BARITE, WITHERITE, AND BARIUM CHEMICALS

By Charles L. Harness and K. G. Warner [1]

SUMMARY OUTLINE

SUMMARY

The war and other factors caused substantial declines in the use of barite in certain industries but fostered expansion in other ways, so that the net demand remained high. More crude barite was produced in 1942 (449,873 short tons) than during any previous year except 1941 (483,391 tons). The quantity of crude barite sold or used by producers in 1942—429,484 tons valued at $2,673,002—was exceeded only by 1941 sales—503,156 tons valued at $3,134,234.

The largest single loss in markets for ground barite was in rotary oil-well drilling muds, reflecting a general decline in well-drilling activity in the United States. Demand for drilling muds in Trinidad and Venezuela was active, but sufficient shipping space was not available to meet requirements. Consumption of barite for lithopone and blanc fixe manufacture also decreased, owing to the curtailed use of the finished products in paints and civilian white goods, such as linoleum, oilcloth, and rubber goods.

The quantity of crude barite consumed in making barium chemicals reached an all-time high in 1942. However, the tonnage of chemicals produced declined slightly owing to the reduced output of lithopone, which requires less barite per unit weight than other barium chemicals. Sales of barium carbonate, principally for use in case-hardening steel and in preventing efflorescence in structural brick, increased substantially, as did sales of barium nitrate for flares and barium peroxide for hydrogen peroxide manufacture.

Imports of crude barite in 1942 were 4,680 short tons from Canada and Cuba compared with 456 in 1941, all from Cuba. Imports of witherite (from Great Britain) were 3,066 tons in 1942 compared with 4,790 in 1941. Exports of barite from the United States are not reported separately.

[1] Figures on imports and exports compiled by M. B. Price, of the Bureau of Mines, from records of the Department of Commerce.

Salient statistics of the barite, witherite, and barium chemical industries in the United States, 1938–42

	1938	1939	1940	1941	1942
Barite:					
Crude:					
Produced short tons	335,433	365,870	390,462	483,391	449,873
Sold or used by producers:					
Short tons	309,663	383,609	409,353	503,156	429,484
Value: [1]					
Total	$2,004,521	$2,344,103	$2,596,743	$3,134,234	$2,673,002
Average	$6.47	$6.11	$6.34	$6.23	$6.22
Imports for consumption:					
Short tons	24,845	11,588	7,391	456	4,680
Value: [2]					
Total	$151,235	$55,985	$41,342	$2,518	$34,756
Average	$6.09	$4.83	$5.59	$5.52	$7.43
Apparent new supply [3] short tons	334,508	395,197	416,744	503,612	434,164
Domestic percent	92.6	97.1	98.2	99.9	98.9
Reported consumption (total) short tons	364,985	391,683	404,388	490,833	449,424
Ground (and crushed):					
Sold or used by producers:					
Short tons	161,422	170,695	184,390	234,877	178,765
Value	$2,786,823	$2,902,973	$3,697,806	$4,606,832	$3,611,745
Imports for consumption:					
Short tons	1,700	1,590	314		
Value	$15,466	$14,999	$3,299		
Witherite:					
Imports for consumption:					
Short tons	2,115	3,819	3,584	4,790	3,066
Value	$43,568	$64,106	$70,126	$107,238	$60,824
Barium chemicals:					
Sold or used by producers: [4]					
Short tons	165,680	183,748	198,201	245,952	207,434
Value	$12,085,012	$12,791,269	$12,868,417	$16,949,120	$17,678,769
Imports for consumption:					
Short tons	4,519	3,205	191	317	365
Value	$254,874	$172,490	$9,045	$15,944	$103,156
Exports of lithopone:					
Short tons	1,734	4,845	14,298	21,527	17,036
Value	$153,567	$392,798	$1,112,362	$2,079,229	$1,732,898

[1] F. o. b. mine shipping point.
[2] Declared value f. o. b. foreign market.
[3] Barite sold or used by producers plus imports.
[4] 1938–41: To avoid duplication, the barium chemicals reported here do not include the output of firms that make these chemicals from such products as barium chemicals and imported barite and witherite purchased in the open market. 1942: Includes barium chemicals made from barium chemicals and imported barite and witherite purchased in the open market. The data have been adjusted to remove duplication.

BARITE

CRUDE

PRODUCTION

Total mine output of crude barite in 1942—449,873 short tons—was greater than in any previous year except 1941, when a record quantity—483,391 tons—was mined. Excellent demand maintained mining activity at high levels in the Southern, Midwestern, and Western barite-mining districts throughout the year.

When imports of German barite began to decline in 1938, production in the Southern district (Alabama, Georgia, South Carolina, Tennessee, and Virginia) expanded to meet requirements on the East coast. These requirements totaled about 220,000 tons annually, including about 180,000 tons of domestic origin, chiefly from the Southern district, and about 40,000 tons of crude imported barite, mostly from Germany. The German barite found a ready market on the East coast despite an import duty of $4 a ton. In meeting wartime demands, production of crude barite in the Southern district in 1942 exceeded all previous years except 1941. In the Midwestern district

(Missouri and Arkansas) production increased slightly, as losses in well-drilling-mud markets were compensated by increased demands of lithopone and barium chemical plants in Illinois and Missouri. In the Western district barite output declined slightly, owing to decreased use of barite in California well drilling, but requirements for the manufacture of barium chemicals at Modesto, Calif., remained substantial. Barite was produced in Nevada and New Mexico; the output in the latter State was held in stock.

Crude barite sold or used by producers in the United States, 1941–42, by States

State	1941		1942	
	Short tons	Value	Short tons	Value
Georgia	104,446	$553,445	86,636	$483,261
Missouri	212,718	1,337,756	146,270	943,131
Tennessee	104,511	779,565	83,291	624,584
Other States [1]	81,481	463,468	113,287	622,026
	503,156	3,134,234	429,484	2,673,002

[1] 1941: Arkansas, California, Colorado, Nevada, South Carolina, Texas, and Virginia; 1942: Alabama, Arkansas, California, Nevada, South Carolina, and Virginia.

Hubbell[2] prepared interesting articles on two of the largest producers of barite in the United States—L. A. Wood Co., Sweetwater, Tenn., and New Riverside Ochre Co., Cartersville, Ga. The L. A. Wood Co. operates seven open-pit mines in the Sweetwater district—the Stephens, Harmon, Garrison, Pond Creek, Fork Creek, Roy, and Calhoun. Each of the mines has its own washing plant, including log washers and jigs. The output of the mines is accumulated at a railroad yard for loading. The yard is equipped with a kiln for decrepitating some of the material to facilitate screening out iron oxide, thus yielding a purer product for glass use. The firm, under the name of the Barytes Mining Co. (Cartersville, Ga.), also mines barite from an open pit in north Georgia. Two grades of barite are produced at the Georgia mine—one about 96 percent barium sulfate, the other about 92 percent.

New Riverside Ochre Co. mines barite from five open pits in the Cartersville (Ga.) area. The crude material is dug with five caterpillar-mounted shovels and moved from the pits to the plant in trucks. Overburden ranges from a film to over 60 feet. Working benches are operated at about 15 feet. Approximately 8 tons of barite-bearing material are needed to produce 1 ton of washed barite. Treatment at the washing plant includes log washing, screening, crushing, jigging, and tabling. Three grades are produced: (1) A low-grade product containing about 92 percent barium sulfate and 5 percent iron oxide for use in oil-well drilling muds; (2) a 96-percent grade, maximum 1.0 percent iron oxide, for lithopone manufacture; and (3) glass grade, 98 percent barium sulfate, maximum 0.3 percent iron oxide. In making the glass grade, iron oxide is removed by magnetic separation.

Zapp[3] examined barite occurrences in the Llano (Tex.) area and

[2] Hubbell, A. H., Barytes—Nonmetallic Product of Eastern Tennessee: Eng. and Min. Jour., vol. 144, No. 1, January 1943, pp. 63–65. New Riverside—Producer of Barytes in Georgia: Eng. and Min. Jour., vol. 143, No. 10, October 1942, pp. 62–65.

[3] Zapp, Alfred, Barite in Northern Llano County: University of Texas Mineral Resource Survey Circ. 35, September 25, 1941, 6 pp.

found that, although barite did not appear to occur commercially in the locality, core drilling might reveal larger deposits.

PRICES

The opening 1942 quotation for crude barite from Georgia was $8 a long ton, f. o. b. mine, rising to $9 in April 1942, according to E&MJ Metal and Mineral Markets. From 1935 to 1940 the price was $7 a long ton. Missouri crude barite, 93 percent $BaSO_4$, was quoted at $6 to $6.35 a long ton, f. o. b. mine, in January 1942, rising to $6.75 to $7.25 a long ton in April. Missouri crude, 95 percent $BaSO_4$, maximum 1 percent iron oxide, was quoted at $6.25 to $7.00 a long ton in January but rose to $7 to $7.50 in April.

The average value, f. o. b. mine shipping point, of crude barite for the entire United States, as shown by compilations from reports to the Bureau of Mines, was $6.22 in 1942 compared with $6.23 in 1941.

CONSUMPTION

Crude barite (domestic and imported) used in the manufacture of ground barite and barium chemicals in the United States, 1938–42, in short tons

Year	In manufacture of—			Total	Year	In manufacture of—			Total
	Ground barite [1]	Lithopone	Barium chemicals			Ground barite [1]	Lithopone	Barium chemicals	
1938	193,728	117,007	54,250	364,985	1941	243,846	153,982	93,005	490,833
1939	192,112	141,556	58,015	391,683	1942	200,443	144,821	104,160	449,424
1940	200,899	136,885	66,604	404,388					

[1] Includes some crushed barite.

Crude barite (domestic and imported) used in the manufacture of ground barite and barium chemicals in the United States in 1942, by States

State	Product manufactured	Plants [1]	Barite used (short tons) [2]
Missouri	Ground barite and chemicals	3	68,529
California	Ground barite, lithopone, and chemicals.	8	39,207
Delaware and New Jersey	do	6	60,939
Illinois	do	6	51,777
Colorado	Chemicals	1	
Ohio	do	1	
West Virginia	do	3	
Kansas	Lithopone	1	
Maryland	do	1	
Pennsylvania	do	1	
Georgia	Ground barite and chemicals	2	228,972
New York	Ground barite	1	
Arkansas	do	2	
South Carolina	do	1	
Tennessee	do	2	
Texas	do	1	
Louisiana	do	1	
		41	449,424

[1] A plant producing more than 1 product is counted but once in arriving at State totals.
[2] Includes some crushed barite.

WORLD PRODUCTION

Canada.—Barite output more than doubled in 1942 over 1941.[4] Of the total production, 16,667 short tons, Nova Scotia produced 14,849 and British Columbia 1,818. The Nova Scotia mine, at Walton, Hants County, is comparatively new, having begun shipments in 1941. It is operated by Canadian Industrial Minerals, Ltd., a subsidiary of Springer Sturgeon Gold Mines, Ltd. According to The Northern Miner,[5] the firm ships most of its output to Trinidad for oil-well drilling mud. About two-thirds of the Nova Scotia sales is ground barite and the remainder crude barite. The British Columbia deposit is 23 miles southeast of Golden; most of the output is shipped to a grinding plant at Montreal. The deposit has been known for a number of years, but until recent road construction was undertaken by the British Columbia Government it was inaccessible to trucks. Trenching indicates a large tonnage of a pure white barite, analyzing about 98 percent barium sulfate.

Cuba.—Shipments of barite from Cuba, going mainly to Trinidad and the United States, declined somewhat in 1942 compared with 1941,[6] probably owing to lack of shipping space. Cuban barite is produced in the Provinces of Oriente and Pinar del Rio. The latter area is the chief source, as the Oriente deposits are somewhat inaccessible. The Cuban output is ground at Regla near Habana.

Eire.—Barite is mined in western Ireland from a vertical fissure vein about 7 feet wide that cuts Carboniferous limestone, it is reported.[7] Benbulben Barytes, Ltd., operating the mine, ships crude, ground, and micronized barite, principally to Great Britain for use in lithopone manufacture and as a paint extender. The material analyzes about 96 to 98 percent barium sulfate, the impurities being chiefly silica.

Germany.—Before 1939 Germany was the chief producer of barite, supplying nearly half the world output. German production in 1937 was 452,388 and in 1938, 480,877 metric tons. Subsequent data are not available, but loss of export markets for crude and ground barite and barium chemicals has probably curtailed current output. Prussia is the chief producing State, followed by Baden. The barite occurs chiefly in veins and is recovered by underground mining.

Italy.—Annual production, which comes from about 40 deposits, is said to exceed 50,000 tons. The principal workings are near Trent, on the Island of Sardinia, in the Val D'Aosta, in Valassina, and in Tuscany.

United Kingdom.—Production of barite in the United Kingdom has increased greatly since 1939, owing mainly to cessation of imports from Germany. Large deposits of barite are available in Ayrshire, Devonshire, Shropshire, and Derbyshire, but it is said that production cannot meet demand.[8]

Much witherite is substituted for barite in England (see Witherite section of this chapter).

[4] Canadian Mining Journal, vol. 64, No. 2, February 1943, pp. 60–61.
[5] Northern Miner, vol. 29, No. 6, April 29, 1943, p. 17.
[6] Bureau of Mines Mineral Trade Notes, Confidential Series 7, January 1943, p. 17.
[7] Bureau of Mines Mineral Trade Notes, Confidential Series 2, August 1942, pp. 23–24. Confidential Series 4, October 1942, p. 24.
[8] Chemical and Engineering News, vol. 20, No. 7, April 10, 1942, p. 467.

World production of barite, 1937–42, by countries, in metric tons [1]

[Compiled by B. B. Waldbauer]

Country [1]	1937	1938	1939	1940	1941	1942
Algeria	2,137	3,069	(2)	(2)	(2)	(2)
Argentina			768	2,680	4,174	(2)
Australia:						
New South Wales	268	322	(2)	(2)	(2)	(2)
South Australia	2,736	2,909	3,886	3,672	3,631	(2)
Tasmania	77			(2)	(2)	(2)
Victoria	71			(2)	(2)	(2)
Brazil (exports)	600	(2)	(2)	(2)	(2)	(2)
Canada			(2)	307	6,043	15,120
Chosen	8,400	(2)	(2)	(2)	(2)	(2)
Cuba	3,849		12,000	16,105	13,223	(2)
Egypt	51	20	31	61	30	(2)
France	19,850	(2)	(2)	(2)	(2)	(2)
Germany:						
Austria	855	373	(2)	(2)	(2)	(2)
Baden	21,653	36,305	(2)	(2)	(2)	(2)
Bavaria	11,832	26,748	(2)	(2)	(2)	(2)
Prussia [3]	410,634	401,906	(2)	(2)	(2)	(2)
Saxony	432	230	(2)	(2)	(2)	(2)
Thuringia	6,790	15,315	(2)	(2)	(2)	(2)
Württemburg	192		(2)	(2)	(2)	(2)
Greece	39,343	34,700	24,055	(2)	(2)	(2)
India, British	15,941	8,205	9,404	(2)	(2)	(2)
Indochina	45	50	155	185	(2)	(2)
Italy	45,202	48,169	(2)	(2)	(2)	(2)
Norway	70			(2)	(2)	(2)
Portugal	113	24	25	20	(2)	(2)
Southern Rhodesia		91	50	(2)	(2)	(2)
Spain		500	8,606	9,936	(2)	(2)
Union of South Africa	570	491	439	691	[4] 1,326	[5] 448
United Kingdom	74,485	77,543	(2)	(2)	(2)	(2)
United States	327,380	304,298	331,910	354,219	438,523	408,116

[1] In addition to the countries listed, barite is produced in China, Czechoslovakia, Eire, Japan, and U. S. S. R., but data on production are not available.
[2] Data not available.
[3] Official figures which, it is reported, cover only output of mines included under the mining law.
[4] January to October, inclusive.
[5] January to September, inclusive.

GROUND (AND CRUSHED)

SALES

All principal uses of ground (and crushed) barite sold or used by producers declined in 1942, and the total, though comparing favorably with pre-1940 output, was 24 percent less than the record 1941 sales. In its individual consumption outlets, demand for use in well drilling dropped 24 percent, in paint 40 percent, in glass 3 percent, and in rubber 35 percent.

Ground (and crushed) barite sold or used by producers in the United States, 1938–42

	1938	1939	1940	1941	1942
Plants	14	13	16	16	19
Short tons	161,422	170,695	184,390	234,877	178,765
Value	$2,786,823	$2,902,973	$3,697,806	$4,606,832	$3,611,745

Ground (and crushed) barite sold or used by producers, 1940–42, by consuming industries

Industry	1940		1941		1942	
	Short tons	Percent of total	Short tons	Percent of total	Short tons	Percent of total
Well drilling	138,055	75	154,760	66	117,380	66
Paint	11,056	6	31,009	13	18,484	10
Glass	12,697	7	22,615	10	21,895	12
Rubber	4,283	2	9,800	4	6,334	4
Undistributed	18,299	10	16,693	7	14,672	8
	184,390	100	234,877	100	178,765	100

Virtually all barite is ground or crushed before use, but "ground (and crushed) barite" is generally held to mean barite ground for use other than in barium chemicals or lithopone, and such meaning is adhered to in this chapter. Nearly all ground barite is used for its physical rather than its chemical properties, except for the quantity consumed in glass batches.

As in years past, rotary oil-well drilling muds absorbed the greater part of the ground-barite output in 1942, although the number of wells drilled was considerably less than in 1941. The following table shows the relation between wells drilled and ground barite consumed in drilling muds.

Ground barite consumed in drilling wells in the United States, 1938–42

Year	Wells drilled [1]	Ground barite used (short tons)		Year	Wells drilled [1]	Ground barite used (short tons)	
		Total	Per well drilled			Total	Per well drilled
1938	26,712	126,697	4.74	1941	29,070	154,760	5.32
1939	25,987	125,560	4.83	1942	17,934	117,380	6.55
1940	28,124	138,055	4.91				

[1] Oil, gas, and dry wells drilled in United States, as recorded in chapters of this series on Crude Petroleum and Petroleum Products.

Barite has several functions in drilling muds, the principal one being to confine gas and oil to their respective formations during drilling. Barite drilling muds also seal the walls of the hole and lubricate the drilling mechanism.

Foreign demand for barite drilling muds has expanded considerably since 1938, particularly in Trinidad and Venezuela. American, Cuban, and Canadian producers competed in these markets in 1942. The Southern and Midwestern districts generally supply most of the ground barite exported from the United States for well drilling, shipping 10,000 to over 20,000 tons annually, depending on foreign demand, through Mobile, Ala., New Orleans, La., and other Gulf ports.

One of the newer uses for crushed barite is in glassmaking, where it acts as a flux in the glass batch, permitting lower furnace temperature or increased output at the usual temperature. Barium compounds, particularly precipitated barium carbonate, are used in optical, bottle, and flat glasses, not only as fluxes but to impart density and brilliance to the finished product. As barium glasses corrode

ordinary glass pots, special types of pots are generally required. According to a communication received by the Bureau of Mines from a large glass producer, the specifications of glass-grade barite are somewhat as follows: Barium sulfate, not less than 96 percent; moisture, not over 3 percent; iron oxide, not over 0.4 percent; titanium oxide, not over a trace; no particles coarser than 16-mesh; not over 3 percent plus 20-mesh; not over 40 percent minus 100-mesh; not less than 15 percent minus 100-mesh.

Ground barite has certain advantages as a paint extender. It has low oil absorption and fair sanding properties and contributes to a dense, nonporous film. Barite is added to inside paints to aid easy working with the brush; owing to the low oil absorption, considerable quantities can be incorporated without bodying. Its low tinting strength makes it a good base for colored as well as white pigments.

Ground barite is also used as a filler for paper, paper board, wallpaper, rubber goods, linoleum, and oilcloth. A recent novel use is in weighting concrete ballast for drydock caissons. Barium cements containing as much as 50 percent barium oxide have high specific gravity. This suggests their possible use, in conjunction with such heavy aggregates as barite, in making heavy concrete blocks to be substituted for pig iron in ships' ballast.

PRICES

The price quoted in Chemical Industries for ground barite, carlots, 350-pound barrels, works, was $27.65 a short ton in 1942, the same as in 1941.

FOREIGN TRADE

There were no imports of ground barite in 1941 and 1942. Imports for 1938–40 are shown in the salient statistics table of this chapter. Exports of ground barite are not reported separately.

WITHERITE

PRODUCTION

The Baroid Sales Division of the National Lead Co., which operates a mine near El Portal, Calif., is the only producer of witherite in the United States. Figures on output are not available for separate publication but are combined with those of barite.

Deposits of witherite in North America were reviewed in the chapter of this series in Minerals Yearbook, 1941.

Nearly the entire world production of witherite is centered in northern England. Sources, preparation, and uses of witherite have been reviewed by Muddiman [9] and Michell.[10] Jameson [11] reviewed methods of analyzing witherite.

In British paint formulas, ground witherite has been substituted for ground barite for mixing with ultramarine blue to make a green pigment, and it is claimed that such substitution improves the product.[12]

[9] Muddiman, E. W., Witherite: Jour. Oil Col. Chem. Assoc., vol. 25, 1942, pp. 127–142; British Chem. and Physiol. Abs., B, I, III, October 1942, p. 416.

[10] Michell, F. B., Barite and Witherite: Mine and Quarry Eng., vol. 7, 1942, pp. 37–40, 44; Chem. Abs., vol. 36, No. 11, June 10, 1942, p. 3123.

[11] Jameson, F. L., Examination of Natural White Pigments: Paint Mfr., vol. 12, 1942, pp. 145–146, 153; Chem. Abs., vol. 36, No. 21, November 10, 1942, p. 6817.

[12] Bureau of Foreign and Domestic Commerce, Foreign Commerce Weekly, vol. 9, No. 10, December 5, 1942, p. 33.

PRICES

According to Chemical Industries, the price of ground witherite in 1942 remained constant at $43 a short ton in carlots, bags, works, for the 90-percent grade, the same price as in 1941.

IMPORTS

Receipts of witherite were 3,066 short tons valued at $60,824 in 1942, all from Great Britain, compared with 4,790 tons valued at $107,238 in 1941. Exports of witherite, if any, are not reported separately.

Witherite, crude, unground, imported for consumption in the United States, 1938–42

[Value at port of shipment]

Year	Short tons	Value	Year	Short tons	Value
1938	2,115	$43,568	1941	4,790	$107,238
1939	3,819	64,106	1942	3,066	60,824
1940	3,584	70,126			

BARIUM CHEMICALS

SALES

War conditions increased the demand for certain barium chemicals in 1942 but curtailed the production of others, particularly those whose principal uses were closely connected with civilian consumption.

All barium chemicals in the United States are derived from barite, except a small quantity obtained from witherite. Barite is crushed and roasted with coal, coke, or petroleum-coke breeze in a rotary kiln for

Barium chemicals sold or used by producers in the United States, 1938–42 [1]

Chemical	1938	1939	1940	1941	1942
Lithopone: [2]					
Plants	11	11	11	9	9
Short tons	125,746	142,759	151,802	176,642	137,320
Value	$9,975,012	$10,461,102	$10,197,897	$12,550,193	$10,828,924
Blanc fixe (precipitated barium sulfate):					
Plants	7	6	6	6	5
Short tons	19,428	18,653	22,247	29,352	21,278
Value	$921,203	$898,198	$1,250,303	$1,806,882	$1,403,689
Artificial barium carbonate (chemically precipitated):					
Plants	4	5	5	5	7
Short tons	9,543	12,478	13,339	17,477	18,174
Value	$459,901	$617,799	$616,331	$785,486	$1,012,522
Other barium chemicals: [3]					
Plants	5	7	7	7	11
Short tons	10,963	9,858	10,813	22,481	30,662
Value	$728,896	$814,170	$803,886	$1,806,559	$4,433,634
Total barium chemicals:					
Short tons	165,680	183,748	198,201	245,952	207,434
Value	$12,085,012	$12,791,269	$12,868,417	$16,949,120	$17,678,769

[1] 1938–41: To avoid duplication, the barium chemicals reported here do not include the output of firms that make these chemicals from such products as barium chemicals and imported barite and witherite purchased in the open market. 1942: Includes barium chemicals made from barium chemicals and imported barite and witherite purchased in the open market. The data have been adjusted to remove duplication.

[2] Does not include cadmium lithopone.

[3] Figures cover chemicals, in order of value, as follows: 1938: Chloride, dioxide, sulfide, hydroxide, and oxide; 1939: Chloride, dioxide, hydroxide, sulfide, and oxide; 1940: Chloride, dioxide, hydroxide, sulfide, oxide, and nitrate; 1941: Chloride, sulfide, dioxide, hydroxide, nitrate, oxide, and tribarium aluminate; 1942: Nitrate, 11,489 tons, $2,483,115; chloride, 13,414 tons, $960,876; dioxide, 2,844 tons, $666,232; hydroxide, 2,335 tons, $267,572; sulfide and oxide, 580 tons, $55,839.

about 4 hours, yielding black ash, which contains about 80 percent barium sulfide. The black ash is leached with hot water to give barium sulfide liquor. There were 21 producers of black ash in 1942, compared with 18 in 1941. The Bureau of Mines does not report the output of black ash, as this is regarded as an intermediate barium chemical. Where possible only finished barium chemicals not used in the manufacture of other barium chemicals are reported.

Production of lithopone, long a major outlet for barite, declined in 1942 to 137,320 short tons, the lowest figure since 1938. There were nine producers in 1942, as in 1941. Paint remained the largest use of lithopone, but increasing military uses of paint did not compensate for losses in civilian paint markets caused by reduced construction of civilian dwellings and the shortage of painters for general maintenance work. Lithopone paint markets were also said to have been adversely affected by a growing use of titanium pigments in the white-pigment field. Shortages of linseed and other drying oils used with lithopone in the manufacture of linoleum and oilcloth held down production of these two commodities, which ordinarily consume 17,000 to 20,000 tons of lithopone annually. The declining production of rubber white goods has forced a corresponding decrease in the amount of lithopone needed for this purpose.

Lithopone[1] *sold or used by producers, 1940–42, by consuming industries*

Industry	1940		1941		1942	
	Short tons	Percent of total	Short tons	Percent of total	Short tons	Percent of total
Paints, enamels, and lacquers	117,075	77	132,691	75	109,216	80
Floor coverings and textiles	18,738	13	21,114	12	15,775	11
Rubber	3,387	2	3,547	2	1,047	1
Other	12,602	8	19,290	11	11,282	8
	151,802	100	176,642	100	137,320	100

[1] Does not include cadmium lithopone.

Manufacturers of lithopone generally purchase washed and jigged barite analyzing about 96 percent barium sulfate, 1 to 2 percent Fe_2O_3, less than 1.75 percent silica, and no more than traces of zinc, lead, and fluorides. The barite is crushed and roasted with coal to form black ash as described above. The solution of barium sulfide obtained from black ash is reacted with a solution of zinc sulfate, whereby lithopone (barium sulfate intimately mixed with zinc sulfide) is precipitated; it is then dried, roasted, quenched in water, ground, bagged, and sold.

Lithopone has been suggested as a carrier pigment for luminous paints.[13]

The demand for blanc fixe declined owing to curtailment in use of white paint, rubber goods, linoleum, and oilcloth, its major outlets. Blanc fixe is made by reacting a solution of sodium sulfate with a solution of barium sulfide, precipitating barium sulfate (blanc fixe) and leaving a valuable byproduct—sodium sulfide—in solution. Blanc fixe is also a byproduct of the manufacture of hydrogen peroxide by the barium peroxide-sulfuric acid process. Five producers of

[13] Chemical and Engineering News, vol. 20, No. 8, April 25, 1942, p. 529.

blanc fixe reported to the Bureau of Mines in 1942 compared with six in 1941.

Barium carbonate production expanded to meet added demands in several fields. There were seven producers in 1942, five in 1941. This barium chemical is generally made by adding a solution of soda ash to one of barium sulfide, thereby precipitating insoluble barium carbonate, leaving byproduct sodium sulfide in solution. Probably the most important direct wartime use of barium carbonate is in salt baths for case-hardening bomb shells, tools, and other steel parts. Before the war witherite, being less costly, was employed for this purpose rather than precipitated barium carbonate; however, reduced imports of witherite have broadened, at least temporarily, the demand for the synthetic material. The action of barium carbonate as a carbon carrier in steel hardening is not precisely known, but when it is mixed with powdered coke and heated with iron parts at 1,700° F., the coke is gradually oxidized and the carbon content of the surface grains of the iron is increased, thus case-hardening the product. Other barium compounds, notably barium peroxide, are said to be capable of similar use. Barium carbonate is an intermediate in the manufacture of certain other barium chemicals, particularly barium peroxide and barium nitrate. In making the peroxide, barium carbonate is calcined with coke, yielding the oxide, which is then heated with air or oxygen under pressure, yielding a mixed barium peroxide-oxide. The percentage of peroxide obtained depends on the efficiency of the process used. Although most hydrogen peroxide is today made by electrolytic oxidation methods, substantial quantities of barium peroxide are still used to make hydrogen peroxide. There were three producers of barium peroxide in 1942, two in 1941. Barium carbonate can be used in glassmaking, as previously mentioned. The carbonate and other barium compounds are used in brickmaking to prevent formation of scum.

Barium nitrate is generally obtained by treating the carbonate with nitric acid. The nitrate is used in green signal flares and in explosives. In 1942, five firms reported production of barium nitrate compared with three in 1941.

Barium chloride, which may be crystallized from a solution of barium sulfide and calcium chloride, is used to purify salt brines for chlorine and sodium hydroxide manufacture, in making coatings for photographic paper, in the manufacture of extended titanium pigments, in color lakes, in finishing white leather, and in purifying beet-sugar juice. Three firms produced barium chloride in 1942, as in 1941.

Barium hydroxide was produced by four companies in 1942 (four in 1941), principally for use in beet-sugar purification and for refining animal and vegetable oils.

PRICES

Range of quotations on barium chemicals, 1940–42 [1]

	1940	1941	1942
Lithopone:			
Domestic, ordinary, delivered, bags, pound	$0.03⅜	$0.0385–$0.04¼	$0.04¼
Do. barrels, do.	.03¾	.041 – .04½	.04½
High strength, bags, do.	.05		
Do. barrels, do.	.05¼		
Titanated, bags, do.	.05¼	.05¼ – .056	.056
Do. barrels, do.	.05½	.05½ – .0585	.0585
Barium carbonate, precipitated, 200-pound bags, works, short ton	$45.00 –62.50	45.00 –65.00	$55.00 –65.00
Barium chlorate, 112-pound kegs, New York, pound	.20 – .45	.45	.60
Barium chloride, barrels, delivered zone 1, short ton	77.00 –92.00	77.00 –92.00	77.00 –92.00
Barium dioxide (binoxide or peroxide), 88 percent, drums, pound	.10 – .12	.10	.10
Barium hydrate, 500-pound barrels, do.	.05½ – .07	.05½ – .07	.06 – .07
Barium nitrate, barrels, do.	.09½ – .10½	.08½ – .12½	.10½ – .12½
Barium sulfate, precipitated (blanc fixe), 400-pound barrels, works [2], short ton	50.00 –80.00	35.00 –46.50	40.00 –46.50

[1] Chemical Industries (formerly Chemical Markets), New York (monthly).
[2] Lowest price for pulp grade, highest for high-grade precipitated.

FOREIGN TRADE

Barium chemicals imported for consumption in the United States, 1938–42

[Value at port of shipment]

Year	Lithopone		Barium dioxide		Blanc fixe (precipitated barium sulfate)		Barium carbonate (precipitated)	
	Short tons	Value	Pounds	Value	Short tons	Value	Short tons	Value
1938	3,932	$207,121	100	$13	106	$5,102	(1)	$32
1939	2,641	130,893	350	51	38	1,891		
1940								
1941	(2)	9	4,032	208	15	865		
1942					28	1,357		

Year	Barium chloride		Barium nitrate		Barium hydroxide		Barium oxide		Barium compounds (n. e. s.)	
	Short tons	Value	Short tons	Value	Short tons	Value	Pounds	Value	Short tons	Value
1938	69	$2,351	126	$12,061	236	$16,874			50	$11,320
1939	39	1,329	100	11,094	360	19,975	22	$13	27	7,244
1940			18	1,427	151	3,332			22	4,286
1941					292	10,791			8	4,071
1942	36	15,770	(3)	1	147	9,361			154	76,667

[1] 110 pounds. [2] 112 pounds. [3] 53 pounds.

Lithopone exported from the United States, 1938–42

Year	Short tons	Value		Year	Short tons	Value	
		Total	Average			Total	Average
1938	1,734	$153,567	$88.56	1941	21,527	$2,079,229	$96.59
1939	4,845	392,798	81.07	1942	17,036	1,732,898	101.72
1940	14,298	1,112,362	77.80				