

Mineral Industry Surveys

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BISMUTH IN THE THIRD QUARTER 2003

Total bismuth consumption in the United States was 608,000 kilograms during the third quarter of 2003, significantly above the consumption for the first and second quarters of 2003 and above the average quarterly consumption of 2002 (table 1).

Total consumption has increased, and a current, ongoing USGS evaluation of consumption categories reveals a consumption pattern that has changed from previous reporting periods. The consumption breakdown for bismuth in the third quarter was 46% for metallurgical additives in alloying and galvanizing; 29% for fusible alloys, solders, and ammunition; 24% for chemical and pharmaceutical uses; and 1% for research and other miscellaneous uses. Total estimated consumption for the third quarter of 2003 increased when compared with that of the third quarter of 2002.

The New York dealer price for bismuth, as published in Platts Metals Week, began the third quarter within a price range of \$2.70–\$3.10 per pound. The price range narrowed at the end of July to \$2.80–\$3.10 per pound and then remained steady, ending the quarter in a slightly narrower range of \$2.90–\$3.10 per pound.

Reserves.—Tiberon Minerals Ltd. (Canada) announced completion of financing for a bankable feasibility study on its 70%-owned Nui Phao tungsten polymetallic deposit in Vietnam (Tiberon Minerals Ltd., 2003b¹). Tiberon has submitted the Investment License Application to the Vietnam Government (Tiberon Minerals Ltd., 2003c[§]) and expects to have a bankable feasibility study (Tiberon Minerals Ltd., 2003a[§]) completed by the end of 2004 at what may possibly become the world's largest tungsten mine as well as the world's largest bismuth mine (Platts Metals Week, 2003b).

Fortune Minerals Limited (Canada) completed an additional 13 holes in the "East Pit" area of its NICO gold-cobalt-bismuth deposit in the Northwest Territories. This drilling program is expected to confirm continuity of the ore in this area and to contribute positively to the feasibility study scheduled for completion in 2004 (Fortune Minerals Limited, 2003a; 2003b).

Research and Uses.—AlphaMed Inc. (MA) announced it has received a \$500,000 grant to further develop radiotherapy for metastatic melanoma. AlphaMed, as project manager—in conjunction with the University of Missouri in Columbia—will supply the lead-212 and bismuth-212 generators needed for research into developing a cure for this type of melanoma (Mass High Tech, 2003[§]).

Nanophase Technologies Corporation (IL) has developed a commercial scale process for producing bismuth oxide nanomaterial. This nanoscale material can be incorporated into specialty materials for bone implants and other medical applications. The advantage of the new material is that it is readily detectable by x-rays, but does not have the toxic and carcinogenic attributes of other heavy metals. When incorporated into plastics, the nanomaterial allows security personnel to detect plastic firearms and can help emergency medical care specialists locate plastic toys if swallowed by children (Nanophase Technologies Corporation, 2003).

Research and development continues on lead-free solders for electronics applications. The Next Generation Environment-Friendly Soldering Technology (EFSOT) effort continues to study and develop system solutions, including those involving bismuth, for advanced and sustainable lead-free soldering (EFSOT, 2003[§]). The U.S. Environmental Protection Agency, in coordination with industry, is preparing life-cycle studies of lead-free solders—one of those being considered contains 3.3% bismuth (U.S. Environmental Protection Agency, 2002[§]).

Substitution.—Work continues on finding an environmentally friendly alternative to lead in small arms ammunition. Alliant Techsystem's ATK ammunition division, producer of 3.4 billion rounds of ammunition annually, is working to develop a non-bismuth, metal-polymer bullet. Although lead bullets in current use are less expensive, environmental cleanup of such ammunition can cost three times more than the bullets alone (Metal-Pages, 2003a[§]).

Although metal alloy solders using bismuth and other non-toxic metals are being pursued as a short-term solution to lead-free electronics, research into "smart glues" may provide a metal-less solution in the longer term (Penman, 2003).

¹References that include a section mark (§) are found in the Internet References Cited section.

Production.—China, the world's leading supplier of bismuth, is becoming more cost efficient in its production of the metal in order to offset rising power and transport costs. However, reductions in smelter capacity reportedly may continue to decrease bismuth output (Metal Bulletin, 2003). Nevertheless, Yunnan Tin Corp. plans to increase bismuth production by 30% in 2003 to 130 metric tons (t), and Hunan Shizhuyuan Nonferrous Metals Mine expects to exceed its targeted output by reaching 650 t of bismuth; Ganzhou Nonferrous Metal Smelter has maintained its output at 300 t annually (Platts Metals Week, 2003a).

Industrias Peñoles, S.A. de C.V. (Mexico), the largest single producer of bismuth in the world, produced 788 t of bismuth in the first three quarters of 2003, with 270 t of that total being produced in the third quarter (Industrias Peñoles, S.A. de C.V., 2003§).

Cía. Doe Run Perú has increased production of bismuth to 769 t to offset loss of revenue from copper in fiscal year 2003. The higher output represents a production increase of 35%. The company has plans to further increase production of bismuth to more than 1,000 t in fiscal year 2004 (Mining Journal, 2003a). These increases represent improvements to processes and, therefore, improved metallurgical recovery, rather than construction of new capacity (Metal-Pages, 2003b§).

Consumption.—The world bismuth market was relatively quiet in the third quarter with demand for bismuth expected to remain steady (Mining Journal, 2003b). Bismuth imports by Japan have continued to increase as it leads worldwide efforts to reduce the use of lead and cadmium in soldering, plumbing, and metal alloys. Trade figures for the first 4 months of 2003 indicate that Japanese bismuth imports have increased by 16% compared with those of the same period in the previous year (Roskill's Letter from Japan, 2003).

According to the Bismuth Producers Association (Brussels, Belgium), Japan is making additional use of bismuth, along with selenium, in lead-free brasses. The forecast use is for several hundred tons of bismuth per year in this application alone (Yves Palmieri, Bismuth Producers Association, written commun., November 17, 2003).

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TABLE 1
SALIENT BISMUTH STATISTICS¹

(Kilograms unless otherwise specified)

	2002	2003			
		First quarter	Second quarter	Third quarter	Year to date
Consumption	2,230,000	431,000 ^e	432,000 ^e	608,000 ^e	1,470,000 ^e
Exports ²	131,000	24,500	36,000	14,300 ³	74,700
Imports for consumption	1,930,000	499,000	569,000	476,000 ³	1,540,000
Price per pound, dealer, end of period	\$3.20	\$2.70	\$2.95	\$2.70	XX
Stocks, end of period, consumer	88,800	133,000 ^e	234,000 ^e	133,000 ^e	XX

^eEstimated. XX Not applicable.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Comprises bismuth metal and the bismuth content of alloys and waste and scrap.

³Includes July-August; September data were not available at the time of publication.

TABLE 2
BISMUTH METAL CONSUMED IN THE UNITED STATES, BY USE¹

(Kilograms)

Use	2002	2003 ^e			
		First quarter	Second quarter	Third quarter	Year to date
Chemicals ²	814,000	163,000	193,000	147,000	503,000
Bismuth alloys ³	985,000	160,000	150,000	179,000	490,000
Metallurgical additives	383,000	103,000	83,400	278,000	464,000
Other	45,300	5,430	5,190	3,840	14,500
Total	2,230,000	431,000	432,000	608,000	1,470,000

^eEstimated.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Includes industrial and laboratory chemicals, cosmetics, and pharmaceuticals.

³Includes fusible alloys, solders, and ammunition.

TABLE 3
U.S. EXPORTS OF BISMUTH METAL, ALLOYS AND WASTE AND SCRAP, BY COUNTRY¹

(Kilograms)

Country	2002	2003 ²				
		First quarter	Second quarter	July	August	January-August
Belgium	759	10,500	--	--	--	10,500
Brazil	999	999	500	--	--	1,500
Canada	47,700	1,470	1,260	477	8,170	11,400
China	3,000	--	--	--	--	--
Costa Rica	--	492	--	--	--	492
Dominican Republic	500	270	849	531	226	1,880
Egypt	--	340	108	--	--	448
Germany	6	--	4	--	--	4
Guatemala	--	--	143	--	--	143
Hong Kong	332	61	48	--	--	109
Hungary	--	136	--	--	--	136
Israel	167	--	--	--	--	--
Japan	66	--	20,700	--	--	20,700
Korea, Republic of	4	--	--	--	--	--
Malaysia	9,520	--	--	--	--	--
Mexico	34,800	7,640	12,300	2,090	2,060	24,100
Netherlands	5,990	--	--	--	--	--
Peru	4,000	--	--	--	--	--
Russia	2,070	1,510	--	--	--	1,510
Singapore	150	--	--	--	--	--
United Arab Emirates	58	--	--	--	--	--
United Kingdom	20,600	1,110	1	--	729	1,840
Total	131,000	24,500	36,000	3,100	11,200	74,700

-- Zero.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²September data were not available at the time of publication.

Source: U.S. Census Bureau.

TABLE 4
U.S. IMPORTS FOR CONSUMPTION OF BISMUTH METAL, BY COUNTRY¹

(Kilograms, metal content)

Country	2002	2003 ²				
		First quarter	Second quarter	July	August	January-August
Bahamas, The	684	219	--	194	--	413
Belgium	724,000	143,000	273,000	62,700	76,900	556,000
Canada	49,800	12,600	6,030	1,090	758	20,500
China	393,000	153,000	84,400	67,300	73,900	378,000
Germany	835	16,600	32,300	--	--	49,000
Hong Kong	58,500	--	200	--	51,300	51,500
Italy	208	200	--	--	--	200
Japan	3,150	--	--	--	--	--
Mexico	518,000	128,000	127,000	54,200	36,400	346,000
Netherlands	102	15	21	19,600	--	19,600
Peru	19,500	--	--	--	--	--
Spain	--	--	200	556	--	756
United Kingdom	163,000	45,600	45,000	14,500	16,400	121,000
Total	1,930,000	499,000	569,000	220,000	256,000	1,540,000

-- Zero.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²September data were not available at the time of publication.

Source: U.S. Census Bureau.