.	6% ad val.
421.84	Sulfate, other------	10.5% ad val.	5% ad val.
421.86	Other----------	10.5% ad val.	5% ad val.

The rates effective January 1, 1972, represent the final stage of concessions granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reductions became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rates shown above as existing prior to January 1, 1968, remained unchanged under the TSUS from August 31, 1963 (the effective date of the TSUS), through the end of 1967.

Strontium compounds are produced in the United States by about 20 chemical companies, with plants situated in California, Colorado, Illinois, Kentucky, Maryland, Missouri, New Jersey, New York, Ohio, and Pennsylvania. For most of the companies, the output of strontium compounds represents a small part of their total annual production.

Domestic consumption approximates domestic production. Data on production of strontium compounds are not reported in official statistics, but the current annual production is estimated to be about 20 million pounds.

Domestic exports of strontium compounds are estimated to be negligible. Domestic imports are small and sporadic and have been reported separately only since September 1963 (see accompanying table). In 1964, imports were reported for precipitated strontium carbonate (15,000 pounds, valued at $3,562), chiefly from Canada and France, and for strontium compounds not elsewhere enumerated (61,000 pounds, valued at $16,742), all from West Germany, consisting mainly of strontium chloride. The imports reported for 1965 consisted of strontium nitrate (5,000 pounds, valued at $789), all from West Germany, and strontium sulfate (valued at $276) from Switzerland. Imports in 1966 consisted of a few pounds of precipitated strontium carbonate from the United Kingdom valued at $1,483 and 123,000 pounds of strontium com-

pounds not elsewhere enumerated, valued at $40,912 (in part strontium bromide and chloride from West Germany). In 1967, a small amount of precipitated strontium carbonate, valued at $897, was received from the United Kingdom and 16,000 pounds of strontium compounds not elsewhere enumerated, valued at $4,561, from the United Kingdom and West Germany. There were no imports reported for strontium oxide during 1964-67.

The quantity of strontium compounds involved in world trade is small. Canada, France, Italy, the United Kingdom, and West Germany are known to produce and export strontium compounds.

Strontium compounds 1/: Imports for consumption, 1964-67

Year	Quantity	Value
	1,000 pounds	1,000 dollars
1964	76	20
1965	5	1
1966	123	42
1967	16	5

1/ Includes items 421.72-.76 and 421.84-.86.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Note.--Composition of imports was as follows:
1964 Strontium carbonate, precipitated and strontium chloride.
1965 Strontium nitrate.
1966 Strontium chloride.
1967 Strontium chloride.

Commodity	TSUS item
Tellurium compounds----------	421.90

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

Virtually all U.S. consumption of tellurium compounds (about 20,000 pounds annually) has been supplied by domestic production. Exports are believed to be small; there were no imports in 1965, 1966, or 1967.

Comment

This summary comprises those inorganic tellurium compounds not provided for elsewhere in the TSUS, principally tellurium dioxide, a white, crystalline powder, and tellurium hexafluoride, a colorless gas. Other inorganic compounds containing tellurium are covered by the summaries pertaining to the positive ion (cation) of the compound. For example, sodium tellurate, sodium tellurite, and sodium telluride are covered in the summary on inorganic sodium compounds (item 421.62). Tellurium compounds are recovered as byproducts in the refining of copper and lead, and are used principally as analytic reagents and in the manufacture of catalysts.

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
421.90	Tellurium compounds--	10% ad val.	5% ad val.

The rate effective January 1, 1972, represents the final stage of a concession granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reduction became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rate shown above as existing prior to January 1, 1968,

remained unchanged under the TSUS from August 31, 1963 (the effective date of the TSUS), through the end of 1967.

No statistics are available on the consumption or production of tellurium compounds, but it is known that virtually all U.S. consumption comes from domestic production. Current annual U.S. production is estimated at 20,000 pounds. Some eight corporations, principally refiners of copper and lead, produce tellurium compounds at plants located in Indiana, Louisiana, Maryland, New Jersey, New York, and Pennsylvania. For none of these corporations are the revenues derived from the sale of tellurium chemicals a major source of income.

Exports of tellurium chemicals are believed to be small. Imports, which were first separately reported effective August 31, 1963, amounted to 500 pounds, valued at $3,000 (all from Canada), during the remainder of that year. In 1964, one pound of a tellurium compound (presumably some specially tailored material), valued at $838, was imported from the United Kingdom. No imports were reported in 1965, 1966, or 1967.

Commodity	TSUS item
Thallium compounds----------	422.00

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

The thallium compounds covered by this summary are not important items of trade; total U.S. consumption and production in 1967 were valued at about $57,000 and $52,000, respectively. Imports amounted to about 10 percent of estimated U.S. consumption. Probably there have been no exports.

Comment

The principal thallium compounds included in this summary are thallium sulfate, thallium carbonate, thallium hydroxide, thallium iodide, thallium nitrate, and thallium sulfide. These chemicals, which vary from white to blue-black in color, are all very poisonous. Thallium compounds are produced from thallium which is recovered as a byproduct from processing zinc ores and pyrite. Thallium sulfide, commercially the most important compound, is used mainly as a pesticide. However, since August 1, 1965, under the Pesticide Registration Regulations of the United States Department of Agriculture, only properly trained personnel of Federal, State, or local Governments have been allowed to use this highly poisonous pesticide. Thallium carbonate is used in producing artificial gem stones; thallium hydroxide, as an indicator in analytical chemistry; thallium iodide, in medicine; thallium nitrate, in pyrotechnics; and thallium sulfide, in infrared-sensitive photocells.

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
422.00	Thallium compounds---------	10.5% ad val.	5% ad val.

The rate effective January 1, 1972, represents the final stage of a concession granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reduction became operative January 1, 1968. Rates of duty for the individual stages

are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rate shown above as existing prior to January 1, 1968, remained unchanged under the TSUS from August 31, 1963 (the effective date of the TSUS), through the end of 1967.

It is believed that consumption and production of thallium compounds have been relatively stable in recent years and in 1967 totaled about $57,000 and $52,000, respectively. Production of various thallium compounds in 1967 was by 8 concerns; at 3 plants in New Jersey and at one plant each in California, Colorado, Ohio, New York, and Pennsylvania. None of the producing companies derive a substantial part of their income from sales of thallium compounds.

Imports of thallium compounds, 1964-67 (compiled from official statistics of the U.S. Department of Commerce) were as follows:

Year	Pounds	Dollars
1964	6,885	12,000
1965	3,499	9,000
1966	3,184	7,000
1967	2,188	5,000

West Germany has been the principal source of imports during this period with smaller quantities coming from Belgium and France. It is believed that imports were predominately thallium sulfate. Exports are not separately classified but are believed to be nil.

Production facilities for thallium compounds are known to exist in Belgium, France, West Germany, and the U.S.S.R., but no data on production are available. Because of the low demand for thallium and its compounds, a large amount of the thallium available from the processing of zinc ores and pyrite is not recovered.

Commodity	TSUS item
Thorium compounds:	
Nitrate	422.10
Oxide	422.12
Other	422.14

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

Virtually the entire U.S. consumption, estimated to be about 100,000 pounds annually, is supplied by domestic production. Recent exports are believed to have been small. Imports in 1966 amounted to 841 pounds and in 1967 to 1,512 pounds.

Description and uses

This summary comprises two specified thorium compounds and those which are not elsewhere enumerated in the TSUS; they are principally thorium carbide, fluoride, nitrate, and oxide, but also included are some 15 other thorium compounds of lesser commercial significance.

Thorium compounds are produced from the minerals monazite (item 601.45), thorite (item 601.45), and uranothorite (item 601.57). Thorium nitrate is used mainly in the manufacture of gas mantles; thorium fluoride in thorium-magnesium alloys; thorium carbide and oxide in breeding elements for nuclear fuels; thorium oxide is also used in the manufacture of elemental thorium, refractories, thorium-dispersed nickel, and special optical glass. When the compounds are from monazite, rare-earth compounds (items 418.40-.44) are important coproducts. When produced from uranothorite, uranium compounds (items 422.50-.52) are important coproducts.

Thorium compounds are classified as "source materials" under the Atomic Energy Act of 1946 and are subject to the licensing requirements of the Atomic Energy Commission.

U.S. tariff treatment

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
	Thorium compounds:		
422.10	Nitrate	35% ad val.	17.5% ad val.
422.12	Oxide	35% ad val.	17.5% ad val.
422.14	Other	35% ad val.	17.5% ad val.

The rates effective January 1, 1972, represent the final stage of concessions granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reductions became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rates shown above as existing prior to January 1, 1968, remained unchanged under the TSUS from August 31, 1963 (the effective date of the TSUS), through the end of 1967.

U.S. consumption, production, and exports

The current rate of U.S. consumption is estimated at 100,000 pounds annually. Statistics are not available on domestic production, but it is known that virtually the entire consumption is supplied from the domestic output. Two diversified companies produce the bulk of the output at four plants situated in Illinois (one), New Jersey (one), and Tennessee (two). Smaller quantities are produced by six additional companies at plants located in New Jersey (two), Ohio (one), Oklahoma (two), and Pennsylvania (one). For none of these companies are thorium compounds the principal source of income, but their production constitutes a major activity at the four plants producing the bulk of domestic output.

In recent years, monazite has been the principal raw material for the joint production of thorium compounds and rare-earth chemicals in the United States. Formerly, thorium compounds were the component in chief demand and large commercial stocks of rare-earth chemicals accumulated. In recent years, the demand situation has reversed and stocks of thorium compounds have accumulated.

Government inventories of thorium compounds on June 30, 1966, amounted to 8.6 million pounds of thorium nitrate, of which 1.1 million pounds was equivalent to the inventory objective of 0.5 million

pounds of thorium oxide, and 7.5 million pounds of the nitrate was in excess of that objective.

Separate statistics on exports of thorium compounds are not available, but such exports are believed to be small.

U.S. imports

Separate statistics on imports of inorganic thorium compounds first became available effective August 31, 1963. In the years 1964 and 1965, imports amounted to 86 pounds, valued at $8,830, and 115 pounds, valued at $10,042, respectively. In the years 1966 and 1967, imports amounted to 841 pounds, valued at $19,075, and 1,512 pounds, valued at $21,243, respectively. Thorium oxide and fluoride have been the principal items imported; West Germany and France have been the principal sources of such imports.

Foreign production and trade

Free-world production of thorium compounds outside the United States occurs principally in Canada, France, India, the United Kingdom, and Brazil, but world markets are small for these products.

In 1946, India, and in 1951, Brazil, embargoed all exports of thorium materials (except those made to other friendly governments) to conserve their supplies for potential nuclear applications. In both countries, production is from monazite in government-owned plants, and large stocks of compounds are believed to have accumulated by these two countries.

In Canada and France, thorium compounds are obtained as byproducts from the processing of uranium ores by publicly owned firms. Trade information indicates that the Canadian output has been dominating a large share of the free-world market since its inception in 1959. The sole producer in Canada is a large British mining corporation, which using Canadian byproduct raw material, is also the principal producer of thorium compounds in the United Kingdom.

Commodity	TSUS item
Tin compounds:	
Dichloride	422.20
Tetrachloride	422.24
Other	422.26

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

Domestic consumption, estimated at 15 million to 20 million pounds annually, is supplied chiefly by domestic production. U.S. exports are estimated not to exceed 500,000 pounds annually and domestic imports are estimated at about 2,000 pounds annually.

Comment

This summary deals with tin dichloride ($SnCl_2$), tin tetrachloride ($SnCl_4$), and about 45 inorganic tin compounds not provided for by name in the TSUS. About 10 of these compounds are produced on a commercial scale in the United States. The tin compounds domestically produced are made mainly from tin alloys scrap but are also obtained as a direct by-product of detinning operations. Industrial tin compounds are used in the fields of ceramics, metal coatings and textiles. The following tabulation lists the principal uses for a number of the significant domestic tin compounds included in this summary:

Tin compound	Principal use
Dichloride	Reducing agent in dyeing
Difluoride	Fluoride source in tooth paste
Dioxide	Manufacture of tin compounds
Oxide	Reducing agent
Sulfate	Tin-plating
Tetrabromide	Mineral separations
Tetrachloride	Perfume stabilization

For tin compounds used as pigments, see separate summary on pigments, not specially provided for, item 473.88. Organic tin salts are

discussed in a summary on TSUS item 426.16.

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
	Tin compounds:		
422.20	Dichloride----	12.5% ad val.	6% ad val.
422.24	Tetrachloride-	12.5% ad val.	6% ad val.
422.26	Other----------	12.5% ad val.	6% ad val.

The rates effective January 1, 1972, represent the final stage of concessions granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reductions became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rates shown above as existing prior to January 1, 1968, remained unchanged under the TSUS from August 31, 1963 (the effective date of the TSUS), through the end of 1967.

Tin compounds are produced in the United States by eleven chemical companies with plants situated as follows: two each in New Jersey, Ohio, and Pennsylvania, and one each in California, Kentucky, Missouri, New York, and Oklahoma. Domestic production accounts for the bulk of the estimated 15 million to 20 million pounds of annual consumption. Data on th p oduction of tin dioxide are the only published official statistics on the tin compounds covered here. The production of tin dioxide for the years 1962-66, as reported by the United States Department of Commerce is shown in the following tabulation:

	Quantity (1,000 pounds)	Value (1,000 dollars)
1962--------	1,468	1,728
1963--------	1,402	1,780
1964--------	1,424	1,913
1965--------	1,494	3,546
1966--------	1,204	2,268

Domestic exports of tin compounds are not reported separately in official statistics, but it is estimated they do not exceed 500,000 pounds annually. Domestic imports have been reported separately in official statistics only since September 1963. During 1964-67, imports of tin dichloride amounted to 227 pounds, valued at $792 from

West Germany, in 1966. Imports of tin tetrachloride during the same period totaled 698 pounds, valued at $15,627 from Mexico, in 1967. Imports reported for item 422.26 (tin compounds not elsewhere enumerated) are not shown since a study of entry documents has indicated that the great bulk of the totals published consisted of several organic tin compounds that should have been reported under other TSUS classes. Such imports as could be properly identified with TSUS class 422.26 consisted of tin oxide from the United Kingdom. The total for each year probably amounted to about 2,000 pounds.

International trade in tin compounds is small. Most consuming countries obtain their requirements by processing tin alloys scrap and as a direct by-product of detinning operations.

Commodity	TSUS item
Titanium compounds	422.30

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

Domestic consumption, estimated at 10 million to 20 million pounds annually, is supplied chiefly by domestic production. U.S. exports are estimated to be negligible and imports amounted to 2.7 million pounds in 1967.

Comment

This summary deals with about 25 inorganic titanium compounds not provided for by name in the TSUS. About one-half of these compounds are produced on a commercial scale in the United States. The titanium compounds of industrial importance include the carbide, diboride, hydride, hydroxide, nitride, sulfate, and tetrachloride. The following tabulation lists the principal uses for these compounds in the United States:

Titanium compound	Principal use
Carbide	Additive with tungsten carbide in making cutting tools
Diboride	Coatings resistant to attack by molten metals
Hydride	Powder metallurgy
Hydroxide	Mordant in textile dyeing
Nitride	Manufacture of alloys
Sulfate	Laundry chemical
Tetrachloride	Manufacture of pigments and smoke producing mixtures

For titanium dioxide, the most important inorganic titanium compound, see separate summary on titanium pigments, TSUS item 473.70. Organic titanium salts are discussed in summaries on TSUS items 427.18 and 427.20.

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
422.30	Titanium compounds--	15% ad val.	7.5% ad val.

The rate effective January 1, 1972, represents the final stage of a concession granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reduction became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rate shown above as existing prior to January 1, 1968, remained unchanged under the TSUS from August 31, 1963 (the effective date of the TSUS), through the end of 1967.

Titanium compounds are produced in the United States by twenty chemical companies with plants situated as follows: New Jersey (5), California (3), Massachusetts (2), Pennsylvania (2), and one each in Louisiana, Maryland, Michigan, Mississippi, Nevada, New York, Oklahoma, and West Virginia. Domestic production accounts for the bulk of the estimated 10 million to 20 million pounds of annual consumption. Data on the production of titanium compounds are not published in official statistics.

Domestic exports of titanium compounds are not reported separately in official statistics, but it is estimated that they are negligible. Domestic imports have been reported separately in official statistics only since September 1963. Imports as published for 1964 and 1965 are not shown since a study of entry documents has indicated that a significant amount of the 417,000 pounds and 171,000 pounds published as totals for 1964 and 1965, respectively, consisted chiefly of barium titanate which should have been reported in TSUS 417.80. Imports properly reported under TSUS class 422.30 consisted chiefly of titanium carbide from Canada and West Germany. Small amounts of titanium monoxide were entered from Canada, the United Kingdom, and West Germany. Imports for 1966-67 are shown in the accompanying table. Imports in both 1966 and 1967 consisted chiefly of titanium monoxide and titanium carbide. The 1967 imports from Finland included a substantial amount of titanium dioxide, which should have been reported under item 473.70.

International trade in titanium compounds is small. Most consuming countries obtain their requirements from products developed in the production of titanium dioxide from titanium ore.

Titanium compounds: U.S. imports for consumption by sources, 1966-67

Source	1966	1967
	Quantity (1,000 pounds)	
Finland	160	2,484
West Germany	43	32
Canada	57	20
Switzerland	2	1/
Japan	53	53
United Kingdom	156	102
Belgium	-	1/
Italy	-	1/
Sweden	1/	-
Total	471	2,691
	Value (1,000 dollars)	
Finland	31	474
West Germany	118	100
Canada	50	44
Switzerland	38	23
Japan	21	20
United Kingdom	27	17
Belgium	-	2
Italy	-	2/
Sweden	1	-
Total	286	680

1/ Less than 500 pounds.
2/ Less than $500.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Tungsten carbide----------	422.40

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

Domestic production of tungsten carbide exceeded 6.9 million pounds and imports were only 5,000 pounds, valued at $17,000, in 1966. Exports are not available.

Comment

Tungsten carbide, an important abrasive, is usually produced by the combination of tungsten metal powder and carbon heated to a very high temperature (about 2000°C). It has a hardness approaching that of a diamond and is produced and used in three forms: cemented or sintered; cast or fused; and crystalline. Cemented (sintered) tungsten carbide is usually made from hydrogen-reduced tungsten powder, which is carburized, impacted with a cobalt binder into various shapes and sintered. Cast or fused tungsten carbide is made generally from carbon-reduced tungsten powder and scrap, melted together with some form of carbon and cast into shapes or crushed and used as a hard facing material. Crystalline tungsten carbides are usually made directly from tungsten ore concentrates. The crystalline material, although produced in much smaller quantities than cemented and cast tungsten carbides, is gaining in use.

Cemented tungsten carbide is used principally for machine tools and by the mining industry as in carbide-tipped rock bits. Cast tungsten carbide is used chiefly as a hard facing material, but is also used in dies and wear-resistant parts. Crystalline tungsten carbide is used for cutting edges and for wear-resistant machine parts.

The column 1 rates of duty applicable to imports (see general headnote 3 in the Tariff Schedules of the United States Annotated) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
422.40	Tungsten carbide---------	42¢ per lb. on tungsten content + 25% ad val.	21¢ per lb. on tungsten content + 12.5% ad val.

The rate effective January 1, 1972, represents the final stage of a concession granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reduction became operative January 1, 1968. Rates of duty for each of the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rate shown above as existing prior to January 1, 1968, remained unchanged under the TSUS from August 31, 1963 (the effective date of the TSUS), through the end of 1967.

The ad valorem equivalent of the compound rate of duty in effect prior to January 1, 1968, based on imports in 1967, was 32.9 percent.

Since 1961. U.S. production of cemented and cast tungsten carbides has ranged from a low of 3.3 million pounds (tungsten content) in 1963 to a high of 6.9 million pounds of contained tungsten in 1966. Consumption of all forms of tungsten carbide increased from 4.2 million pounds (tungsten content) in 1963 to 7.6 million pounds (tungsten content in 1966 (see accompanying table).

Tungsten carbide is produced at 16 plants in the United States, 4 of which are in Texas, 3 each in Michigan and Pennsylvania, 2 in California, and 1 each in New Jersey, Ohio, Nevada, and Illinois. Six of these plants produce crushed cast carbide powder, two produce crystalline carbide powder, and the remainder produce carbide powder made from hydrogen-reduced tungsten.

U.S. imports of tungsten carbide were 935 pounds (743 pounds tungsten content), valued at $3,875, in 1964; were 4,483 pounds (3,507 pounds tungsten content) valued at $17,714, in 1965; were 4,959 pounds (3,768 pounds tungsten content), valued at $16,970, in 1966; and were 2,168 pounds (1,772 pounds tungsten content), valued at $9,368, in 1967. Imports have come principally from Sweden and West Germany.

Statistics on exports of tungsten carbide are not reported separately; exports are probably small.

Tungsten carbide: U.S. production, imports for consumption, and apparent consumption, 1962-67

Year	Production 1/	Imports	Consumption
	(In pounds of contained tungsten)		
1962	5,071,000	2/	5,370,000
1963	3,320,000	2/	4,207,000
1964	4,614,000	3/ 743	4,765,000
1965	5,892,000	3/ 3,507	6,125,000
1966	6,877,000	3/ 3,768	7,623,000
1967	2/	1,772	2/

1/ Does not include production of crystalline tungsten carbide powder.

2/ Not available.

3/ Gross imports were 935 pounds, valued at $3,875, in 1964; 4,483 pounds, valued at $17,714, in 1965; 4,959 pounds, valued at $16,970, in 1966; and 2,168 pounds, valued at $9,368, in 1967.

Source: Production and consumption compiled from official statistics of the U.S. Bureau of Mines; imports for consumption compiled from official statistics of the U. S. Department of Commerce.

Note.--Exports are not separately classified in official statistics; they are believed to be very small.

Commodity	TSUS item
Tungstic acid	416.40
Ammonium tungstate	417.40
Calcium tungstate	418.30
Potassium tungstate	420.32
Sodium tungstate	421.56
Tungsten compounds not elsewhere enumerated	422.42
Mixtures of two or more inorganic compounds in chief value of tungsten	423.92

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

Domestic output of tungsten compounds and mixtures except for those produced as intermediates in the manufacture of tungsten metal was about 120,000 pounds (tungsten content) in 1966; imports were 31,270 pounds (tungsten content), valued at $164,202 in the same year. Exports are probably small.

Comment

This summary covers five separately enumerated tungsten compounds (tungstic acid, ammonium tungstate, calcium tungstate, potassium tungstate, and sodium tungstate), tungsten compounds not elsewhere enumerated, and mixtures of inorganic tungsten compounds. Ammonium tungstate, tungstic acid, and calcium and sodium tungstates are intermediates in the manufacture of metallic tungsten from tungsten ores. Tungsten compounds, other than these intermediates, are used in textile dyes, inks, paints, enamels, glass, luminescent pigments, fluorescent lighting, and television picture tubes. Less than 2 percent of the total tungsten consumed in the United States is used in the manufacture of these finished tungsten chemicals, the balance being consumed in tungsten carbides, tungsten metal, tungsten steels, and other tungsten alloys.

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
416.40	Tungstic acid----------	42¢ per lb. on tungsten content + 20% ad val.	21¢ per lb. on tungsten content + 10% ad val.
417.40	Ammonium tungstate--------	------do------	Do.
418.30	Calcium tungstate---------	------do------	Do.
420.32	Potassium tungstate-------	------do------	Do.
421.56	Sodium tungstate----------	------do------	Do.
422.42	Tungsten compounds not elsewhere enumerated.	------do------	Do.
423.92	Mixtures of two or more inorganic compounds in chief value of tungsten.	------do------	Do.

The rates effective January 1, 1972, represent the final stage of concessions granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reductions became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rates shown above as existing prior to January 1, 1968, remained unchanged under the TSUS from August 31, 1963 (the effective date of the TSUS), through the end of 1967. The ad valorem equivalent of the specific rate of duty in effect prior to January 1, 1968, based on imports of all tungsten compounds and mixtures in 1967, was 27.2 percent.

Domestic production of the tungsten compounds considered herein is estimated to have been between 10 and 15 million pounds annually during recent years. Most of this production has consisted of ammonium paratungstate and tungstic acid, which are converted to tungsten metal. Tungsten compounds are produced by seven integrated concerns and by four small companies with plants located in Pennsylvania, California, Colorado, New Jersey, Illinois, New York, and Ohio.

United States imports of tungsten compounds and mixtures, principally from West Germany and Canada, were valued at $34,000, in 1964 and at $56,000, in 1965. Imports by sources for the years 1966 and 1967 are shown in the accompanying table. Shipments of 71,447 pounds (tungsten content - 36,991 pounds) of tungstic acid, valued at $52,000 were received from the Virgin Islands, in 1966. Statistics on U.S. exports of tungsten compounds and mixtures are not available: exports are believed to be very small.

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Mainland China, the U.S.S.R., Bolivia, Portugal, and Korea are the world's leading producers of tungsten ores. Their exports go chiefly to the United States, France, the United Kingdom, West Germany, and Sweden, which are the principal producing countries of tungsten metal and compounds.

Tungsten compounds and mixtures: U.S. imports for consumption by sources, 1966 and 1967

Commodity and source	1966			1967		
	Quantity (pounds)	Tungsten content (pounds)	Value	Quantity (pounds)	Tungsten content (pounds)	Value
Tungstic acid						
Belgium	100	75	$296	-	-	-
Ammonium tungstate						
France	-	-	-	1,350	945	$3,175
Calcium tungstate:						
United Kingdom	5,827	3,644	27,457	8,693	5,735	47,086
West Germany	19,618	12,555	76,703	7,802	4,996	30,798
Total	25,445	16,199	104,160	16,495	10,731	77,884
Other tungsten compounds						
Canada	14,000	10,010	37,031	600	480	1,854
Netherlands	-	-	-	1,102	779	3,725
West Germany	2,850	1,844	11,073	350	275	1,557
Total	16,850	11,854	48,104	2,052	1,534	7,136
Mixtures of inorganic compounds in chief value of tungsten						
Canada	2,980	1,383	1,892	6,000	4,020	20,717
Sweden	1,933	1,359	7,893	36,938	26,870	150,804
West Germany	550	400	1,857	-	-	-
Total	5,463	3,142	11,642	42,938	30,890	171,521

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Sodium uranate	421.58
Uranium oxide	422.50
Uranium compounds not elsewhere enumerated	422.52

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

U.S. consumption is supplied primarily from domestic output (probably 15 to 20 million pounds annually). Exports are moderate. Imports amounted to 4.25 million pounds in 1966 and 2.62 million pounds in 1967.

Comment

The products included within the scope of this summary are: sodium uranate, uranium oxide (principally dioxide and trioxide), and a number of inorganic uranium compounds that are not elsewhere enumerated in the TSUS. The latter group includes principally uranium carbide, uranium tetrafluoride, uranium hexafluoride, and some 10 other, commercially less significant, uranium compounds. Ownership of uranium compounds is subject to regulations issued by the Atomic Energy Commission (AEC) pursuant to the Atomic Energy Act of 1954, as amended.

Uranium compounds are obtained from such minerals as carnotite, uraninite, and coffinite (item 601.57), and are used mainly as intermediates in the production of nuclear materials, although small amounts have been used in ceramics, in specialty glass, and as catalysts.

U.S. imports of sodium uranate, uranium oxide, and uranium compounds, not elsewhere enumerated, are free of duty. The duty-free status was provided for in the Tariff Act of 1930, as originally enacted, and in the TSUS, effective August 31, 1963, and was bound for the first time in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT).

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Statistics on production and consumption of uranium compounds are not released by the AEC, but it is known that the AEC has been the free world's largest producer and consumer of these chemicals. Substantially the entire domestic output has been consumed by the AEC in the production of nuclear materials. The uranium oxide (U_3O_8) content of the ore produced in the United States during 1966 was almost 20 million pounds. Some 10 firms, chiefly large and diversified chemical manufacturers, currently produce relatively small quantities of uranium compounds.

Statistics on exports of the chemicals covered here are not separately reported, but exports are believed to be moderate. Virtually all imports have originated in Canada and South Africa and have been produced mainly under contract with the AEC. They consist largely of uranium trioxide, dioxide, and tetrafluoride. Imports amounted to 11.5 million pounds, valued at $111 million, in 1964; 6.0 million pounds, valued at $58 million, in 1965; 4.25 million pounds, valued at $41.3 million, in 1966; and 2.6 million pounds, valued at $12.6 million, in 1967.

Foreign production and trade of these chemicals are dominated largely by nuclear materials requirements and are subject to control by governmental agencies. Statistics are generally not released on the chemicals covered herein.

Commodity	TSUS item
Vanadium carbide----------	422.58

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

Vanadium carbide is an unimportant and seldom used abrasive and no statistics on domestic production or exports are available. Imports were only 100 pounds, valued at $795, in 1967.

Comment

Vanadium carbide is a hard, crystalline material produced in the electric furnace from vanadium metal and carbon. It is used in small amounts as a cutting edge for certain machine tools. The use at present, is almost exclusively experimental, and the material is an unimportant article of commerce.

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
422.58	Vanadium carbide--------	12.5% ad val.	6% ad val.

The rate effective January 1, 1972, represents the final stage of a concession granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reduction became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rate shown above as existing prior to January 1, 1968, remained unchanged under the TSUS from August 31, 1963 (the effective date of the TSUS), through the end of 1967.

Only a few companies produce vanadium carbide. Production is believed to be less than 500 pounds annually. There are probably no exports.

There were no imports of vanadium carbide in 1962 but small quantities have been imported annually since then. All entries have been from West Germany (see accompanying table).

Production of vanadium carbide in foreign countries, as in the United States, is in very limited quantities.

Vanadium carbide: U.S. imports for consumption, 1962-67

Year	Quantity (pounds)	Value
1962	-	-
1963	10	$109
1964	152	1,184
1965	690	2,301
1966	250	1,983
1967	100	795

Source: Compiled from official statistics of the U.S. Department of Commerce.

Note.--All imports are from West Germany.

Commodity	TSUS item
Ammonium vanadate	417.42
Potassium vanadate	420.34
Sodium vanadate	421.60
Vanadium pentoxide (anhydride)	422.60
Vanadium compounds not elsewhere enumerated	422.62
Mixtures of two or more inorganic compounds in chief value of vanadium	423.94

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

Domestic output of vanadium compounds and mixtures covered by this summary, chiefly vanadium pentoxide, was 24 million pounds, valued at $27.5 million in 1966; exports in the same year were 3.2 million pounds, valued at $4.2 million, and imports are insignificant.

Comment

This summary covers four separately named vanadium compounds (ammonium, potassium, and sodium vanadate and vanadium pentoxide), vanadium compounds not elsewhere enumerated, and mixtures of inorganic vanadium compounds. By far the most important item considered here is vanadium pentoxide. It is used mainly for the production of ferrovanadium, other vanadium alloys, and metallic vanadium. Vanadium pentoxide is also employed as a catalyst in the manufacture of sulfuric acid and in petroleum cracking processes, for coloring glass and ceramics, and as a drier in paints and varnishes. Ammonium and sodium vanadates, which are used as photographic developers and in the manufacture of inks are of minor commercial importance. The other vanadium products considered here are insignificant articles of commerce.

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
417.42	Ammonium vanadate	32% ad val.	16% ad val.
420.34	Potassium vanadate	----do----	Do.
421.60	Sodium vanadate	----do----	Do.
422.60	Vanadium pentoxide (anhydride)	----do----	Do.
422.62	Vanadium compounds not elsewhere enumerated	----do----	Do.
423.94	Mixtures of two or more inorganic compounds in chief value of vanadium	----do----	Do.

The rates effective January 1, 1972, represent the final stage of concessions granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reductions became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rates shown above as existing prior to January 1, 1968, remained unchanged under the TSUS from August 31, 1963 (the effective date of the TSUS), through the end of 1967.

Data on the total domestic output of all the vanadium compounds and mixtures considered in this summary are not available, but the production of the principal compound, vanadium pentoxide, declined from 17.9 million pounds in 1962 to 14.7 million pounds in 1963 and then rose to 23.9 million pounds in 1966 (see accompanying table). U.S. production of vanadium pentoxide is by four principal producers with plants located in Colorado (2), New Mexico, and South Dakota.

U.S. imports of vanadium compounds and mixtures have been very small, except in 1962, when imports were 89,000 pounds, valued at $124,000, and were chiefly from the Republic of South Africa and West Germany.

Export data for vanadium compounds also include vanadium metal and ores but the bulk of the exports are believed to be vanadium pentoxide. Since 1962, these exports have varied considerably from 1.9 million pounds to 4.3 million pounds but have averaged about 3.2 million pounds annually. The principal markets are Belgium, Japan, Canada, Austria, and other European countries.

Vanadium ores occur in south-west Africa, the Republic of South Africa, Finland, and the U.S.S.R. These countries also produce vanadium compounds.

Vanadium compounds: U.S. production, imports for consumption, exports of domestic merchandise, and apparent consumption, 1962-67

(Quantity in thousands of pounds; value in thousands of dollars)

Year	Production	Imports	Exports	Apparent consumption
	Quantity			
1962	17,910	89	3,476	14,523
1963	14,694	2	1,857	12,839
1964	19,550	1/	4,321	15,229
1965	22,996	1/	3,314	19,682
1966	23,910	25	3,162	20,773
1967	2/	100	2,812	2/
	Value			
1962	24,716	124	2,830	22,010
1963	18,368	5	1,561	16,812
1964	22,483	1/	3,525	18,958
1965	26,445	1	3,540	22,906
1966	27,497	15	4,226	23,286
1967	2/	9	4,043	2/

1/ Less than 500.
2/ Not available.

Source: Production data from U.S. Bureau of Mines; import and export data from the U.S. Department of Commerce.

Commodity	TSUS item
Zinc arsenate----------	422.70

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

Zinc arsenate is insignificant both in domestic and foreign trade.

Comment

Zinc arsenate is a white odorless powder which is produced by the reaction of sodium arsenate and a soluble zinc salt. It is a very poisonous compound and is used in limited quantities as an insecticide. Zinc arsenate occurs in nature as the mineral kottigite.

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
422.70	Zinc arsenate----------	12.5% ad val.	6% ad val.

The rate effective January 1, 1972, represents the final stage of a concession granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reduction became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rate shown above as existing prior to January 1, 1968, remained unchanged under the TSUS from August 31, 1963 (the effective date of the TSUS), through the end of 1967.

U.S. production statistics on zinc arsenate are not available but the domestic output is probably very small; only one small chemical company located in New Jersey produces this chemical in the United States. There are probably no exports and there have been no imports since 1963. U.S. imports for consumption were 1,102 pounds, valued at $690, in 1962 and 551 pounds, valued at $345, in 1963; all from West Germany.

Commodity	TSUS item
Zinc chloride----------	422.72

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

U.S. consumption of 50-60 million pounds annually has been supplied chiefly by domestic producers, with less than 6 percent of domestic requirements having been imported. Exports are believed to have been very small.

Comment

Most zinc chloride is obtained by treating scrap zinc with hydrochloric acid. It is also produced as a byproduct from zinc smelters and from some galvanizing processes. Zinc chloride is produced and consumed principally in liquid form but is also available as crystals or lumps. It is used in galvanizing iron, preserving wood, vulcanizing fiber, as a flux in tinning and soldering and as a fungicide.

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
422.72	Zinc chloride----------	0.65¢ per lb.	0.3¢ per lb. 1/

1/ This rate, as well as those for 1970 and 1971, is contingent; see footnote 1 to Staged Rates and Historical Notes to Pt. 2 of schedule 4 of the TSUSA-1968, as shown in appendix A to this volume.

The rate effective January 1, 1972, represents the final stage of a concession granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reduction became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rate shown above as existing prior to January 1, 1968, remained unchanged under the TSUS from August 31, 1963 (the effective date of the TSUS), through the end of 1967. The ad valorem

equivalent of the specific rate of duty prior to January 1, 1968, based on imports in 1967, was 7.7 percent.

Domestic output of zinc chloride rose from 49.4 million pounds in 1962 to 56 million pounds in 1966 (see accompanying table). U.S. apparent consumption similarly increased from 51.4 million pounds in 1962 to 59.2 million pounds in 1966.

Zinc chloride is produced by 12 companies operating 14 plants. The two largest chemical companies operate two producing plants each. There are three plants located in Pennsylvania, and one each in Louisiana, California, Illinois, Indiana, Massachusetts, Maryland, Missouri, New Jersey, New York, Ohio, and Wisconsin.

U.S. imports of zinc chloride have increased irregularly from 2.0 million pounds in 1962 to 3.2 million pounds in 1966 but then declined to 2.3 million pounds in 1967. Imports have come principally from West Germany and Belgium; smaller quantities have come from Canada and Japan.

Exports are not separately classified in official statistics but are believed to have been relatively small.

Zinc chloride is produced in most of the foreign countries which have available supplies of zinc ores and well-established chemical industries, such as West Germany, Belgium, Canada, Japan, and the United Kingdom.

Zinc chloride: U.S. production, imports for consumption, and apparent consumption, 1962-67

(Quantity in thousands of pounds; value in thousands of dollars)

Year	Production	Imports	Apparent consumption	Ratio (percent) of imports to consumption
	Quantity			
1962	49,392	2,000	51,392	3.9
1963	50,446	1,873	52,319	3.6
1964	50,654	2,399	53,053	4.5
1965	50,452	2,198	52,650	4.2
1966	55,972	3,189	59,161	5.4
1967	1/	2,335	1/	1/
	Value			
1962	5,070	168	5,238	3.2
1963	5,346	140	5,486	2.6
1964	5,535	188	5,723	3.3
1965	5,827	186	6,013	3.1
1966	6,410	266	6,676	4.0
1967	1/	197	1/	1/

1/ Not available.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Note.--Statistics on exports are not available; exports have probably been very small.

Commodity	TSUS item
Zinc sulfate	422.76

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

In recent years the domestic consumption of zinc sulfate has been supplied almost entirely by U.S. production. Imports during the same period amounted to between 1 and 4 percent of consumption. In 1966, the value of production approached $9 million. Exports are believed to have been insignificant.

Comment

This summary covers zinc sulfate, a colorless crystalline material or white powder produced by treating zinc ore with sulfuric acid. Zinc sulfate is used in the manufacture of rayon, as a trace element in fertilizers, and in the production of lithopone, a pigment co-precipitated from the reaction between zinc sulfate and barium sulfide. It is also used as a reagent in flotation processes, in textile dyeing and printing, and in the manufacture of paints, varnishes, glue, and of other zinc compounds.

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
422.76	Zinc sulfate	0.3¢ per lb.	0.15¢ per lb. 1/

1/ This rate, as well as those for 1970 and 1971, is contingent; see footnote 1 to Staged Rates and Historical Notes to Pt. 2 of schedule 4 of the TSUSA-1968, as shown in appendix A to this volume.

The rate effective January 1, 1972, represents the final stage of a concession granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reduction became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rate shown above as existing prior

to January 1, 1968, remained unchanged under the TSUS from August 31, 1963 (the effective date of the TSUS), through the end of 1967. The ad valorem equivalent of the specific rate of duty in effect prior to January 1, 1968, based on imports in 1967, was 5.6 percent.

U.S. production of zinc sulfate rose from 120 million pounds in 1962 to 160 million pounds in 1966. Apparent consumption also increased from 122 million pounds in 1962 to 164 million pounds in 1966. Sixteen domestic companies produce zinc sulfate, each operating one plant. Five plants are located in California, two each in Georgia and Kansas, and one each in Texas, New Jersey, Idaho, Maryland, New York, Virginia, and Hawaii.

U.S. imports of zinc sulfate have increased each year, except in 1966 when they amounted to 3.2 million pounds, from 1.7 million pounds in 1962 to 6.6 million pounds in 1967. Mexico, Belgium, and West Germany have been the principal supplying countries. Exports of zinc sulfate are not separately reported but are believed to have been small.

Zinc ores are widely distributed throughout the world and most countries with available zinc ores and production facilities for sulfuric acid can readily make zinc sulfate. Belgium, West Germany, the Netherlands, Canada, and Mexico are among the world's major producers and exporters of zinc sulfate.

Zinc sulfate: U.S. production, imports for consumption, and apparent consumption, 1962-67

(Quantity in thousands of pounds; value in thousands of dollars)

Year	Production	Imports	Apparent consumption	Ratio (percent) of imports to consumption
	Quantity			
1962	120,274	1,663	121,937	1.4
1963	132,216	1,769	133,985	1.3
1964	146,284	2,491	148,775	1.7
1965	157,562	5,635	163,197	3.5
1966	160,278	3,233	163,511	2.0
1967	1/	6,583	1/	1/
	Value			
1962	4,982	83	5,065	1.6
1963	5,669	84	5,753	1.5
1964	6,793	123	6,916	1.8
1965	8,511	305	8,816	3.5
1966	8,752	177	8,929	2.0
1967	1/	351	1/	1/

1/ Not available.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Note.--Statistics on exports are not separately classified; exports are probably very small.

	TSUS item
Zinc compounds not elsewhere enumerated	422.78

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

U.S. production of these inorganic zinc compounds is probably between 1 and 3 million pounds annually. Imports were 340,000 pounds, valued at $89,000, in 1967. Export statistics are not available but exports are probably small.

Comment

This summary covers all inorganic zinc compounds other than zinc arsenate, zinc chloride, zinc cyanide, zinc hydrosulfite, and zinc sulfate (items 422.70-422.76) and the zinc pigments (items 473.72-473.80). Organic zinc salts are included in items 427.24 and 427.25.

The inorganic zinc compounds covered by this summary probably include from 30 to 50 chemicals of minor commercial importance. These zinc compounds include zinc borate used as a fire retardant in paper products, textile, and building materials; zinc carbonate used to make other zinc compounds; zinc bromide employed in photography; and zinc nitrate used as a mordant in dyeing.

U.S. tariff treatment

The column 1 rates of duty applicable to imports (see general headnote 3 to the Tariff Schedules of the United States Annotated) are as follows:

TSUS item	Commodity	Rate prior to January 1, 1968	Rate effective January 1, 1972
422.78	Zinc compounds not elsewhere enumerated.	10.5% ad val.	5% ad val.

The rate effective January 1, 1972, represents the final stage of a concession granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reduction became operative January 1, 1968. Rates of duty for each of the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rate shown above as existing prior to January 1, 1968, remained unchanged under the TSUS from August 31, 1963 (the effective date of the TSUS), through the end of 1967.

No data are available on the production of the zinc compounds considered here. U.S. production in recent years is estimated to have ranged between 1 million and 3 million pounds annually and consumption is believed to be only slightly larger than production. Zinc borate is produced by three companies, plants of which are located (2) in Maryland and (1) in Ohio. Zinc carbonate is produced in five plants, two in New Jersey and one each in Illinois, Missouri, and Pennsylvania. Zinc bromide is manufactured at two plants, one in Michigan and one in Pennsylvania. Zinc nitrate is produced in six plants, one each in New York, New Jersey, Georgia Ohio, Missouri, and North Carolina. These inorganic zinc compounds are produced by manufacturers of fine chemicals and zinc pigments. They amount to only a small part of the total production of these companies.

U.S. imports of the inorganic zinc compounds considered here amounted to 1,306,713 pounds, valued at $188,406, in 1964, and 3,153,666 pounds, valued at $471,531, in 1965. The bulk of these imports in 1964 and 1965 were entries of zinc oxide pigments from Canada, which should have been classified for statistical purposes under items 473.76 or 473.78. U.S. imports of these inorganic zinc compounds amounted to 604,489 pounds, valued at $178,152, in 1966 and 340,236 pounds, valued at $89,023, in 1967.

Export data on these inorganic zinc chemicals are not separately classified in official statistics, but exports are believed to be very small.

Commodity	TSUS item
Zirconium compounds:	
Oxide	422.80
Other	422.82

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

The zirconium compounds covered by this summary are not important items of trade; total U.S. production is estimated at about 6,000 short tons in 1966. Imports supplied about 15 percent of estimated U.S. consumption.

Comment

This summary covers zirconium oxide (zirconia) and other zirconium compounds such as zirconium boride, carbide, carbonate, silicate, nitride, and sulfate. These compounds are produced from zircon (TSUS item 601.63), a zirconium silicate mineral. Most of these compounds are white to gray crystals and are highly resistant to temperature change and abrasion. Zirconium oxide, boride, carbide, nitride, and silicate are all used in refractories, cermets and abrasives. Zirconium oxide is used also in vitreous enamels, special porcelains and as a solid electrolyte in solid-state fuel cells. Zirconium silicate is used in special ceramic glazes and fluxes. Zirconium sulfate is used in treating textiles. Zirconium carbonate is used in the production of zirconium oxide.

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
	Zirconium compounds:		
422.80	Oxide	10.5% ad val.	5% ad val.
422.82	Other	10.5% ad val.	5% ad val.

The rates effective January 1, 1972, represent the final stage of concessions granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT).

The first of five annual stages of the reductions became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rates shown above as existing prior to January 1, 1968, remained unchanged under the TSUS from August 31, 1963 (the effective date of the TSUS), through the end of 1967.

It is believed that consumption and production of zirconium compounds covered herein have ranged from 5,000 to 6,000 tons in recent years. Production of zirconium oxide totaled 4,000 tons in 1966 compared to 4,100 tons in 1965 and 3,500 tons in 1964. Production in 1966 was reported by 5 large concerns at 2 plants in New York and at 1 plant each in Alabama, New Jersey, and Ohio; none derived a significant part of its revenue from sales of the compounds covered. Estimated output of other zirconium compounds in 1966 was 2,000 tons.

U.S. exports of the zirconium compounds covered herein are not separately classified but are believed to be nil. Imports of zirconium oxide and other zirconium compounds were first separately classified in 1964 and have ranged from 13 short tons to 250 tons and from 406 tons to 818 tons during the period 1964-67, respectively (see accompanying table). The United Kingdom has been the major source of other zirconium compounds which are believed to be mainly zirconium silicate and sulfate.

Production facilities for zirconium compounds are known to exist in Japan, the United Kingdom, Canada, West Germany, and the U.S.S.R. Statistical data on output are not available.

Zirconium compounds: U.S. imports for consumption, 1964-67

Year	Zirconium oxide		Other zirconium compounds	
	Quantity	Value	Quantity	Value
	Short tons	1,000 dollars	Short tons	1,000 dollars
1964	114	37	619	158
1965	13	17	406	107
1966	250	161	818	218
1967	85	113	694	208

Source: Compiled from official statistics of the U.S. Department of Commerce.

Commodity	TSUS item
Boron carbide	422.90
Chromium carbide	422.92

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

The carbide materials covered by this summary are not large-volume items of trade; they are relatively high-cost materials but are preferred to less costly materials in their applications as abrasives and hard materials. Imports of both boron carbide and chromium carbide have been increasing since 1965 and imports of each totaled over 200,000 pounds in 1967.

Comment

Boron carbide and chromium carbide are both extremely hard crystalline compounds. Boron carbide is used in personnel and aircraft armors, as an abrasive material and for sand-blast nozzles and gauge blocks. Chromium carbide is used mainly as the cutting edge of tools and also as gauge blocks. Ample supplies of boron raw materials are available in the United States as are carbon and low-cost electric power necessary for the manufacture of boron carbide. The chromium raw material required is not available in sufficient quantities and has to be imported.

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
422.90	Boron carbide	6.25% ad val.	3% ad val. 1/
422.92	Chromium carbide	12.5% ad val.	6% ad val.

1/ This rate, as well as those for 1970 and 1971, is contingent; see footnote 1 to Staged Rates and Historical Notes to Pt. 2 of schedule 4 of the TSUSA-1968, as shown in appendix A to this volume.

The rates effective January 1, 1972, represent the final stage of concessions granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT).

The first of five annual stages of the reductions became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rates shown above as existing prior to January 1, 1968, remained unchanged under the TSUS from August 31, 1963 (the effective date of the TSUS), through the end of 1967.

No statistics are available on consumption or production of these two carbides. It is believed that boron carbide was produced at one plant and chromium carbide was produced at two plants, all in the northeastern United States.

Exports of boron carbide and chromium carbide are not separately classified but are believed to be nil. Boron carbide imports have been generally increasing since 1962 and totaled 215,000 pounds, valued at $469,000 in 1967 (see accompanying table). Canada has been the major source of boron carbide for the last two years and accounted for 88 percent of the imports in 1967. Chromium carbide imports increased from 60,000 pounds in 1962 to nearly 130,000 pounds in 1964, decreased to 85,000 pounds in 1965 and then increased during the next 2 years totaling 212,000 pounds in 1967. West Germany has been the predominant source, accounting for 92 percent of the imports in 1967.

Production facilities for boron carbide are known to exist in Canada, West Germany, the United Kingdom, France, and the U.S.S.R., and for chromium carbide, in West Germany, the United Kingdom, and Belgium. Statistical data on output are not available.

Boron carbide and chromium carbide: U.S. imports for consumption, 1962-67

Year	Boron carbide		Chromium carbide	
	Quantity	Value	Quantity	Value
	1,000 pounds	1,000 dollars	1,000 pounds	1,000 dollars
1962	9	34	60	59
1963	13	39	70	69
1964	8	32	129	120
1965	14	48	85	73
1966	183	513	168	212
1967	215	469	202	269

Source: Compiled from official statistics of the U.S. Department of Commerce.

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Commodity	TSUS item
Sulfur dioxide----------	422.94

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

The United States is the largest sulfur dioxide producing and consuming country in the world, with the bulk of the output used as an intermediate in the manufacture of sulfuric acid. Production of sulfur dioxide for sale as such totaled about 100,000 short tons in 1966. Exports are negligible and imports in 1967 amounted to 10,000 short tons.

Comment

Sulfur dioxide, an irritating colorless gas is produced from elemental sulfur (TSUS item 415.45), recovered as a by-product of smelting sulfide ores or from the production of beta-naphthol. Commercial sales are in the compressed liquid form.

The principal use of sulfur dioxide is as an intermediate in the manufacture of sulfuric acid (TSUS item 416.35). Other main uses are in bleaching, preserving foods and beverages, wood pulp processing, refrigerants, disinfectants, and fumigants.

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
422.94	Sulfur dioxide----------	12.5% ad val.	6% ad val.

The rate effective January 1, 1972, represents the final stage of a concession granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reduction became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is produced as appendix A to this volume. The rate shown above as existing prior to January 1, 1968, remained unchanged under the TSUS from August 31, 1963 (the effective date of the TSUS), through the end of 1967.

The total consumption and production of sulfur dioxide is estimated at 18 million short tons in 1966. The bulk of the output is consumed directly by the producer in manufacturing sulfuric acid. The quantity of sulfur dioxide produced for sale has been generally increasing each year since 1961 and is estimated to have been about 100,000 tons in 1966.

In 1967, sulfur dioxide for sale was produced by 10 large chemical corporations with plants located in New York, New Jersey, Ohio, Illinois, Wisconsin, Virginia, Tennessee, and California. In addition, sulfur dioxide was produced and consumed by about 200 plants manufacturing sulfuric acid.

No data are available on exports of sulfur dioxide, but exports are believed to be nil. Imports, not separately classified until 1964, all of Canadian origin, were as follows (compiled from official statistics of the United States Department of Commerce):

Year	Short tons	Value
1964	2,135	$50,000
1965	4,148	104,000
1966	4,372	122,000
1967	10,545	248,000

The increased imports in 1967 were partly because of increasing availability of by-product sulfur dioxide from Canada and partly because of the short supply of sulfur in the United States.

Sulfur dioxide is produced in nearly every country in the world and consumed in the manufacture of sulfuric acid with the exception of a few small countries that lack manufacturing facilities. Small quantities are sold as such for other uses, principally for wood pulp and paper processing and food preservation.

Sulfur dioxide is of little importance in international trade as most countries produce their own, importing the raw material if necessary.

Commodity	TSUS item
Inorganic compounds not elsewhere enumerated-----	423.00

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

U.S. production is known to amount to many million dollars annually and is estimated to be increasing. Exports are believed to be several times larger than imports. Imports in 1967 amounted to about 19.8 million pounds, valued at $7.8 million.

Description and uses

This summary deals with several hundred inorganic compounds which are not specifically named in the TSUS or included in other more specific classifications. Many of these compounds, however, are of little or no industrial importance. Some of the more important items include carbon dioxide, hydrogen peroxide, and inorganic compounds of boron, cadmium, chromium, nitrogen (oxides), palladium, the precious metals, the rare earths, silicon, tantalum, and yttrium. The following tabulation lists the principal uses for these items:

Item	Principal uses
Carbon dioxide----------	Refrigeration (dry ice) Chemical intermediate Fire extinguishers
Hydrogen peroxide----------	Bleaching agent Chemical intermediate Oxydizing agent
Boron compounds----------	Catalysts in organic syntheses
Cadmium compounds----------	Engraving Electroplating Photography
Chromium compounds---------- (exclusive of chromium pigments, items 473.10-.20)	Chemical intermediate Chromium plating Textile mordant

Item --Continued	Principal uses --Continued
Nitrogen oxides----------	Anesthetic Manufacture of nitric acid Nitrating agent Oxydizing agent
Palladium compounds----------	Catalyst in organic synthesis Analytical reagent Indelible inks Electroplating
Precious metal compounds------ (Iridium, osmium, ruthenium)	Catalyst in organic synthesis Photography
Rare earth compounds----------	Phosphors for color TV Household fluorescent lamps Industrial mercury vapor lamps
Silicon compounds----------	Chemical intermediate Chemical analysis Smoke screens in warfare
Tantalum compounds----------	Chemical intermediate Optical glass
Yttrium compounds----------	Phosphors for color TV Analytical chemistry Chemical intermediate

U.S. tariff treatment

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
423.00	Inorganic compounds not elsewhere enumerated.	10.5% ad val.	5% ad val.

The rate effective January 1, 1972, represents the final stage of a concession granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reduction became operative January 1, 1968. Rates of duty for the individual stages are given

in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rate shown above as existing prior to January 1, 1968, remained unchanged under the TSUS from August 31, 1963 (the effective date of the TSUS), through the end of 1967. For products of the U.S.S.R., the current rate of duty is (as indicated in Pt. e of general headnote 3 mentioned above) the column 2 rate, i.e., 25 percent ad valorem.

U.S. consumption, producers, and production

There is no reasonable basis for estimating domestic consumption; however, the total is substantial and believed to be increasing.

The numerous items included in this summary are produced by many chemical concerns distributed throughout the United States.

Virtually no data on U,S. production of the compounds covered herein are published in official statistics. A few chemicals are produced in sufficient quantity to warrant publication of production data. The following tabulation compiled from official statistics of the U.S. Department of Commerce shows production of carbon dioxide and hydrogen peroxide during 1962-66:

Year	Carbon dioxide 1,000 pounds	Hydrogen peroxide 1,000 pounds
1962----------	1,847,514	68,944
1963----------	1,953,374	78,170
1964----------	2,013,540	91,038
1965----------	2,178,874	105,132
1966----------	2,178,098	109,216

Carbon dioxide is produced by 20 companies operating 77 plants located in 26 States. Hydrogen peroxide is produced by six companies operating eight plants located as follows: one each in Louisiana, Michigan, Ohio, Tennessee, Washington, and West Virginia, and two in New York.

U.S. exports and imports

Data on U.S. exports are not published in official statistics; however, exports are substantial and believed to be increasing.

U.S. imports have been reported separately only since September 1963. The accompanying table shows imports for 1964-67, as given in official statistics. A review of the entry documents, however, revealed that a significant amount of the reported imports for 1964-67 should have been reported for statistical purposes under other TSUS numbers. Some of the important import items correctly classified for statistical purposes in 1967 include carbon dioxide from Canada, the United Kingdom, and Japan; columbium pentoxide from Switzerland; europium oxide from

France and West Germany; germanium dioxide from West Germany; hydrazine hydrate from Japan and West Germany; hydrogen peroxide from Austria, Japan and the Netherlands; nitrous oxide from the United Kingdom; tantalum carbide from West Germany; tantalum pentoxide from Switzerland; and yttrium oxide from France, Japan, the Netherlands, the United Kingdom and West Germany.

Foreign production and trade

The industrialized nations of the world produce and export many of the compounds included in this summary. There is no reasonable basis for estimating the quantity that moves in international trade due mainly to the different systems of statistical classification that are used by the leading exporting nations, plus the fact that exports and imports in certain instances are not shown in commodity details; however, it is believed that the quantity is substantial and is increasing.

Inorganic compounds not elsewhere enumerated: U.S. imports for consumption, by principal sources, 1964-67

Source	1964	1965	1966	1967
	Quantity (1,000 pounds)			
West Germany	470	1,327	898	2,364
Japan	192	786	2,239	5,382
United Kingdom	135	328	462	325
France	875	1,298	2,735	1,540
Austria	3,006	1,636	1,901	1,786
Canada	740	9,744	9,968	7,330
Switzerland	9	16	26	58
U.S.S.R.	1/	2	398	444
Republic of South Africa	36	2	-	4
Finland	1/	1/	1/	-
All other	843	905	681	610
Total	6,306	16,044	19,308	19,843
	Value (1,000 dollars)			
West Germany	774	1,923	2,776	3,964
Japan	75	167	677	1,271
United Kingdom	103	232	653	567
France	105	252	654	471
Austria	316	198	234	402
Canada	68	547	362	264
Switzerland	63	122	237	266
U.S.S.R.	38	256	297	174
Republic of South Africa	3	125	-	131
Finland	31	192	168	-
All other	738	380	639	328
Total	2,314	4,394	6,697	7,838

1/ Less than 500 pounds.

Source: Compiled from official statistics of the U.S. Department of Commerce.

MIXTURES OF TWO OR MORE INORGANIC COMPOUNDS, NOT ELSEWHERE ENUMERATED

Commodity	TSUS item
Mixtures of two or more inorganic compounds not elsewhere enumerated	423.96

Note.--For the statutory description, see the Tariff Schedules of the United States Annotated (TSUSA-1968) (pertinent sections thereof are reproduced in appendix A to this volume).

U.S. trade position

Imports of mixtures of two or more inorganic compounds, defined for tariff purposes by the exclusion of articles more specifically identified in the schedules, had a foreign value of $4.6 million in 1967. If domestic production of similar articles, falling within a group thus arbitrarily defined, could be measured it would probably be overwhelmingly greater than the imports; yet the imports, being largely of a specialized nature, supply the particular needs of certain consumers.

Comment

The mixtures, which are the subject of this summary, consist of any two or more inorganic compounds, except such mixtures in chief value of bismuth, certain duty-free cyanide compounds, hydrosulfite compounds, sulfoxylate compounds, mercury, molybdenum, nickel oxide, tungsten, or vanadium (items 423.80-.94). Drugs and fertilizers, when they are mixtures of inorganic compounds by reason of their use, are specially provided for in the TSUS. Mixtures not specially provided for (item 432.00) consist of one or more organic compounds mixed with one or more inorganic compounds and are not within the scope of this summary.

It is more difficult to say what the mixtures are than what they are not. The number of such inorganic mixtures is estimated to be in the hundreds. From current information it appears that the products covered are prepared and marketed under various proprietary and trade names and are designed for specific uses, particularly industrial uses.

MIXTURES OF TWO OR MORE INORGANIC COMPOUNDS, NOT ELSEWHERE ENUMERATED

The column 1 rates of duty applicable to imports (see general headnote 3 in the TSUSA-1968) are as follows:

TSUS item	Commodity	Rate prior to Jan. 1, 1968	Rate effective Jan. 1, 1972
423.96	Mixtures of two or more inorganic compounds, not elsewhere enumerated.	10.5% ad val.	5% ad val.

The rate effective January 1, 1972, represents the final stage of a concession granted by the United States in the sixth round of trade negotiations under the General Agreement on Tariffs and Trade (GATT). The first of five annual stages of the reduction became operative January 1, 1968. Rates of duty for the individual stages are given in the TSUSA-1968, an excerpt from which is reproduced as appendix A to this volume. The rate shown above as existing prior to January 1, 1968, remained unchanged under the TSUS from August 31, 1963 (the effective date of the TSUS), through the end of 1967.

Since the articles under discussion represent more a tariff concept than an industrial grouping, no data are available on the number of domestic producers. It is estimated that a large number of concerns (small, medium, and large) produce one or more of the inorganic mixtures covered. There is no basis for estimating domestic production, which may reach high figures annually on both a quantity and value basis.

Export data comparable to import data are not published in official statistics. There is no basis for estimating domestic exports, even though they may be quite substantial. Imports (shown in the accompanying table) have been reported separately only since August 31, 1963. In 1967, they amounted to 24.8 million pounds, valued at $4.6 million. West Germany, Canada, the United Kingdom, and India were the leading suppliers in 1967; Sweden, Brazil, and Japan were secondary sources. For the most part, imports of these inorganic mixtures probably supplement rather than compete with domestic products. Large increases in imports for 1967 occurred in the imports from West Germany and India. The increased imports from West Germany consisted largely of tungsten titanium carbide; those from India consisted largely of rare earth chloride.

MIXTURES OF TWO OR MORE INORGANIC COMPOUNDS, NOT ELSEWHERE ENUMERATED

Foreign production of such inorganic chemical mixtures exists chiefly in countries with well-developed chemical industries. Both local consumption and exports are substantial for the countries that are sources of U.S. imports.

MIXTURES OF TWO OR MORE INORGANIC COMPOUNDS, NOT ELSEWHERE ENUMERATED

Mixtures of two or more inorganic compounds, not elsewhere enumerated: U.S. imports for consumption, by principal sources, 1964-67

Source	1964	1965	1966	1967
	Quantity (1,000 pounds)			
West Germany	540	467	705	1,244
Canada	3	6,056	15,648	14,967
United Kingdom	1,296	1,671	2,200	2,470
India	-	992	2,535	3,779
Sweden	97	192	335	1,134
Brazil	100	5,623	4,111	1,077
Japan	243	337	49	32
Netherlands	1	14	61	7
Switzerland	1	2	3	29
U.S.S.R.	-	1	-	-
All other	144	33	326	96
Total	2,425	15,388	25,973	24,835
	Value (1,000 dollars)			
West Germany	512	681	778	2,257
Canada	6	319	756	776
United Kingdom	269	367	554	599
India	-	121	304	444
Sweden	25	49	72	225
Brazil	16	694	545	190
Japan	65	88	69	51
Netherlands	1	63	40	23
Switzerland	5	27	19	15
U.S.S.R.	-	39	-	-
All other	53	20	41	34
Total	952	2,468	3,178	4,614

Source: Compiled from official statistics of the U.S. Department of Commerce.

A P P E N D I X A

Tariff Schedules of the United States Annotated (1968)
General headnotes and rules of interpretation, and excerpts relating to the items included in this volume.

Note: The shaded areas in this appendix cover headnotes and TSUS items not included in the summaries in this volume.

GENERAL HEADNOTES AND RULES OF INTERPRETATION

1. Tariff Treatment of Imported Articles. All articles imported into the customs territory of the United States from outside thereof are subject to duty or exempt therefrom as prescribed in general headnote 3.

2. Customs Territory of the United States. The term "customs territory of the United States", as used in the schedules, includes only the States, the District of Columbia, and Puerto Rico.

3. Rates of Duty. The rates of duty in the "Rates of Duty" columns numbered 1 and 2 of the schedules apply to articles imported into the customs territory of the United States as hereinafter provided in this headnote:

(a) Products of Insular Possessions.

(i) Except as provided in headnote 6 of schedule 7, part 2, subpart E, [and] except as provided in headnote 4 of schedule 7, part 7, subpart A, articles imported from insular possessions of the United States which are outside the customs territory of the United States are subject to the rates of duty set forth in column numbered 1 of the schedules, except that all such articles the growth or product of any such possession, or manufactured or produced in any such possession from materials the growth, product, or manufacture of any such possession or of the customs territory of the United States, or of both, which do not contain foreign materials to the value of more than 50 percent of their total value, coming to the customs territory of the United States directly from any such possession, and all articles previously imported into the customs territory of the United States with payment of all applicable duties and taxes imposed upon or by reason of importation which were shipped from the United States, without remission, refund, or drawback of such duties or taxes, directly to the possession from which they are being returned by direct shipment, are exempt from duty.

(ii) In determining whether an article produced or manufactured in any such insular possession contains foreign materials to the value of more than 50 percent, no material shall be considered foreign which, at the time such article is entered, may be imported into the customs territory from a foreign country, other than Cuba or the Philippine Republic, and entered free of duty.

(b) Products of Cuba. Products of Cuba imported into the customs territory of the United States, whether imported directly or indirectly, are subject to the rates of duty set forth in column numbered 1 of the schedules. Preferential rates of duty for such products apply only as shown in the said column 1. 1/

(c) Products of the Philippine Republic.

(i) Products of the Philippine Republic imported into the customs territory of the United States, whether imported directly or indirectly, are subject to the rates of duty which are set forth in column numbered 1 of the schedules or to fractional parts of the rates in the said column 1, as hereinafter prescribed in subdivisions (c)(ii) and (c)(iii) of this headnote.

(ii) Except as otherwise prescribed in the schedules, a Philippine article, as defined in subdivision (c)(iv) of this headnote, imported into the customs territory of the United States and entered on or before July 3, 1974, is subject to that rate which results from the application of the following percentages to the most favorable rate of duty (i.e., including a preferential rate prescribed for any product of Cuba) set forth in column numbered 1 of the schedules:

(A) 20 percent, during calendar years 1963 through 1964,

(B) 40 percent, during calendar years 1965 through 1967,

(C) 60 percent, during calendar years 1968 through 1970,

(D) 80 percent, during calendar years 1971 through 1973,

(E) 100 percent, during the period from January 1, 1974, through July 3, 1974.

(iii) Except as otherwise prescribed in the schedules, products of the Philippine Republic, other than Philippine articles, are subject to the rates of duty (except any preferential rates prescribed for products of Cuba) set forth in column numbered 1 of the schedules.

(iv) The term "Philippine article", as used in the schedules, means an article which is the product of the Philippines, but does not include any article produced with the use of materials imported into the Philippines which are products of any foreign country (except materials produced within the customs territory of the United States) if the aggregate value of such imported materials when landed at the Philippine port of entry, exclusive of any landing cost and Philippine duty, was more than 20 percent of the appraised customs value of the article imported into the customs territory of the United States.

(d) Products of Canada.

(i) Products of Canada imported into the customs territory of the United States, whether imported directly or indirectly, are subject to the rates of duty set forth in column numbered 1 of the schedules. The rates of duty for a Canadian article, as defined in subdivision (d)(ii) of this headnote, apply only as shown in the said column numbered 1.

(ii) The term "Canadian article", as used in the schedules, means an article which is the product of Canada, but does not include any article produced with the use of materials imported into Canada which are products of any foreign country (except materials produced within the customs territory of the United States), if the aggregate value of such imported materials when landed at the Canadian port of entry (that is, the actual purchase price, or if not purchased, the export value, of such materials, plus, if not included therein, the cost of transporting such materials to Canada but exclusive of any landing cost and Canadian duty) was --

(A) with regard to any motor vehicle or automobile truck tractor entered on or before December 31, 1967, more than 60 percent of the appraised value of the article imported into the customs territory of the United States; and

(B) with regard to any other article (including any motor vehicle or automobile truck tractor entered after December 31, 1967), more than 50 percent of the appraised value of the article imported into the customs territory of the United States.

1/ By virtue of section 401 of the Tariff Classification Act of 1962, the application to products of Cuba of either a preferential or other reduced rate of duty in column 1 is suspended. See general headnote 3(e), infra. The provisions for preferential Cuban rates continue to be reflected in the schedules because, under section 401, the rates therefor in column 1 still form the bases for determining the rates of duty applicable to certain products, including "Philippine articles".

APPENDIX A
TARIFF SCHEDULES OF THE UNITED STATES ANNOTATED (1968)

General Headnotes and Rules of Interpretation

(e) Products of Communist Countries. Notwithstanding any of the foregoing provisions of this headnote, the rates of duty shown in column numbered 2 shall apply to products, whether imported directly or indirectly, of the following countries and areas pursuant to section 401 of the Tariff Classification Act of 1962, to section 231 or 257(e)(2) of the Trade Expansion Act of 1962, or to action taken by the President thereunder:

Albania
Bulgaria
China (any part of which may be under Communist domination or control)
Cuba 1/
Czechoslovakia
Estonia
Germany (the Soviet zone and the Soviet sector of Berlin)
Hungary
Indochina (any part of Cambodia, Laos, or Vietnam which may be under Communist domination or control)
Korea (any part of which may be under Communist domination or control)
Kurile Islands
Latvia
Lithuania
Outer Mongolia
Rumania
Southern Sakhalin
Tanna Tuva
Tibet
Union of Soviet Socialist Republics and the area in East Prussia under the provisional administration of the Union of Soviet Socialist Republics.

(f) Products of All Other Countries. Products of all countries not previously mentioned in this headnote imported into the customs territory of the United States are subject to the rates of duty set forth in column numbered 1 of the schedules.

(g) Effective Date; Exceptions - Staged Rates of Duty. Except as specified below or as may be specified elsewhere, pursuant to section 501(a) of the Tariff Classification Act of 1962 (P.L. 87-456, approved May 24, 1962), the rates of duty in columns numbered 1 and 2 become effective with respect to articles entered on or after the 10th day following the date of the President's proclamation provided for in section 102 of the said Act. If, in column numbered 1, any rate of duty or part thereof is set forth in parenthesis, the effective date shall be governed as follows:

(i) If the rate in column numbered 1 has only one part (i.e., 8¢ (10¢) per lb.), the parenthetical rate (viz., 10¢ per lb.) shall be effective as to articles entered before July 1, 1964, and the other rate (viz., 8¢ per lb.) shall be effective as to articles entered on or after July 1, 1964.

(ii) If the rate in column numbered 1 has two or more parts (i.e., 5¢ per lb. + 50% ad val.) and has a parenthetical rate for either or both parts, each part of the rate shall be governed as if it were a one-part rate. For example, if a rate is expressed as "4¢ (4.5¢) per lb. + 8% (9%) ad val.", the rate applicable to articles entered before July 1, 1964, would be "4.5¢ per lb. + 9% ad val."; the rate applicable to articles entered on or after July 1, 1964, would be "4¢ per lb. + 8% ad val.".

(iii) If the rate in column numbered 1 is marked with an asterisk (*), the foregoing provisions of (i) and (ii) shall apply except that "January 1, 1964" shall be substituted for "July 1, 1964", wherever this latter date appears.

1/ In Proclamation 3447, dated February 3, 1962, the President, acting under authority of section 620(a) of the Foreign Assistance Act of 1961 (75 Stat. 445), as amended, prohibited the importation into the United States of all goods of Cuban origin and all goods imported from or through Cuba, subject to such exceptions as the Secretary of the Treasury determines to be consistent with the effective operation of the embargo.

4. Modification or Amendment of Rates of Duty. Except as otherwise provided in the Appendix to the Tariff Schedules --

(a) a statutory rate of duty supersedes and terminates the existing rates of duty in both column numbered 1 and column numbered 2 unless otherwise specified in the amending statute;

(b) a rate of duty proclaimed pursuant to a concession granted in a trade agreement shall be reflected in column numbered 1 and, if higher than the then existing rate in column numbered 2, also in the latter column, and shall supersede but not terminate the then existing rate (or rates) in such column (or columns);

(c) a rate of duty proclaimed pursuant to section 336 of the Tariff Act of 1930 shall be reflected in both column numbered 1 and column numbered 2 and shall supersede but not terminate the then existing rates in such columns; and

(d) whenever a proclaimed rate is terminated or suspended, the rate shall revert, unless otherwise provided, to the next intervening proclaimed rate previously superseded but not terminated or, if none, to the statutory rate.

5. Intangibles. For the purposes of headnote 1 --

(a) corpses, together with their coffins and accompanying flowers,
(b) currency (metal or paper) in current circulation in any country and imported for monetary purposes,
(c) electricity,
(d) securities and similar evidences of value, and
(e) vessels which are not "yachts or pleasure boats" within the purview of subpart D, part 6, of schedule 6,

are not articles subject to the provisions of these schedules.

6. Containers or Holders for Imported Merchandise. For the purposes of the tariff schedules, containers or holders are subject to tariff treatment as follows:

(a) Imported Empty: Containers or holders if imported empty are subject to tariff treatment as imported articles and as such are subject to duty unless they are within the purview of a provision which specifically exempts them from duty.

(b) Not Imported Empty: Containers or holders if imported containing or holding articles are subject to tariff treatment as follows:

(i) The usual or ordinary types of shipping or transportation containers or holders, if not designed for, or capable of, reuse, and containers of usual types ordinarily sold at retail with their contents, are not subject to treatment as imported articles. Their cost, however, is, under section 402 or section 402a of the tariff act, a part of the value of their contents and if their contents are subject to an ad valorem rate of duty such containers or holders are, in effect, dutiable at the same rate as their contents, except that their cost is deductible from dutiable value upon submission of satisfactory proof that they are products of the United States which are being returned without having been advanced in value or improved in condition by any means while abroad.

(ii) The usual or ordinary types of shipping or transportation containers or holders, if designed for, or capable of, reuse, are subject to treatment as imported articles separate and distinct from their contents. Such holders or containers are not part of the dutiable value of their contents and are separately subject to duty upon each and every importation into the customs territory of the United States unless within the scope of a provision specifically exempting them from duty.

(iii) In the absence of context which requires otherwise, all other containers or holders are subject to the same treatment as specified in (ii) above for usual or ordinary types of shipping or transportation containers or holders designed for, or capable of, reuse.

7. Commingling of Articles. (a) Whenever articles subject to different rates of duty are so packed together or mingled that the quantity or value of each class of articles cannot be readily ascertained by customs officers (without physical segregation of the shipment or the contents of any entire package thereof), by one or more of the following means:

(I) sampling,

(II) verification of packing lists or other documents filed at the time of entry, or

(III) evidence showing performance of commercial settlement tests generally accepted in the trade and filed in such time and manner as may be prescribed by regulations of the Secretary of the Treasury,

the commingled articles shall be subject to the highest rate of duty applicable to any part thereof unless the consignee or his agent segregates the articles pursuant to subdivision (b) hereof.

(b) Every segregation of articles made pursuant to this headnote shall be accomplished by the consignee or his agent at the risk and expense of the consignee within 30 days (unless the Secretary authorizes in writing a longer time) after the date of personal delivery or mailing, by such employee as the Secretary of the Treasury shall designate, of written notice to the consignee that the articles are commingled and that the quantity or value of each class of articles cannot be readily ascertained by customs officers. Every such segregation shall be accomplished under customs supervision, and the compensation and expenses of the supervising customs officers shall be reimbursed to the Government by the consignee under such regulations as the Secretary of the Treasury may prescribe.

(c) The foregoing provisions of this headnote do not apply with respect to any part of a shipment if the consignee or his agent furnishes, in such time and manner as may be prescribed by regulations of the Secretary of the Treasury, satisfactory proof --

(I) that such part (A) is commercially negligible, (B) is not capable of segregation without excessive cost, and (C) will not be segregated prior to its use in a manufacturing process or otherwise, and

(II) that the commingling was not intended to avoid the payment of lawful duties.

Any article with respect to which such proof is furnished shall be considered for all customs purposes as a part of the article, subject to the next lower rate of duty, with which it is commingled.

(d) The foregoing provisions of this headnote do not apply with respect to any shipment if the consignee or his agent shall furnish, in such time and manner as may be prescribed by regulations of the Secretary of the Treasury, satisfactory proof --

(i) that the value of the commingled articles is less than the aggregate value would be if the shipment were segregated;

(ii) that the shipment is not capable of segregation without excessive cost and will not be segregated prior to its use in a manufacturing process or otherwise; and

(iii) that the commingling was not intended to avoid the payment of lawful duties.

Any merchandise with respect to which such proof is furnished shall be considered for all customs purposes to be dutiable at the rate applicable to the material present in greater quantity than any other material.

(e) The provisions of this headnote shall apply only in cases where the schedules do not expressly provide a particular tariff treatment for commingled articles.

8. Abbreviations. In the schedules the following symbols and abbreviations are used with the meanings respectively indicated below:

$	-	dollars
¢	-	cents
%	-	percent
+	-	plus
ad val.	-	ad valorem
bu.	-	bushel
cu.	-	cubic
doz.	-	dozen
ft.	-	feet
gal.	-	gallon
in.	-	inches
lb.	-	pounds
oz.	-	ounces
sq.	-	square
wt.	-	weight
yd.	-	yard
pcs.	-	pieces
prs.	-	pairs
lin.	-	linear
I.R.C.	-	Internal Revenue Code

9. Definitions. For the purposes of the schedules, unless the context otherwise requires --

(a) the term "entered" means entered, or withdrawn from warehouse, for consumption in the customs territory of the United States;

(b) the term "entered for consumption" does not include withdrawals from warehouse for consumption;

(c) the term "withdrawn for consumption" means withdrawn from warehouse for consumption and does not include articles entered for consumption;

(d) the term "rate of duty" includes a free rate of duty; rates of duty proclaimed by the President shall be referred to as "proclaimed" rates of duty; rates of duty enacted by the Congress shall be referred to as "statutory" rates of duty; and the rates of duty in column numbered 2 at the time the schedules become effective shall be referred to as "original statutory" rates of duty;

(e) the term "ton" means 2,240 pounds, and the term "short ton" means 2,000 pounds;

(f) the terms "of", "wholly of", "almost wholly of", "in part of" and "containing", when used between the description of an article and a material (e.g., "furniture of wood", "woven fabrics, wholly of cotton", etc.), have the following meanings:

(I) "of" means that the article is wholly or in chief value of the named material;

(II) "wholly of" means that the article is, except for negligible or insignificant quantities of some other material or materials, composed completely of the named material;

(III) "almost wholly of" means that the essential character of the article is imparted by the named material, notwithstanding the fact that significant quantities of some other material or materials may be present; and

(IV) "in part of" or "containing" mean that the article contains a significant quantity of the named material.

With regard to the application of the quantitative concepts specified in subparagraphs (II) and (IV) above, it is intended that the de minimis rule apply.

10. General Interpretative Rules. For the purposes of these schedules --

(a) the general, schedule, part, and subpart headnotes, and the provisions describing the classes of imported articles and specifying the rates of duty or other import restrictions to be imposed thereon are subject to the rules of interpretation set forth herein and to such other rules of statutory interpretation, not inconsistent therewith, as have been or may be developed under administrative or judicial rulings;

(b) the titles of the various schedules, parts, and subparts and the footnotes therein are intended for convenience in reference only and have no legal or interpretative significance;

(c) an imported article which is described in two or more provisions of the schedules is classifiable in the provision which most specifically describes it; but, in applying this rule of interpretation, the following considerations shall govern:

(i) a superior heading cannot be enlarged by inferior headings indented under it but can be limited thereby;

(ii) comparisons are to be made only between provisions of coordinate or equal status, i.e., between the primary or main superior headings of the schedules or between coordinate inferior headings which are subordinate to the same superior heading;

(d) if two or more tariff descriptions are equally applicable to an article, such article shall be subject to duty under the description for which the original statutory rate is highest, and, should the highest original statutory rate be applicable to two or more of such descriptions, the article shall be subject to duty under that one of such descriptions which first appears in the schedules;

(e) in the absence of special language or context which otherwise requires --

(i) a tariff classification controlled by use (other than actual use) is to be determined in accordance with the use in the United States at, or immediately prior to, the date of importation, of articles of that class or kind to which the imported articles belong, and the controlling use is the chief use, i.e., the use which exceeds all other uses (if any) combined;

(ii) a tariff classification controlled by the actual use to which an imported article is put in the United States is satisfied only if such use is intended at the time of importation, the article is so used, and proof thereof is furnished within 3 years after the date the article is entered;

(f) an article is in chief value of a material if such material exceeds in value each other single component material of the article;

(g) a headnote provision which enumerates articles not included in a schedule, part, or subpart is not necessarily exhaustive, and the absence of a particular article from such headnote provision shall not be given weight in determining the relative specificity of competing provisions which describe such article;

(h) unless the context requires otherwise, a tariff description for an article covers such article, whether assembled or not assembled, and whether finished or not finished;

(ij) a provision for "parts" of an article covers a product solely or chiefly used as a part of such article, but does not prevail over a specific provision for such part.

11. Issuance of Rules and Regulations. The Secretary of the Treasury is hereby authorized to issue rules and regulations governing the admission of articles under the provisions of the schedules. The allowance of an importer's claim for classification, under any of the provisions of the schedules which provide for total or partial relief from duty or other import restrictions on the basis of facts which are not determinable from an examination of the article itself in its condition as imported, is dependent upon his complying with any rules or regulations which may be issued pursuant to this headnote.

12. The Secretary of the Treasury is authorized to prescribe methods of analyzing, testing, sampling, weighing, gauging, measuring, or other methods of ascertainment whenever he finds that such methods are necessary to determine the physical, chemical, or other properties or characteristics of articles for purposes of any law administered by the Customs Service.

General statistical headnotes:

1. Statistical Requirements for Imported Articles. Persons making customs entry or withdrawal of articles imported into the customs territory of the United States shall complete the entry or withdrawal forms, as provided herein and in regulations issued pursuant to law, to provide for statistical purposes information as follows:

(a) the number of the Customs district and of the port where the articles are being entered for consumption or warehouse, as shown in Statistical Annex A of these schedules;

(b) the name of the carrier or the means of transportation by which the articles were transported to the first port of unloading in the United States;

(c) the foreign port of lading;

(d) the United States port of unlading;

(e) the date of importation;

(f) the country of origin of the articles expressed in terms of the designation therefor in Statistical Annex B of these schedules;

(g) a description of the articles in sufficient detail to permit the classification thereof under the proper statistical reporting number in these schedules;

(h) the statistical reporting number under which the articles are classifiable;

(ij) gross weight in pounds for the articles covered by each reporting number when imported in vessels or aircraft;

(k) the net quantity in the units specified herein for the classification involved;

(l) the U.S. dollar value in accordance with the definition in Section 402 or 402a of the Tariff Act of 1930, as amended, for all merchandise including that free of duty or dutiable at specific rates; and

(m) such other information with respect to the imported articles as is provided for elsewhere in these schedules.

3. Statistical Annotations. (a) The statistical annotations to the Tariff Schedules of the United States consist of --

(i) the 2-digit statistical suffixes,
(ii) the indicated units of quantity,
(iii) the statistical headnotes and annexes, and
(iv) the italicized article descriptions.

(b) The legal text of the Tariff Schedules of the United States consists of the remaining text as more specifically identified in headnote 10(a) of the general headnotes and rules of interpretation.

(c) The statistical annotations are subordinate to the provisions of the legal text and cannot change their scope.

3. Statistical Reporting Number. (a) General Rule: Except as provided in paragraph (b) of this headnote, and in the absence of specific instructions to the contrary elsewhere, the statistical reporting number for an article consists of the 7-digit number formed by combining the 5-digit item number with the appropriate 2-digit statistical suffix. Thus, the statistical reporting number for live monkeys dutiable under item 100.95 is "100.9520".

(b) Wherever in the tariff schedules an article is classifiable under a provision which derives its rate of duty from a different provision, the statistical reporting number is, in the absence of specific instructions to the contrary elsewhere, the 7-digit number for the basic provision followed by the item number of the provision from which the rate is derived. Thus, the statistical reporting number of mixed apple and grape juices, not containing over 1.0 percent of ethyl alcohol by volume, is "165.6500-165.40".

4. Abbreviations. (a) The following symbols and abbreviations are used with the meanings respectively indicated below:

s. ton	-	short ton
C.	-	one hundred
Cwt.	-	100 lbs.
mg.	-	milligram
M.	-	1,000
bd. ft.	-	board feet
M. bd. ft.	-	1,000 board feet
mc.	-	millicurie
cord	-	128 cubic feet
square	-	amount to cover 100 square feet of surface
sup. ft.	-	superficial foot
oz.	-	ounces avoirdupois
fl. oz.	-	fluid ounces
oz. troy	-	troy ounce
pf. gal.	-	proof gallon

(b) An "X" appearing in the column for units of quantity means that no quantity (other than gross weight) is to be reported.

(c) Whenever two separate units of quantity are shown for the same article, the "v" following one of such units means that the value of the article is to be reported with that quantity.

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HISTORICAL NOTES

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Amendments and Modifications

PROVISIONS	
Gen Hdnte--3(a)(i)	Language "Except as provided in headnote 6 of schedule 7, part 2, subpart E," added; language "except that all articles" deleted and language "except that all such articles" inserted in lieu thereof. Pub. L. 89-805, Secs. 1(a), (c), Nov. 10, 1966, 80 Stat. 1521, 1522, effective date Jan. 1, 1967.
	Language "Except as provided in headnote 4 of schedule 7, part 7, subpart A," added. Pub. L. 89-806, Secs. 2(b), (c), Nov. 10, 1966, 80 Stat. 1523, effective date March 11, 1967.
Gen Hdnte--3(d), (e), (f) and (g)	Headnotes 3(d), (e), and (f) redesignated as headnotes 3(e), (f), and (g), respectively, and new headnote 3(d) added. Pub. L. 89-285, Secs. 401(a), 403, Oct. 21, 1965, 79 Stat. 1021, 1022; entered into force Oct. 22, 1965, by Pres. Proc. 3682, Oct. 21, 1965, 3 CFR, 1965 Supp., p. 68.
Gen Hdnte--6(b)(i)	Language "and containers of usual types ordinarily sold at retail with their contents," added. Pub. L. 89-241, Secs. 2(a), 4, Oct. 7, 1965, 79 Stat. 933, 934, effective date Dec. 7, 1965.

SCHEDULE 4. - CHEMICALS AND RELATED PRODUCTS

TARIFF SCHEDULES OF THE UNITED STATES ANNOTATED (1968)

SCHEDULE 4. - CHEMICALS AND RELATED PRODUCTS
Part 2. - Chemical Elements, Inorganic and Organic Compounds, and Mixtures

Item	Stat Suf-fix	Articles	Units of Quantity	Rates of Duty 1	Rates of Duty 2
		PART 2. - CHEMICAL ELEMENTS, INORGANIC AND ORGANIC COMPOUNDS, AND MIXTURES			
		Part 2 headnotes:			
		1. This part covers chemicals, except those provided for elsewhere in this schedule and those specially provided for in any of the other schedules.			
		2. For the purpose of this part, inorganic compounds (including salts) are compounds not containing carbon, except carbides and such carbon-containing compounds as inorganic cyanides and cyanates, metallic carbonates, and oxides of carbon which are inorganic in nature.			
		3. For the purpose of this part, organic compounds are compounds containing carbon except such carbon-containing compounds as carbides, inorganic cyanides and cyanates, metallic carbonates, and oxides of carbon.			
		Subpart A. - Chemical Elements			
		Chemical elements in any physical form:			
415.05	00	Bromine	Lb.	9¢ per lb.	10¢ per lb.
415.10	00	Cesium, potassium, and sodium	Lb.	15% ad val.	25% ad val.
415.15	00	Carbon	Lb.	4% ad val.	20% ad val.
415.20	00	Chlorine	Lb.	9% ad val.	25% ad val.
		Iodine:			
415.25	00	Crude	Lb.	Free	Free
415.27	00	Resublimed	Lb.	5¢ per lb.	10¢ per lb.
415.30	00	Lithium	Lb.	24% ad val.	25% ad val.
415.35	00	Phosphorus	Lb.	3.5¢ per lb.	4¢ per lb.
415.40	00	Rubidium	Lb.	9% ad val.	25% ad val.
415.45	00	Sulfur	Ton.	Free	Free
415.50	00	Other	Lb.	9% ad val.	25% ad val.
		Subpart B. - Inorganic Acids			
		Subpart B headnote:			
		1. This subpart covers monobasic, dibasic, and polybasic inorganic acids. Salts and anhydrides of these acids are provided for in subpart C of this part.			
		Inorganic acids:			
416.05	00	Arsenic	Lb.	2.7¢ per lb.	3¢ per lb.
416.10	00	Boric	Lb.	0.4¢ per lb.	1¢ per lb.
416.15	00	Hydrochloric	Lb.	Free	Free
416.20	00	Hydrofluoric	Lb.	Free	Free
416.25	00	Nitric	Lb.	Free	Free
416.30	00	Phosphoric	Lb.	0.9¢ per lb.	2¢ per lb.
416.35	00	Sulfuric	Lb.	Free	Free
416.40	00	Tungstic	Lb.	37¢ per lb. on tungsten content + 18% ad val.	60¢ per lb. on tungsten content + 40% ad val.
		tungsten content	*Lb.* ✓		
416.45		Other		11% ad val.	25% ad val.
	20	*Sulfamic acid*	*Lb.*		
	40	*Other*	*Lb.*		

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SCHEDULE 4. - CHEMICALS AND RELATED PRODUCTS
Part 2. - Chemical Elements, Inorganic and Organic Compounds, and Mixtures

4 - 2 - C
417.10 - 417.80

Item	Stat. Suffix	Articles	Units of Quantity	Rates of Duty 1	Rates of Duty 2
		Subpart C. - Inorganic Chemical Compounds			
		Subpart C headnote:			
		1. This subpart does not include any organic compounds. For the purposes of this subpart, inorganic compounds containing only one kind of cation are classifiable according to the cation constituent as indicated in the alphabetical listing set forth in this subpart; and inorganic compounds containing two or more different kinds of cations are classifiable according to the cation constituent thereof first named in the alphabetical listing in this subpart. Inorganic compounds, having no cations or none of the cation constituents of which are named in this subpart, are covered by the provision for other inorganic compounds (item 423.00).			
		Aluminum compounds:			
417.10	00	Ammonium sulfate (ammonia alum)	Lb.	0.47¢ per lb.	0.75¢ per lb.
417.12	00	Hydroxide and oxide (alumina) 1/	Lb.	0.22¢ per lb.	0.5¢ per lb.
417.14	00	Potassium sulfate (potash alum)	Lb.	0.3¢ per lb.	0.75¢ per lb.
417.16	00	Sulfate	Lb.	0.06¢ per lb.	0.375¢ per lb.
417.18	00	Other	Lb.	7.5% ad val.	25% ad val.
		Ammonium compounds:			
417.20	00	Ammonia, aqua	Lb.	7.5% ad val.	25% ad val.
417.22	00	Ammonia, liquid anhydrous	Lb.	1.12¢ per lb.	2.5¢ per lb.
417.24	00	Carbonate and bicarbonate	Lb.	0.45¢ per lb.	2¢ per lb.
417.26	00	Chloride	Lb.	0.47¢ per lb.	1.25¢ per lb.
417.28	00	Molybdate	Lb.	18¢ per lb. on molybdenum content + 5% ad val.	50¢ per lb. on molybdenum content + 15% ad val.
		molybdenum content	*Lb.* ✓		
417.30	00	Nitrate	Lb.	0.45¢ per lb.	1¢ per lb.
417.32	00	Perchlorate	Lb.	0.6¢ per lb.	1.5¢ per lb.
417.34	00	Phosphate	Lb.	0.54¢ per lb.	1.5¢ per lb.
417.36	00	Silicofluoride	Lb.	9% ad val.	25% ad val.
417.38	00	Sulfate	Lb.	7.5% ad val.	25% ad val.
417.40	00	Tungstate	Lb.	37¢ per lb. on tungsten content + 18% ad val.	60¢ per lb. on tungsten content + 40% ad val.
		tungsten content	*Lb.* ✓		
417.42	00	Vanadate	Lb.	28.5% ad val.	40% ad val.
417.44	00	Other	Lb.	7.5% ad val.	25% ad val.
		Antimony compounds:			
417.50	00	Oxide	Lb.	0.5¢ per lb.	2¢ per lb.
417.52	00	Sulfide	Lb.	0.4¢ per lb. + 11% ad val.	1¢ per lb. + 35% ad val.
417.54	00	Other	Lb.	0.4¢ per lb. + 10% ad val.	1¢ per lb. + 25% ad val.
		Arsenic compounds:			
417.60	00	Sulfide	Lb.	Free	Free
417.62	00	Trioxide (arsenious acid)	Lb.	Free	Free
417.64	00	Other	Lb.	9% ad val.	25% ad val.
		Barium compounds:			
417.70	00	Chloride	Lb.	1.44¢ per lb.	2¢ per lb.
417.72	00	Dioxide	Lb.	4.3¢ per lb.	6¢ per lb.
417.74	00	Hydroxide	Lb.	1.1¢ per lb.	1.25¢ per lb.
417.76	00	Nitrate	Lb.	0.9¢ per lb.	2¢ per lb.
417.78	00	Oxide	Lb.	1.4¢ per lb.	2.5¢ per lb.
417.80	00	Other	Lb.	9% ad val.	35% ad val.

1/ The duties on aluminum oxide (alumina) imported for use in producing aluminum are temporarily suspended. See Appendix to Tariff Schedules

TARIFF SCHEDULES OF THE UNITED STATES ANNOTATED (1968)

SCHEDULE 4. - CHEMICALS AND RELATED PRODUCTS
Part 2. - Chemical Elements, Inorganic and Organic Compounds, and Mixtures

Item	Stat. Suf-fix	Articles	Units of Quantity	Rates of Duty	
				1	2
		Beryllium compounds:			
417.90	00	Oxide or carbonate	Lb.	9% ad val.	25% ad val.
417.92	00	Other	Lb.	6% ad val.	25% ad val.
418.00	00	Bismuth compounds	Lb.	25% ad val.	35% ad val.
		Calcium compounds:			
418.10	00	Arsenate	Lb.	Free	Free
418.12	00	Borate, crude	Lb.	Free	Free
418.14	00	Carbide	Lb.	0.38¢ per lb.	1¢ per lb.
		Chloride:			
418.15	00	Crude	Lb.	Free	Free
418.16	00	Other	Lb.	3% ad val.	25% ad val.
418.20	00	Cyanide	Lb.	Free	Free
418.22	00	Hypochlorite	Lb.	11% ad val.	25% ad val.
418.24	00	Lime, chlorinated, containing not more than 40% of available chlorine (bleaching powder)	Lb.	0.22¢ per lb.	0.3¢ per lb.
418.26	00	Molybdate	Lb.	15¢ per lb. on molybdenum content + 9% ad val.	50¢ per lb. on molybdenum content + 15% ad val.
		molybdenum content	*Lb.*		
418.28	00	Phosphate, dicalcium	Lb.	8.5% ad val.	25% ad val.
418.30	00	Tungstate	Lb.	37¢ per lb. on tungsten content + 18% ad val.	60¢ per lb. on tungsten content + 40% ad val.
		tungsten content	*Lb.*		
418.32	00	Other	Lb.	9% ad val.	25% ad val.
		Cerium compounds:			
418.40	00	Chloride	Lb.	27% ad val.	35% ad val.
418.42	00	Oxide	Lb.	27% ad val.	35% ad val.
418.44	00	Other	Lb.	27% ad val.	35% ad val.
		Cesium compounds:			
418.50	00	Chloride	Lb.	12% ad val.	25% ad val.
418.52	00	Other	Lb.	9% ad val.	25% ad val.
		Cobalt compounds:			
418.60	00	Oxide	Lb.	1.3¢ per lb.	20¢ per lb.
418.62	00	Sulfate	Lb.	1.3¢ per lb.	10¢ per lb.
418.64	00	Other	Lb.	10.5% ad val.	30% ad val.
		Copper compounds:			
418.69	00	Cyanide	Lb.	Free	Free
		Sulfate:			
418.70	00	Crude	Lb.	Free	Free
418.72	00	Other	Lb.	1.14¢ per lb. + 9% ad val.	3¢ per lb. + 25% ad val.
418.74	00	Oxide (cuprite)	Lb.	1.14¢ per lb. + 9% ad val.	3¢ per lb. + 25% ad val.
418.76	00	Sulfate	Lb.	1.5¢ per lb. on copper content +	4¢ per lb. on copper content +
		copper content	*Lb.*		
418.78	00	Other	Lb.	1.14¢ per lb. + 9% ad val.	3¢ per lb. + 25% ad val.
418.80	00	Gold compounds	Lb.	9% ad val.	25% ad val.
		Iron compounds:			
418.90	00	Sulfate, ferrous (copperas)	Ton	Free	Free
418.92	00	Sulfate, ferrous (copperas) (copperas)	Lb.	Free	Free
418.94	00	Other	Lb.	7% ad val.	25% ad val.
		Lead compounds:			
419.00	00	Arsenate	Lb.	1.2¢ per lb.	3¢ per lb.
419.02	00	Nitrate	Lb.	1.2¢ per lb.	3¢ per lb.
419.04	00	Other	Lb.	13% ad val.	20% ad val.
419.10	00	Lithium compounds	Lb.	9% ad val.	20% ad val.
		Magnesium compounds:			
		Carbonate:			
419.22	00	Not precipitated	Lb.	2.5% ad val.	35% ad val.
419.23	00	Precipitated	Lb.	0.5¢ per lb.	1.5¢ per lb.

Item	Stat. Suffix	Articles	Units of Quantity	Rates of Duty 1	Rates of Duty 2
		Magnesium compounds (con.):			
		Chloride:			
419.24	00	Anhydrous	Lb.	0.8¢ per lb.	1¢ per lb.
419.28	00	Other	Lb.	0.375¢ per lb.	0.625¢ per lb.
419.42	00	Oxide (calcined magnesia)	Lb.	1.6¢ per lb.	7¢ per lb.
		Sulfate:			
419.54	00	Epsom salts	Lb.	0.336¢ per lb.	0.75¢ per lb.
419.56	00	Kieserite (except calcined)	Lb.	Free	Free
419.58	00	Other	Lb.	7.5% ad val.	25% ad val.
		Manganese compounds:			
419.40	00	Borate	Lb.	5% ad val.	25% ad val.
419.42	00	Sulfate	Lb.	5% ad val.	25% ad val.
419.44	00	Other	Lb.	17.5% ad val.	25% ad val.
		Mercury compounds:			
		Chloride:			
419.50	00	Mercuric (corrosive sublimate)	Lb.	16¢ per lb. + 11% ad val.	22¢ per lb. + 25% ad val.
419.52	00	Mercurous (calomel)	Lb.	10¢ per lb. + 11% ad val.	22¢ per lb. + 25% ad val.
419.53	00	Cyanide	Lb.	Free	Free
419.54	00	Other	Lb.	14¢ per lb. + 11% ad val.	22¢ per lb. + 25% ad val.
419.60	00	Molybdenum compounds	Lb.	18¢ per lb. on molybdenum content + 5% ad val.	50¢ per lb. on molybdenum content + 11% ad val.
		molybdenum content	*Lb. v*		
		Nickel compounds:			
419.70	00	Chloride	Lb.	5% ad val.	45% ad val.
419.72	00	Oxide	Lb.	Free	Free
419.74	00	Sulfate	Lb.	5% ad val.	25% ad val.
419.76	00	Other	Lb.	1% ad val.	25% ad val.
		Phosphorus compounds:			
419.80	00	Oxychloride	Lb.	2.7¢ per lb.	6¢ per lb.
419.82	00	Trichloride	Lb.	5.4¢ per lb.	6¢ per lb.
419.84	00	Other	Lb.	9% ad val.	25% ad val.
419.90	00	Platinum compounds	Lb.	9% ad val.	25% ad val.
		Potassium compounds:			
420.00	00	Bicarbonate	Lb.	0.9¢ per lb.	1.8¢ per lb.
420.02	00	Bromide	Lb.	3.5¢ per lb.	10¢ per lb.
420.04	00	Carbonate	Lb.	0.35¢ per lb.	0.75¢ per lb.
420.06	00	Chlorate	Lb.	1.35¢ per lb.	1.8¢ per lb.
420.08	00	Chromate and dichromate	Lb.	2¢ per lb.	7.45¢ per lb.
420.12	00	Cyanide	Lb.	Free	Free
420.14	00	Ferricyanide	Lb.	2¢ per lb.	7¢ per lb.
420.16	00	Ferrocyanide	Lb.	1.4¢ per lb.	4¢ per lb.
420.18	00	Hydroxide (caustic potash)	Lb.	0.15¢ per lb.	1¢ per lb.
420.20	00	Iodide	Lb.	22¢ per lb.	25¢ per lb.
420.22	00	Molybdate	Lb.	18¢ per lb. on molybdenum content + 5% ad val.	50¢ per lb. on molybdenum content + 15% ad val.
		molybdenum content	*Lb. v*		
420.23	00	Nitrate	Lb.	0.75¢ per lb.	1¢ per lb.
420.24	00	Perchlorate	Lb.	1.5¢ per lb.	1.5¢ per lb.
420.26	00	Permanganate	Lb.	5.4¢ per lb.	6¢ per lb.
420.30	00	Persulfate	Lb.	7.5% ad val.	25% ad val.
420.32	00	Tungstate	Lb.	37¢ per lb. on tungsten content + 18% ad val.	60¢ per lb. on tungsten content + 40% ad val.
		tungsten content	*Lb. v*		
420.34	00	Vanadate	Lb.	28.5% ad val.	40% ad val.
420.36	00	Other	Lb.	7.5% ad val.	25% ad val.
420.40	00	Rhodium compounds	Lb.	9% ad val.	25% ad val.

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SCHEDULE 4. - CHEMICALS AND RELATED PRODUCTS
Part 2. - Chemical Elements, Inorganic and Organic Compounds, and Mixtures

Item	Stat. Suffix	Articles	Units of Quantity	Rates of Duty 1	Rates of Duty 2
		Selenium compounds:			
420.50	00	Dioxide	Lb.	Free	Free
420.52	00	Salts	Lb.	Free	Free
420.54	00	Other	Lb.	7% ad val.	25% ad val.
420.60	00	Silver compounds	Lb.	9% ad val.	25% ad val.
		Sodium compounds:			
420.68	00	Aluminate	Lb.	7.5% ad val.	25% ad val.
420.70	00	Arsenate	Lb.	0.7¢ per lb.	1¢ per lb.
420.72	00	Bicarbonate	Lb.	Free	Free
420.74	00	Bisulfate (niter cake)	Lb.	Free	Free
		Borate:			
420.76	00	Crude	Lb.	Free	Free
420.78	00	Other	Lb.	0.1¢ per lb.	0.125¢ per lb.
420.82	00	Bromide	Lb.	8¢ per lb.	10¢ per lb.
		Carbonate:			
420.84	00	Calcined (soda ash)	Lb.	0.22¢ per lb.	0.25¢ per lb.
420.86	00	Hydrated and sesquicarbonate	Lb.	0.2¢ per lb.	0.25¢ per lb.
420.88	00	Chlorate	Lb.	0.65¢ per lb.	1.5¢ per lb.
		Chloride (salt):			
420.92	00	In brine		9% ad val.	20% ad val.
		anhydrous salt content	*S. ton*		
420.94	00	In bulk	S. ton	1.5¢ per 100 lb.	7¢ per 100 lb.
420.96	00	Other	Lb.	2.5¢ per 100 lb.	11¢ per 100 lb.
420.98	00	Chromate and dichromate	Lb.	1.55¢ per lb.	1.75¢ per lb.
421.02	00	Cyanide	Lb.	Free	Free
421.04	00	Ferrocyanide	Lb.	0.3¢ per lb.	2¢ per lb.
421.06	00	Hydrosulfite	Lb.	31% ad val.	35% ad val.
421.08	00	Hydroxide	Lb.	0.2¢ per lb.	0.50¢ per lb.
421.10	00	Molybdate	Lb.	18¢ per lb. on molybdenum content + 5% ad val.	50¢ per lb. on molybdenum content + 15% ad val.
		molybdenum content	*Lb.*		
421.14	00	Nitrite	Lb.	3.24¢ per lb.	4.5¢ per lb.
		Phosphate, except pyrophosphates:			
421.16	00	Containing by weight not over 45% of water of crystallization	Lb.	0.4¢ per lb.	1.5¢ per lb.
421.18	00	Containing by weight over 45% of water of crystallization	Lb.	0.2¢ per lb.	0.75¢ per lb.
421.22	00	Pyrophosphates	Lb.	9% ad val.	25% ad val.
421.34	00	Silicates	Lb.	0.25¢ per lb.	0.375¢ per lb.
421.36	00	Silicofluoride	Lb.	0.55¢ per lb.	1.5¢ per lb.
		Sulfate:			
421.42	00	Crude (salt cake)	S. ton	Free	Free
421.44	00	Anhydrous	Ton	45¢ per ton	$3 per ton
421.46	00	Crystallized (Glauber's salt)	Ton	90¢ per ton	$1 per ton
421.52	00	Sulfide	Lb.	0.67¢ per lb.	0.75¢ per lb.
421.54	00	Sulfite, bisulfite, metabisulfite, and thiosulfate	Lb.	0.16¢ per lb.	0.375¢ per lb.
421.56	00	Tungstate	Lb.	37¢ per lb. on tungsten content + 18% ad val.	60¢ per lb. on tungsten content + 40% ad val.
		tungsten content	*Lb.*		
421.58	00	Uranate	Lb.	Free	Free
421.60	00	Vanadate	Lb.	28.5% ad val.	40% ad val.
421.62		Other		9% ad val.	25% ad val.
	20	*Sodium perborate*	*Lb.*		
	40	*Other*	*Lb.*		
		Strontium compounds:			
		Carbonate:			
421.70	00	Not precipitated, including strontianite	Lb.	Free	Free
421.72	00	Precipitated	Lb.	11% ad val.	25% ad val.
421.74	00	Nitrate	Lb.	11% ad val.	25% ad val.
421.76	00	Oxide	Lb.	11% ad val.	25% ad val.
		Sulfate:			
421.82	00	Mineral (celestite)	Lb.	Free	Free
421.84	00	Other	Lb.	9% ad val.	25% ad val.
421.86	00	Other	Lb.	9% ad val.	25% ad val.

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421.90 - 423.96

SCHEDULE 4. - CHEMICALS AND RELATED PRODUCTS
Part 2. - Chemical Elements, Inorganic and Organic Compounds, and Mixtures

Item	Stat. Suffix	Articles	Units of Quantity	Rates of Duty 1	Rates of Duty 2
421.90	00	Tellurium compounds	Lb.	9% ad val.	25% ad val.
422.00	00	Thallium compounds	Lb.	9% ad val.	25% ad val.
		Thorium compounds:			
422.10	00	Nitrate	Lb.	31% ad val.	35% ad val.
422.12	00	Oxide	Lb.	31% ad val.	35% ad val.
422.14	00	Other	Lb.	31% ad val.	35% ad val.
		Tin compounds:			
422.20	00	Dichloride	Lb.	11% ad val.	25% ad val.
422.24	00	Tetrachloride	Lb.	11% ad val.	25% ad val.
422.26	00	Other	Lb.	11% ad val.	25% ad val.
422.30	00	Titanium compounds	Lb.	13% ad val.	30% ad val.
		Tungsten compounds:			
422.40	00	Carbide	Lb.	37.8¢ per lb. on tungsten content + 22% ad val.	60¢ per lb. on tungsten content + 50% ad val.
		tungsten content	*Lb. v*		
422.42	00	Other	Lb.	37¢ per lb. on tungsten content + 18% ad val.	60¢ per lb. on tungsten content + 40% ad val.
		tungsten content	*Lb. v*		
		Uranium compounds:			
422.50	00	Oxide	Lb.	Free	Free
422.52	00	Other	Lb.	Free	Free
		Vanadium compounds:			
422.58	00	Carbide	Lb.	11% ad val.	25% ad val.
422.60	00	Pentoxide (anhydride)	Lb.	28.5% ad val.	40% ad val.
422.62	00	Other	Lb.	28.5% ad val.	40% ad val.
		Zinc compounds:			
422.70	00	Arsenate	Lb.	11% ad val.	25% ad val.
422.72	00	Chloride	Lb.	0.55¢ per lb.	1.3¢ per lb.
422.73	00	Cyanide	Lb.	Free	Free
422.74	00	Hydrosulfite	Lb.	31% ad val.	35% ad val.
422.76	00	Sulfate	Lb.	0.25¢ per lb.	0.75¢ per lb.
422.78	00	Other	Lb.	9% ad val.	25% ad val.
		Zirconium compounds:			
422.80	00	Oxide	Lb.	9% ad val.	25% ad val.
422.82	00	Other	Lb.	9% ad val.	25% ad val.
		Other inorganic compounds:			
422.90	00	Boron carbide	Lb.	5.5% ad val.	25% ad val.
422.92	00	Chromium carbide	Lb.	11% ad val.	25% ad val.
422.94	00	Sulfur dioxide	S. ton.	11% ad val.	25% ad val.
423.00		Other	.....	9% ad val.	25% ad val.
	40	*Hydrogen peroxide*	*Lb.*		
	60	*Other oxides, hydroxides, and peroxides*	*Lb.*		
	90	*Other*	*Lb.*		
		Mixtures of two or more inorganic compounds:			
423.80	00	In chief value of bismuth	Lb.	45% ad val.	55% ad val.
423.82	00	In chief value of cyanide compounds which are free of duty under the foregoing provisions of this subpart	Lb.	Free	Free
423.84	00	In chief value of hydrosulfite compounds, sulfoxylate compounds, or both	Lb.	31% ad val.	35% ad val.
423.86	00	In chief value of mercury	Lb.	16¢ per lb. + 11% ad val.	22¢ per lb. + 45% ad val.
423.88	00	In chief value of molybdenum	Lb.	18¢ per lb. on molybdenum content + 5% ad val	50¢ per lb. on molybdenum content + 15% ad val.
		molybdenum content	*Lb. v*		
423.90	00	In chief value of nickel oxide	Lb.	Free	Free
423.92	00	In chief value of tungsten	Lb.	37¢ per lb. on tungsten content + 18% ad val.	60¢ per lb. on tungsten content + 40% ad val.
		tungsten content	*Lb. v*		
423.94	00	In chief value of vanadium	Lb.	28.5% ad val.	40% ad val.
423.96	00	Other	Lb.	9% ad val.	25% ad val.

TARIFF SCHEDULES OF THE UNITED STATES ANNOTATED (1968)

STAGED RATES AND HISTORICAL NOTES

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Part 2

Staged Rates

Modification of column 1 rates of duty by Pres. Proc. 3694 (Canadian Compensation), Dec. 17, 1965, 3 CFR, 1965 Supp., as modified by Pres. Proc. 3818, Nov. 6, 1967, 32 F.R. 15467.

TSUS item	Prior rate	Rate of duty, effective with respect to articles entered on and after January 1 --				
		1966	1967	1968	1969	1970
216.20	10.5% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
419.75	10.5% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
426.42	10.5% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.

Modifications of column 1 rates of duty by Pres. Proc. 3822 (Kennedy Round), Dec. 16, 1967, 32 F.R. 19002:

TSUS item	Prior rate	Rate of duty, effective with respect to articles entered on and after January 1 --				
		1968	1969	1970	1971	1972
203.05	10¢ per lb.	9¢ per lb.	8¢ per lb.	7¢ per lb.	6¢ per lb	5¢ per lb.
416.10	15% ad val.	13½% ad val.	12.5% ad val.	11.5% ad val.	10% ad val.	8.5% ad val.
426.15	2% ad val.	1% ad val.	1% ad val.	1% ad val.	1% ad val.	Free
708.25	10.5% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
153.35 1/	10¢ per lb.	9¢ per lb.	8¢ per lb.	7¢ per lb.	6¢ per lb.	5¢ per lb.
206.30	25% ad val.	22½ ad val.	20% ad val.	17½ ad val.	15% ad val.	12.5% ad val.
405.96	3¢ per lb.	3.5¢ per lb.	3¢ per lb.	2.8¢ per lb.	2.4¢ per lb.	2¢ per lb.
415.70	10.5% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
417.20	10.5% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
420.02	3¢ per lb.	2.7¢ per lb.	2.4¢ per lb.	2.1¢ per lb.	1.8¢ per lb.	1.5¢ per lb.
426.10 2/	0.8¢ per lb.	0.4¢ per lb.	0.4¢ per lb.	0.3¢ per lb.	0.2¢ per lb.	0.2¢ per lb.
426.20 2/	1.6¢ per lb.	0.9¢ per lb.	0.8¢ per lb.	0.5¢ per lb.	0.5¢ per lb.	0.5¢ per lb.
416.40	42¢ per lb. on tungsten content + 20% ad val.	37¢ per lb. on tungsten content + 18% ad val.	33¢ per lb. on tungsten content + 16% ad val.	29¢ per lb. on tungsten content + 14% ad val.	25¢ per lb. on tungsten content + 12% ad val.	21¢ per lb. on tungsten content + 10% ad val.
416.50	22½% ad val.	11% ad val.	10% ad val.	8.5% ad val.	7% ad val.	6% ad val.
417.10	0.4¢ per lb.	0.27¢ per lb.	0.24¢ per lb.	0.2¢ per lb.	0.18¢ per lb.	0.15¢ per lb.
417.20	0.2¢ per lb.	0.32¢ per lb.	0.2¢ per lb.	0.2¢ per lb.	0.15¢ per lb.	0.12¢ per lb.
417.30	0.5¢ per lb.	0.5¢ per lb.	0.4¢ per lb.	0.4¢ per lb.	0.3¢ per lb.	0.3¢ per lb.
417.40	0.1¢ per lb.	0.09¢ per lb.	0.08¢ per lb.	0.07¢ per lb.	0.06¢ per lb	0.05¢ per lb.
422.20	6.5% ad val.	7.5% ad val.	6.5% ad val.	5.5% ad val.	5% ad val.	4% ad val.
422.40	6.5% ad val.	7.5% ad val.	6.5% ad val.	5.5% ad val.	5% ad val.	4% ad val.
417.42	2.2¢ per lb.	1.12¢ per lb.	1¢ per lb.	0.87¢ per lb.	0.75¢ per lb.	0.62¢ per lb.
417.44	0.8¢ per lb.	0.45¢ per lb.	0.4¢ per lb.	0.35¢ per lb.	0.3¢ per lb.	0.25¢ per lb.
417.46	0.9¢ per lb.	0.47¢ per lb.	0.42¢ per lb.	0.37¢ per lb.	0.31¢ per lb.	0.26¢ per lb.
417.50	20¢ per lb. on molybdenum content + 5% ad val.	18¢ per lb. on molybdenum content + 4.5% ad val.	16¢ per lb. on molybdenum content + 4% ad val.	14¢ per lb. on molybdenum content + 4% ad val.	12¢ per lb. on molybdenum content + 3.5% ad val.	10¢ per lb. on molybdenum content + 3% ad val.
417.60	0.8¢ per lb.	0.48¢ per lb.	0.4¢ per lb.	0.35¢ per lb.	0.3¢ per lb.	0.25¢ per lb.
417.70	0.7¢ per lb.	0.6¢ per lb.	0.5¢ per lb.	0.5¢ per lb.	0.4¢ per lb.	0.3¢ per lb.
417.80	0.6¢ per lb.	0.54¢ per lb.	0.48¢ per lb.	0.4¢ per lb.	0.35¢ per lb.	0.3¢ per lb.
417.90	6.5% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
422.60	6.5% ad val.	8.5% ad val.	6.5% ad val.	5.5% ad val.	5% ad val.	4% ad val.
417.40	42¢ per lb. on tungsten content + 20% ad val.	37¢ per lb. on tungsten content + 18% ad val.	33¢ per lb. on tungsten content + 16% ad val.	29¢ per lb. on tungsten content + 14% ad val.	25¢ per lb. on tungsten content + 12% ad val.	21¢ per lb. on tungsten content + 10% ad val.
417.42	32% ad val.	28.5% ad val.	25.5% ad val.	22% ad val.	19% ad val.	16% ad val.
417.44	6.5% ad val.	7.5% ad val.	6.5% ad val.	5.5% ad val.	5% ad val.	4% ad val.
417.46	0.4¢ per lb.	0.5¢ per lb.	0.3¢ per lb.	0.3¢ per lb.	0.3¢ per lb.	0.3¢ per lb.
417.50	0.5¢ per lb. + 32.5% ad val.	0.4¢ per lb. + 11% ad val.	0.4¢ per lb. + 10% ad val.	0.3¢ per lb. + 8.5% ad val.	0.3¢ per lb. + 7% ad val.	0.25¢ per lb. + 6% ad val.
417.60	0.9¢ per lb. + 20% ad val.	0.4¢ per lb. + 18% ad val.	0.4¢ per lb. + 16% ad val.	0.4¢ per lb. + 14% ad val.	0.4¢ per lb. + 12% ad val.	0.4¢ per lb. + 10% ad val.
417.64	10.5% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
417.70	1.4¢ per lb.	1.44¢ per lb.	1.28¢ per lb.	1.1¢ per lb.	0.95¢ per lb.	0.8¢ per lb.
417.74	4¢ per lb.	4.2¢ per lb.	3.8¢ per lb.	3.3¢ per lb.	2.8¢ per lb.	2.4¢ per lb.
417.76	1.2¢ per lb.	1.1¢ per lb.	1¢ per lb.	0.85¢ per lb.	0.75¢ per lb.	0.6¢ per lb.
417.78	1¢ per lb.	0.9¢ per lb.	0.8¢ per lb.	0.7¢ per lb.	0.6¢ per lb.	0.5¢ per lb.

1/ See p. 1 of the end of this list of staged rates.

APPENDIX A

TARIFF SCHEDULES OF THE UNITED STATES ANNOTATED (1968)

Notes p. 2
Schedule 4,
Part 2

STAGED RATES AND HISTORICAL NOTES

Staged Rates

Modifications of column 1 rates of duty by Pres. Proc. 3822 (Kennedy Round), Dec. 16, 1967, 32 F.R. 19002 (con.):

TSUS item	Prior rate	Rate of duty, effective with respect to articles entered on and after January 1 -- 1968	1969	1970	1971	1972
417.78	2¢ per lb.	1.8¢ per lb.	1.6¢ per lb.	1.4¢ per lb.	1.2¢ per lb.	1¢ per lb.
417.80	10% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
417.90	10% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
417.92	10.5% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
418.00	28% ad val.	25% ad val.	22% ad val.	19.5% ad val.	16.5% ad val.	14% ad val.
418.14	0.425¢ per lb.	0.38¢ per lb.	0.34¢ per lb.	0.29¢ per lb.	0.25¢ per lb.	0.21¢ per lb.
418.18	10.5% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
418.22	12.5% ad val.	11% ad val.	10% ad val.	8.5% ad val.	7% ad val.	6% ad val.
418.24 1/	0.25¢ per lb.	0.22¢ per lb.	0.2¢ per lb.	0.17¢ per lb.	0.15¢ per lb.	0.12¢ per lb.
418.26	20¢ per lb. on molybdenum content + 6% ad val.	18¢ per lb. on molybdenum content + 5% ad val.	16¢ per lb. on molybdenum content + 4.5% ad val.	14¢ per lb. on molybdenum content + 4% ad val.	12¢ per lb. on molybdenum content + 3.5% ad val.	10¢ per lb. on molybdenum content + 3% ad val.
418.28	9.5% ad val.	8.5% ad val.	7.5% ad val.	6.5% ad val.	5.5% ad val.	4.5% ad val.
418.30	42¢ per lb. on tungsten content + 20% ad val.	37¢ per lb. on tungsten content + 18% ad val.	33¢ per lb. on tungsten content + 16% ad val.	29¢ per lb. on tungsten content + 14% ad val.	25¢ per lb. on tungsten content + 12% ad val.	21¢ per lb. on tungsten content + 10% ad val.
418.32	10.5% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
418.40	30% ad val.	27% ad val.	24% ad val.	21% ad val.	18% ad val.	15% ad val.
418.42	30% ad val.	27% ad val.	24% ad val.	21% ad val.	18% ad val.	15% ad val.
418.44	30% ad val.	27% ad val.	24% ad val.	21% ad val.	18% ad val.	15% ad val.
418.50	12.5% ad val.	11% ad val.	10% ad val.	8.5% ad val.	7% ad val.	6% ad val.
418.52	10.5% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
418.60 1/	1.3¢ per lb.	1.1¢ per lb.	1.2¢ per lb.	1¢ per lb.	0.8¢ per lb.	0.7¢ per lb.
418.62 1/	1.5¢ per lb.	1.3¢ per lb.	1.2¢ per lb.	1¢ per lb.	0.7¢ per lb.	0.7¢ per lb.
418.68	12% ad val.	10.5% ad val.	9.5% ad val.	8% ad val.	7% ad val.	6% ad val.
418.72	1.275¢ per lb. + 10.5% ad val.	1.14¢ per lb. + 9% ad val.	1.02¢ per lb. + 8% ad val.	0.89¢ per lb. + 7% ad val.	0.76¢ per lb. + 6% ad val.	0.637¢ per lb. + 5% ad val.
418.74	1.275¢ per lb. + 10.5% ad val.	1.14¢ per lb. + 9% ad val.	1.02¢ per lb. + 8% ad val.	0.89¢ per lb. + 7% ad val.	0.76¢ per lb. + 6% ad val.	0.637¢ per lb. + 5% ad val.
418.76 1/	1.7¢ per lb. on copper content	1.5¢ per lb. on copper content	1.3¢ per lb. on copper content	1¢ per lb. on copper content	1¢ per lb. on copper content	0.6¢ per lb. on copper content
418.78	1.275¢ per lb. + 10.5% ad val.	1.14¢ per lb. + 9% ad val.	1.02¢ per lb. + 8% ad val.	0.89¢ per lb. + 7% ad val.	0.76¢ per lb. + 6% ad val.	0.637¢ per lb. + 5% ad val.
418.80	10% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
419.00 1/	1.5¢ per lb.	1.3¢ per lb.	1.2¢ per lb.	1¢ per lb.	0.8¢ per lb.	0.7¢ per lb.
419.02	1.5¢ per lb.	1.3¢ per lb.	1.2¢ per lb.	1¢ per lb.	0.8¢ per lb.	0.7¢ per lb.
419.04	15% ad val.	12% ad val.	12% ad val.	10% ad val.	9% ad val.	7.5% ad val.
419.10	10.5% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
419.20	8.5% ad val.	7.5% ad val.	6.5% ad val.	5.5% ad val.	5% ad val.	4% ad val.
419.22 1/	0.35¢ per lb.	0.3¢ per lb.	0.25¢ per lb.	0.24¢ per lb.	0.17¢ per lb.	0.17¢ per lb.
419.24	1¢ per lb.	0.9¢ per lb.	0.8¢ per lb.	0.7¢ per lb.	0.6¢ per lb.	0.5¢ per lb.
419.28	0.42¢ per lb.	0.375¢ per lb.	0.33¢ per lb.	0.29¢ per lb.	0.25¢ per lb.	0.21¢ per lb.
419.32	2¢ per lb.	1.8¢ per lb.	1.6¢ per lb.	1.4¢ per lb.	1.2¢ per lb.	1¢ per lb.
419.34	0.375¢ per lb.	0.333¢ per lb.	0.3¢ per lb.	0.25¢ per lb.	0.225¢ per lb.	0.187¢ per lb.
419.38	8.5% ad val.	7.5% ad val.	6.5% ad val.	5.5% ad val.	5% ad val.	4% ad val.
419.40	10% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
419.42	10% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
419.44	14% ad val.	12.5% ad val.	11% ad val.	9.5% ad val.	8% ad val.	7% ad val.
419.50	13.5¢ per lb. + 12.5% ad val.	16¢ per lb. + 11% ad val.	14¢ per lb. + 10% ad val.	12.5¢ per lb. + 8.5% ad val.	11.1¢ per lb. + 7% ad val.	9¢ per lb. + 6% ad val.
419.52	13.5¢ per lb. + 12.5% ad val.	16¢ per lb. + 11% ad val.	14¢ per lb. + 10% ad val.	12.5¢ per lb. + 8.5% ad val.	11.1¢ per lb. + 7% ad val.	9¢ per lb. + 6% ad val.
419.54	13.5¢ per lb. + 12.5% ad val.	16¢ per lb. + 11% ad val.	14¢ per lb. + 10% ad val.	12.5¢ per lb. + 8.5% ad val.	11.1¢ per lb. + 7% ad val.	9¢ per lb. + 6% ad val.
419.60	20¢ per lb. on molybdenum content + 6% ad val.	18¢ per lb. on molybdenum content + 5% ad val.	16¢ per lb. on molybdenum content + 4.5% ad val.	14¢ per lb. on molybdenum content + 4% ad val.	12¢ per lb. on molybdenum content + 3.5% ad val.	10¢ per lb. on molybdenum content + 3% ad val.
419.70	10.5% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.

1/ See footnote 1 at the end of this list of Staged Rates.

TARIFF SCHEDULES OF THE UNITED STATES ANNOTATED (1968)

STAGED RATES AND HISTORICAL NOTES

Notes p. 3
Schedule 4,
Part 2

Staged Rates

Modifications of column 1 rates of duty by Pres. Proc. 3822 (Kennedy Round), Dec. 16, 1967, 32 F.R. 19002 (con.):

TSUS item	Prior rate	Rate of duty, effective with respect to articles entered on and after January 1 --				
		1968	1969	1970	1971	1972
419.74	10.5% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
419.81	3¢ per lb.	2.7¢ per lb.	2.4¢ per lb.	2.1¢ per lb.	1.8¢ per lb.	1.5¢ per lb.
419.82	6¢ per lb.	5.4¢ per lb.	4.8¢ per lb.	4.2¢ per lb.	3.6¢ per lb.	3¢ per lb.
419.84	10.5% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
419.90	10% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
420.00	1¢ per lb.	0.9¢ per lb.	0.8¢ per lb.	0.7¢ per lb.	0.6¢ per lb.	0.5¢ per lb.
420.02	4¢ per lb.	3.6¢ per lb.	3¢ per lb.	2.8¢ per lb.	2.4¢ per lb.	2¢ per lb.
420.04	0.625¢ per lb.	0.55¢ per lb.	0.5¢ per lb.	0.45¢ per lb.	0.37¢ per lb.	0.3¢ per lb.
420.06	1.5¢ per lb.	1.35¢ per lb.	1.2¢ per lb.	1.05¢ per lb.	0.9¢ per lb.	0.75¢ per lb.
420.08	2.25¢ per lb.	2¢ per lb.	1.8¢ per lb.	1.35¢ per lb.	1.25¢ per lb.	1.1¢ per lb.
420.14 1/	2.3¢ per lb.	2¢ per lb.	1.8¢ per lb.	1.5¢ per lb.	1.3¢ per lb.	1¢ per lb.
420.16	1.6¢ per lb.	1.4¢ per lb.	1.2¢ per lb.	1.1¢ per lb.	0.9¢ per lb.	0.8¢ per lb.
420.18 1/	0.2¢ per lb.	0.18¢ per lb.	0.15¢ per lb.	0.1¢ per lb.	0.1¢ per lb.	0.1¢ per lb.
420.20	25¢ per lb.	22¢ per lb.	20¢ per lb.	17¢ per lb.	15¢ per lb.	12¢ per lb.
420.22	20¢ per lb. on molybdenum content + 6% ad val.	18¢ per lb. on molybdenum content + 5% ad val.	16¢ per lb. on molybdenum content + 4.5% ad val.	14¢ per lb. on molybdenum content + 4% ad val.	12¢ per lb. on molybdenum content + 3.5% ad val.	10¢ per lb. on molybdenum content + 3% ad val.
420.24	0.85¢ per lb.	0.75¢ per lb.	0.68¢ per lb.	0.59¢ per lb.	0.5¢ per lb.	0.42¢ per lb.
420.26	1.5¢ per lb.	1.4¢ per lb.	1.2¢ per lb.	1¢ per lb.	0.9¢ per lb.	0.7¢ per lb.
420.28	6¢ per lb.	5.4¢ per lb.	4.8¢ per lb.	4.2¢ per lb.	3.5¢ per lb.	3¢ per lb.
420.30	8.5% ad val.	7.5% ad val.	6.5% ad val.	5.5% ad val.	5% ad val.	4% ad val.
420.32	42¢ per lb. on tungsten content + 20% ad val.	37¢ per lb. on tungsten content + 18% ad val.	33¢ per lb. on tungsten content + 16% ad val.	29¢ per lb. on tungsten content + 14% ad val.	25¢ per lb. on tungsten content + 12% ad val.	21¢ per lb. on tungsten content + 10% ad val.
420.34	32% ad val.	28.5% ad val.	25.5% ad val.	22% ad val.	19% ad val.	16% ad val.
420.36	8.5% ad val.	7.5% ad val.	6.5% ad val.	5.5% ad val.	5% ad val.	4% ad val.
420.40	10% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
420.60	10% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
420.68	8.5% ad val.	7.5% ad val.	6.5% ad val.	5.5% ad val.	5% ad val.	4% ad val.
420.70	0.8¢ per lb.	0.7¢ per lb.	0.6¢ per lb.	0.55¢ per lb.	0.45¢ per lb.	0.4¢ per lb.
420.78	0.125¢ per lb.	0.1¢ per lb.	0.1¢ per lb.	0.08¢ per lb.	0.07¢ per lb.	0.06¢ per lb.
420.82 1/	10¢ per lb.	9¢ per lb.	8¢ per lb.	7¢ per lb.	6¢ per lb.	5¢ per lb.
420.84	0.25¢ per lb.	0.22¢ per lb.	0.2¢ per lb.	0.17¢ per lb.	0.15¢ per lb.	0.12¢ per lb.
420.86 1/	0.25¢ per lb.	0.2¢ per lb.	0.2¢ per lb.	0.15¢ per lb.	0.15¢ per lb.	0.1¢ per lb.
420.88	0.75¢ per lb.	0.65¢ per lb.	0.6¢ per lb.	0.5¢ per lb.	0.45¢ per lb.	0.37¢ per lb.
420.92	10% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
420.94	1.7¢ per 100 lb.	1.5¢ per 100 lb.	1.3¢ per 100 lb.	1.15¢ per 100 lb.	1¢ per 100 lb.	0.8¢ per 100 lb.
420.96	3.5¢ per 100 lb.	2.5¢ per 100 lb.	2¢ per 100 lb.	1¢ per 100 lb.	0.5¢ per 100 lb.	Free
420.98	1.75¢ per lb.	1.55¢ per lb.	1.4¢ per lb.	1.2¢ per lb.	1.05¢ per lb.	0.87¢ per lb.
421.04 1/	0.6¢ per lb.	0.4¢ per lb.	0.45¢ per lb.	0.4¢ per lb.	0.3¢ per lb.	0.3¢ per lb.
421.06	35% ad val.	31% ad val.	28% ad val.	24% ad val.	21% ad val.	17.5% ad val.
421.08 1/	0.25¢ per lb.	0.2¢ per lb.	0.2¢ per lb.	0.15¢ per lb.	0.15¢ per lb.	0.1¢ per lb.
421.10	20¢ per lb. on molybdenum content + 6% ad val.	18¢ per lb. on molybdenum content + 5% ad val.	16¢ per lb. on molybdenum content + 4.5% ad val.	14¢ per lb. on molybdenum content + 4% ad val.	12¢ per lb. on molybdenum content + 3.5% ad val.	10¢ per lb. on molybdenum content + 3% ad val.
421.14	3.6¢ per lb.	3.24¢ per lb.	2.85¢ per lb.	2.5¢ per lb.	2.15¢ per lb.	1.8¢ per lb.
421.16 1/	0.5¢ per lb.	0.4¢ per lb.	0.4¢ per lb.	0.3¢ per lb.	0.3¢ per lb.	0.2¢ per lb.
421.18 1/	0.25¢ per lb.	0.2¢ per lb.	0.2¢ per lb.	0.15¢ per lb.	0.15¢ per lb.	0.1¢ per lb.
421.22	10.5% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
421.34	0.3¢ per lb.	0.25¢ per lb.	0.24¢ per lb.	0.2¢ per lb.	0.18¢ per lb.	0.15¢ per lb.
421.36	0.625¢ per lb.	0.55¢ per lb.	0.5¢ per lb.	0.43¢ per lb.	0.37¢ per lb.	0.3¢ per lb.
421.44 1/	50¢ per ton	45¢ per ton	40¢ per ton	35¢ per ton	30¢ per ton	25¢ per ton
421.46 1/	$1 per ton	90¢ per ton	80¢ per ton	70¢ per ton	60¢ per ton	50¢ per ton
421.52	0.75¢ per lb.	0.67¢ per lb.	0.6¢ per lb.	0.52¢ per lb.	0.45¢ per lb.	0.37¢ per lb.
421.54 1/	0.188¢ per lb.	0.16¢ per lb.	0.15¢ per lb.	0.13¢ per lb.	0.1¢ per lb.	0.09¢ per lb.
421.56	42¢ per lb. on tungsten content + 20% ad val.	37¢ per lb. on tungsten content + 18% ad val.	33¢ per lb. on tungsten content + 16% ad val.	29¢ per lb. on tungsten content + 14% ad val.	25¢ per lb. on tungsten content + 12% ad val.	21¢ per lb. on tungsten content + 10% ad val.

1/ See footnote 1 at the end of this list of Staged Rates.

APPENDIX A

TARIFF SCHEDULES OF THE UNITED STATES ANNOTATED (1968)

STAGED RATES AND HISTORICAL NOTES

Notes p. 4
Schedule 4,
Part 2

Staged Rates

Modifications of column 1 rates of duty by Pres. Proc. 3822 (Kennedy Round), Dec. 16, 1967, 32 F.R. 19002 (con.):

TSUS item	Prior rate	Rate of duty, effective with respect to articles entered on and after January 1 --				
		1968	1969	1970	1971	1972
421.60	32% ad val.	28.5% ad val.	25.5% ad val.	22% ad val.	19% ad val.	16% ad val.
421.62	10.5% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
421.72	12.5% ad val.	11% ad val.	10% ad val.	8.5% ad val.	7% ad val.	6% ad val.
421.74	12.5% ad val.	11% ad val.	10% ad val.	8.5% ad val.	7% ad val.	6% ad val.
421.76	12.5% ad val.	11% ad val.	10% ad val.	8.5% ad val.	7% ad val.	6% ad val.
421.84	10.5% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
421.86	10.5% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
421.90	10% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
422.00	10.5% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
422.10	35% ad val.	31% ad val.	28% ad val.	24% ad val.	21% ad val.	17.5% ad val.
422.12	35% ad val.	31% ad val.	28% ad val.	24% ad val.	21% ad val.	17.5% ad val.
422.14	35% ad val.	31% ad val.	28% ad val.	24% ad val.	21% ad val.	17.5% ad val.
422.20	12.5% ad val.	11% ad val.	10% ad val.	8.5% ad val.	7% ad val.	6% ad val.
422.24	12.5% ad val.	11% ad val.	10% ad val.	8.5% ad val.	7% ad val.	6% ad val.
422.26	12.5% ad val.	11% ad val.	10% ad val.	8.5% ad val.	7% ad val.	6% ad val.
422.30	15% ad val.	13% ad val.	12% ad val.	10% ad val.	9% ad val.	7.5% ad val.
422.40	42¢ per lb. on tungsten content + 25% ad val.	37.8¢ per lb. on tungsten content + 22% ad val.	33¢ per lb. on tungsten content + 20% ad val.	29.4¢ per lb. on tungsten content + 17% ad val.	25¢ per lb. on tungsten content + 15% ad val.	21¢ per lb. on tungsten content + 12.5% ad val.
422.42	42¢ per lb. on tungsten content + 20% ad val.	37¢ per lb. on tungsten content + 18% ad val.	33¢ per lb. on tungsten content + 16% ad val.	29¢ per lb. on tungsten content + 14% ad val.	25¢ per lb. on tungsten content + 12% ad val.	21¢ per lb. on tungsten content + 10% ad val.
422.58	12.5% ad val.	11% ad val.	10% ad val.	8.5% ad val.	7% ad val.	6% ad val.
422.60	32% ad val.	28.5% ad val.	25.5% ad val.	22% ad val.	19% ad val.	16% ad val.
422.62	32% ad val.	28.5% ad val.	25.5% ad val.	22% ad val.	19% ad val.	16% ad val.
422.70	12.5% ad val.	11% ad val.	10% ad val.	8.5% ad val.	7% ad val.	6% ad val.
422.72 1/	0.65¢ per lb.	0.55¢ per lb.	0.5¢ per lb.	0.45¢ per lb.	0.35¢ per lb.	0.3¢ per lb.
422.74	35% ad val.	31% ad val.	28% ad val.	24% ad val.	21% ad val.	17.5% ad val.
422.76 1/	0.3¢ per lb.	0.25¢ per lb.	0.24¢ per lb.	0.2¢ per lb.	0.18¢ per lb.	0.15¢ per lb.
422.78	10.5% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
422.80	10.5% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
422.82	10.5% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
422.90 1/	6.25% ad val.	5.5% ad val.	5% ad val.	4% ad val.	3.5% ad val.	3% ad val.
422.92	12.5% ad val.	11% ad val.	10% ad val.	8.5% ad val.	7% ad val.	6% ad val.
422.94	12.5% ad val.	11% ad val.	10% ad val.	8.5% ad val.	7% ad val.	6% ad val.
423.00	10.5% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
423.80	28% ad val.	25% ad val.	22% ad val.	19.5% ad val.	16.5% ad val.	14% ad val.
423.84	35% ad val.	31% ad val.	28% ad val.	24% ad val.	21% ad val.	17.5% ad val.
423.86	18.7¢ per lb. + 12.5% ad val.	16¢ per lb. + 11% ad val.	14¢ per lb. + 10% ad val.	12.5¢ per lb. + 8.5% ad val.	11.1¢ per lb. + 7% ad val.	9¢ per lb. + 6% ad val.
423.88	20¢ per lb. on molybdenum content + 6% ad val.	18¢ per lb. on molybdenum content + 5% ad val.	16¢ per lb. on molybdenum content + 4.5% ad val.	14¢ per lb. on molybdenum content + 4% ad val.	12¢ per lb. on molybdenum content + 3.5% ad val.	10¢ per lb. on molybdenum content + 3% ad val.
423.92	42¢ per lb. on tungsten content + 20% ad val.	37¢ per lb. on tungsten content + 18% ad val.	33¢ per lb. on tungsten content + 16% ad val.	29¢ per lb. on tungsten content + 14% ad val.	25¢ per lb. on tungsten content + 12% ad val.	21¢ per lb. on tungsten content + 10% ad val.
423.94	32% ad val.	28.5% ad val.	25.5% ad val.	22% ad val.	19% ad val.	16% ad val.
423.96	10.5% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
425.00	2.5¢ per lb. + 12.5% ad val.	2.2¢ per lb. + 11% ad val.	2¢ per lb. + 10% ad val.	1.7¢ per lb. + 8.5% ad val.	1.5¢ per lb. + 7% ad val.	1.25¢ per lb. + 6% ad val.
425.02	3¢ per lb. + 15% ad val.	2.7¢ per lb. + 13% ad val.	2.4¢ per lb. + 12% ad val.	2.1¢ per lb. + 10% ad val.	1.8¢ per lb. + 9% ad val.	1.5¢ per lb. + 7.5% ad val.
425.04	12.5% ad val.	11% ad val.	10% ad val.	8.5% ad val.	7% ad val.	6% ad val.
425.06	10.5% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
425.08	10.5% ad val.	9% ad val.	8% ad val.	7% ad val.	6% ad val.	5% ad val.
425.09	8.5% ad val.	7.5% ad val.	6.5% ad val.	5.5% ad val.	5% ad val.	4% ad val.

1/ In accordance with general note 3(f) to Schedule XX (Geneva - 1967), the rates of duty for this item in the columns headed 1970, 1971, 1972 will become effective unless the European Economic Community and the United Kingdom do not proceed with certain reductions provided for in their respective schedules annexed to the Geneva (1967) Protocol to the GATT. If these two participants do not so proceed, the President shall so proclaim, and the rate of duty in the column headed 1969 will continue in effect unless or until the President proclaims that they have agreed so to proceed. See related footnote 1 to Kennedy Round Staged Rates at the end of schedule 4, parts 3, 4, 5, 7, 8, 9, and 13; schedule 5, part 1; schedule 6, part 2; and schedule 7, parts 2, 9, 12, and 13.

A P P E N D I X B

Value of U.S. imports for consumption, by TSUS items included in the individual summaries in this volume, total and from the 3 principal suppliers, 1967

Value of U.S. imports for consumption, by TSUS items included in the individual summaries of this volume, total and from the 3 principal suppliers, 1967

(In thousands of dollars. The dollar value of imports shown is defined generally as the market value in the foreign country and therefore excludes U.S. import duties, freight, and transportation insurance)

Summary title and page; TSUS item	All countries: Amount in 1967	All countries: Percent change from 1966	First supplier: Country	First supplier: Value	Second supplier: Country	Second supplier: Value	Third supplier: Country	Third supplier: Value
Sodium arsenate (p. 3)								
420.70	22	-31	U.K.	22	-	-	-	-
Sodium bicarbonate (p. 5)								
420.72	255	+7	U.K.	250	W. Germany	5	-	-
Sodium bisulfate (niter cake) (p. 11)								
420.74	1/	2/	W. Germany	1/	-	-	-	-
Calcium borate, crude and sodium borate, crude and refined (p. 13)								
418.12	697	+55	Turkey	686	Canada	11	-	-
420.76	2	2/	Netherlands	1	Canada	1	-	-
420.78	1	2/	Denmark	1	-	-	-	-
Sodium carbonate, calcined (soda ash) (p. 19)								
420.84	-	-100	-	-	-	-	-	-
Sodium carbonate, hydrated and sesquicarbonate (p. 25)								
420.86	2	-84	U.K.	1	Japan	1/	-	-
Sodium chlorate (p. 29)								
420.88	572	+24	Canada	572	-	-	-	-
Sodium chloride (p. 33)								
420.92	129	-37	Canada	129	-	-	-	-
420.94	8,130	+34	Canada	4,450	Mexico	1,724	Bahamas	1,005
420.96	282	+36	Canada	281	U.K.	1	-	-
Sodium chromate and dichromate (p. 41)								
420.98	1,438	-65	Rep. SAF	494	U.S.S.R.	430	Japan	221
Cyanide compounds (p. 47)								
418.20	1,353	-6	Canada	1,351	Congo	2	-	-
418.69	97	-12	U.K.	96	Ireland	1	-	-
420.12	439	-19	W. Germany	219	Japan	80	Czecho.	19
421.02	2,642	+7	U.K.	913	W. Germany	693	Canada	458
422.73	35	-52	U.K.	24	Japan	11	Ireland	1
423.82	229	-1	W. Germany	177	Netherlands	51	Canada	1
Sodium and zinc hydrosulfites and mixtures (p. 53)								
421.06	17	-30	Switzerland	12	W. Germany	5	-	-
422.74	-	-	-	-	-	-	-	-
423.84	-	-	-	-	-	-	-	-

See footnotes at end of table.

Value of U.S. imports for consumption, by TSUS items included in the individual summaries of this volume, total and from the 3 principal suppliers, 1967--Continued

(In thousands of dollars. The dollar value of imports shown is defined generally as the market value in the foreign country and therefore excludes U.S. import duties, freight, and transportation insurance)

Summary title and page; TSUS item	All countries: Amount in 1967	All countries: Percent change from 1966	First supplier: Country	First supplier: Value	Second supplier: Country	Second supplier: Value	Third supplier: Country	Third supplier: Value
Sodium hydroxide (caustic soda) (p. 59)								
421.08	836	+37	Canada	359	W. Germany	290	Sweden	183
Sodium nitrite (p. 65)								
421.14	6	+201	U.K.	5	W. Germany	1	-	-
Sodium phosphates (p. 67)								
421.16	122	-33	W. Germany	122	-	-	-	-
421.18	-	-	-	-	-	-	-	-
421.22	3	-77	W. Germany	3	Canada	1/	-	-
Sodium silicate (p. 71)								
421.34	112	-57	Canada	74	U.K.	35	W. Germany	2
Sodium silicofluoride (p. 77)								
421.36	693	+104	Denmark	204	Netherlands	126	Spain	73
Sodium sulfate, crude (salt cake) (p. 81)								
421.42	4,312	+14	Belgium	2,353	Canada	1,527	W. Germany	432
Sodium sulfate, anhydrous (p. 85)								
421.44	190	-7	W. Germany	185	Canada	4	Belgium	1
Sodium sulfate, crystallized (Glauber's salt) (p. 89)								
421.46	4	-42	Canada	4	W. Germany	1/	-	-
Sodium sulfide (p. 93)								
421.52	51	2/	U.K.	51	-	-	-	-
Sodium sulfite, bisulfite, metabisulfite and thiosulfate (p. 97)								
421.54	157	+108	France	60	U.K.	40	W. Germany	40
Sodium compounds not elsewhere enumerated (p. 101)								
421.62	3,065	+2	W. Germany	1,374	U.K.	697	Netherlands	180
Strontianite and celestite (strontium minerals) (p. 107)								
421.70	2	-43	Italy	1	Canada	1	-	-
421.82	116	-56	U.K.	75	Mexico	37	Canada	4
Strontium compounds (p. 111)								
421.72	1	-40	U.K.	1	-	-	-	-
421.74	-	-	-	-	-	-	-	-
421.76	-	-	-	-	-	-	-	-
421.84	-	-	-	-	-	-	-	-
421.86	4	-89	W. Germany	3	U.K.	1	-	-

See footnotes at end of table.

Value of U.S. imports for consumption, by TSUS items included in the individual summaries of this volume, total and from the 3 principal suppliers, 1967--Continued

(In thousands of dollars. The dollar value of imports shown is defined generally as the market value in the foreign country and therefore excludes U.S. import duties, freight, and transportation insurance)

Summary title and page; TSUS item	All countries		First supplier		Second supplier		Third supplier	
	Amount in 1967	Percent change from 1966	Country	Value	Country	Value	Country	Value
Tellurium compounds (p. 115)								
421.90	-	-	-	-	-	-	-	-
Thallium compounds (p. 117)								
422.00	5	-26	W. Germany	4	Belgium	1	-	-
Thorium compounds (p. 119)								
422.10	-	-	-	-	-	-	-	-
422.12	7	+47	France	7	-	-	-	-
422.14	14	0	W. Germany	13	Switzerland	1	-	-
Tin compounds (p. 123)								
422.20	-	-100	-	-	-	-	-	-
422.24	16	2/	Mexico	16	-	-	-	-
422.26 3/	189	-59	Canada	89	Japan	57	U.K.	43
Titanium compounds (p. 127)								
422.30 3/	680	+138	Finland	474	W. Germany	100	Canada	44
Tungsten carbide (p. 131)								
422.40	9	-45	W. Germany	4	Canada	3	Sweden	2
Tungsten compounds, not elsewhere enumerated and mixtures (p. 135)								
416.40	-	-100	-	-	-	-	-	-
417.40	3	2/	France	3	-	-	-	-
418.30	78	-25	U.K.	47	W. Germany	31	-	-
420.32	-	-	-	-	-	-	-	-
421.56	-	-	-	-	-	-	-	-
422.42	7	-85	Netherlands	4	Canada	2	W. Germany	1
423.92	172	+1,373	Sweden	151	Canada	21	-	-
Uranium compounds (p. 139)								
421.58	-	-	-	-	-	-	-	-
422.50	12,593	-69	Rep. SAF	8,146	Spain	2,396	Canada	2,051
422.52	3	-59	Canada	3	-	-	-	-
Vanadium carbide (p. 141)								
422.58	1	-60	W. Germany	1	-	-	-	-
Vanadium compounds, not elsewhere enumerated and mixtures (p. 143)								
417.42	-	-	-	-	-	-	-	-
420.34	-	-	-	-	-	-	-	-
421.60	4	2/	W. Germany	4	-	-	-	-
422.60	80	2/	U.K.	67	Spain	13	-	-
422.62	6	+1,591	Japan	6	-	-	-	-
423.94	-	-100	-	-	-	-	-	-

See footnotes at end of table.

Value of U.S. imports for consumption, by TSUS items included in the individual summaries of this volume, total and from the 3 principal suppliers, 1967--Continued

(In thousands of dollars. The dollar value of imports shown is defined generally as the market value in the foreign country and therefore excludes U.S. import duties, freight, and transportation insurance)

Summary title and page; TSUS item	All countries: Amount in 1967	All countries: Percent change from 1966	First supplier: Country	First supplier: Value	Second supplier: Country	Second supplier: Value	Third supplier: Country	Third supplier: Value
Zinc arsenate (p. 147)								
422.70	-	-	-	-	-	-	-	-
Zinc chloride (p. 149)								
422.72	197	-26	Belgium	107	W. Germany	60	Canada	19
Zinc sulfate (p. 153)								
422.76	351	+99	Mexico	253	Belgium	70	W. Germany	26
Zinc compounds not elsewhere enumerated (p. 157)								
422.78 3/	89	-50	W. Germany	50	Canada	17	Italy	7
Zirconium compounds (p. 159)								
422.80	113	-29	U.K.	109	W. Germany	2	Japan	1
422.82	208	-5	Japan	87	U.K.	86	W. Germany	21
Boron carbide and chromium carbide (p. 161)								
422.90	469	-9	Canada	361	W. Germany	104	France	4
422.92	269	+27	W. Germany	257	U.K.	12	-	-
Sulfur dioxide (p. 163)								
422.94	248	+103	Canada	248	-	-	-	-
Inorganic compounds, not elsewhere enumerated (p. 165)								
423.00 3/	7,838	+17	W. Germany	3,964	Japan	1,271	U.K.	567
Mixtures of 2 or more inorganic compounds, not elsewhere enumerated (p. 171)								
423.96	4,614	+45	W. Germany	2,257	Canada	776	U.K.	599

1/ Less than $500.
2/ No imports in 1966.
3/ A study of reported imports established that the published data are incorrect; see text.

Source: Compiled from official statistics of the U.S. Department of Commerce.