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Bismuth

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BISMUTH

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Bismuth continues to be one of the metals that is imported in large quantities. This is due to the limited domestic production. The outlook for increased production, however, is very bright. The imports in recent years have been falling off steadily. No large deposits of bismuth ore are known in the United States, but several rich deposits are found in Colorado. The ore is not mined for its bismuth content. The principal producers are the U. S. Smelting, Refining and Mining Company, Grasselli, Ind., and the American Smelting and Refining Company, Omaha, Neb. The bismuth is obtained as a by-product in the electrolytic refining of lead. Bismuth from this source amounted to about 185,000 lb. during the year 1913

The following table gives the imports since 1904:

Year.	Quantity, lb.	Value.
1904	161,240	$295,200
1905	153,668	305,471
1906	243,926	378,652
1907	215,647	262,775
1908	225,833	313,919
1909	176,729	274,662
1910	200,221	316,838
1911	178,298	321,360
1912	166,980	305,282
1913 (a)	151,030	257,176

(a) Dept. of Commerce.

In spite of the facility with which it is handled metallurgically bismuth commands a high price. This is due to its scarcity and the control of the market by a foreign syndicate. Bismuth can probably be produced at a cost of about 25 cents per pound, but sells at from $1.75 to $2.00 per pound.

The world depends largely upon South America for the supply of bismuth. Bolivia is the chief producer. The main output comes from the Tazna district, though rich bismuth ores occur generally in the district centering about La Paz and Chorolque. Recently veins have been opened in the Department of Potosi. The following table gives the output of Bolivia for recent years:[1]

Year.	Quantity, Metric tons.
1909	139
1910	134
1911	242
1912	263
1913	275

[1] Bismuth: Its Properties and Sources of Supply, T. H. Osborne, *Chem. Eng.*, XVII, 4.

In Peru are many localities in which bismuth ores are found, but at present only one deposit is being worked. During the year 1913, about 200 tons of bismuth concentrate were shipped. The ores average 1 to 2 per cent. bismuth.

Several deposits of bismuth are known in Brazil but have not yet been developed. It is not known whether these deposits can be worked profitably. Near Potrero Grande, Chile, a mineral, called chilenite and consisting of an alloy of bismuth and silver, is found.

A few years ago mines were opened near Herberton, Queensland for wolfram which at that time was commanding a high price. These deposits, which contain from 7 to 8 per cent. bismuth, were abandoned, but recently have been reopened for the bismuth content. The veins, made up of topaz, wolfram and bismuth carbonate, vary in thickness from 8 to 13 in. Near Maldon, Victoria, occurs a molybdenite containing 5 per cent. bismuth, also a bismuth pipe with 26 per cent. The occurrence of native bismuth associated with tin veins is reported from Madagascar.[1] The production of bismuth minerals in Australia for recent years is shown in the following table:

PRODUCTION OF BISMUTH MINERALS IN AUSTRALIA
(Tons of 2240 lb.)

Year.	Queensland.		New South Wales.	
	Tons.	Value.	Tons.	Value.
1903	11.0	£2,523	21.7	£9,537
1904	20.9	3,581	40.3	12,329
1905	15.3	5,368	55.8	20,763
1906	6.5	1,882	25.9	5,700
1907	6.3	1,806	16.3	5,268
1908	22.7	10,595	8.7	2,017
1909	10.3	2,271	8.6	1,624
1910	21.0	9,708	6.4	2,004
1911	9.8	5,525	7.9	1,800
1912	5.0	2,835	5.8	1,210
1913	.....	.....	.....	.....

The report of the Secretary of Mines of Tasmania shows a production in 1913 of 5.08 tons of bismuth, valued at £1627.

Europe.—Bismuth is obtained from lead and silver ores in Saxony, in Bohemia and South Germany. Refined bismuth from Saxony contains 99.98 per cent. bismuth and small quantities of lead and copper.

Canada.—Bismuth occurs on the Stewart River, the Montreal River, at New Ross, Lunenberg County, near Kewagama Lake, Quebec, and near Lyndock and Clarendon, Ontario.

Bismuth has been produced in Spain, Japan, Norway and Rhodesia, but the production in recent years has fallen off considerably.

[1] Bismuth-bearing Minerals from the Pegmatites of Madagascar, A. Lacroix; *Bull. Soc. franc. min.* XXXV, 92-5.

Metallurgy.—Bismuth is extracted from its ores by treatment with hydrochloric acid and subsequent precipitation of the bismuth with either water or iron. The precipitate is then reduced by heating with carbon. In Germany the ore is roasted which results in a uranium-bearing slag, a cobalt speiss, and a crude bismuth matte from which the bismuth is obtained by crystallization. Lacey describes the refining of silver-bismuth alloys by electrolysis.[1]

Properties and Uses.—Bismuth is a silver white, lustrous metal of a specific gravity of 9.823. Its melting point is 268.3° C. In appearance bismuth resembles antimony but has a foliated structure. Upon solidifying, bismuth expands about 2.3 per cent., a property which makes the metal valuable in the production of stereotype plates. It is not affected by dry air, but in moist air becomes coated with a reddish powder. Heated in the atmosphere the metal burns, forming the trioxide, Bi_2O_3. Hot sulphuric acid converts it into a basic sulphate. Bismuth alloys readily with other metals, and imparts to them the properties of hardness and ready fusibility. It is used in the production of fusible alloys, as an amalgam, with or without tin and lead, for silvering mirrors, and in the manufacture of electric fuses.

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[1] Electrolytic Refining of Silver-Bismuth Alloys, W. N. Lacey, *Trans. Am. Electrochem Soc.*, XXII, 304; *Met. Chem. Eng.*, X, 747.