

# Mineral Industry Surveys

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## BISMUTH IN THE FOURTH QUARTER 2005

Bismuth consumption in the United States for the fourth quarter was 525 metric tons (t), which represented an 8% decline compared with consumption in the third quarter of 2005, and a 12% decline compared with consumption in the fourth quarter of 2004, according to estimates compiled by the U.S. Geological Survey. Bismuth consumption in the United States for the year 2005 was estimated to be 2,280 t, a decline of 6% from that estimated for 2004. The estimated consumption breakdown for bismuth in 2005 was 48% for metallurgical additives and galvanizing; 29% for fusible alloys, solders, and ammunition; and 23% for chemical and pharmaceutical uses (table 2).

Imports of bismuth were 2,530 t for 2005, representing an increase of 28% from that in 2004. Belgium was the leading supplier to the United States, followed by China, Mexico, and the United Kingdom.

The New York dealer price for bismuth, as published in Platts Metals Week, began the fourth quarter of 2005 at \$4.40 per pound, then rose moderately through the quarter to end the quarter at \$4.65 per pound. The average bismuth price for the fourth quarter was \$4.57 per pound, a 9% increase compared with that of the third quarter, and a 33% increase compared with that in the fourth quarter 2004.

Tiberon Minerals Ltd. (Toronto, Ontario, Canada), on behalf of the Nui Phao Mining Joint Venture Company Ltd. (Vietnam), announced the signing of an offtake agreement with Sidech S.A. (Belgium), the world's leading producer of bismuth end-products. Under the terms of the agreement, Sidech would purchase 100% of Nui Phao's projected bismuth output from its Vietnam mine for the first 5 years of production with successive 5-year mutual extension options. Based on a July 2005 Final Feasibility Study, annual bismuth production was expected to average 1,990 t, about 20% of world supply. Prices would be calculated using a formula related to then-current market prices as published by London-based Metal Bulletin. The agreement also included a Technical Cooperation Agreement under which Sidech would provide, at no cost to Nui Phao, technical assistance in maximizing both the recovery and quality of bismuth products to be produced at the Nui Phao project. Sidech was founded in 1950 and is the world's leading and only

Western producer specializing in bismuth. Sidech has a capacity of 2,000 metric tons per year (t/yr) and produces a wide variety of bismuth products used for both technical grade applications, like steel and aluminum alloys, and pharmaceutical grade applications, such as cosmetics and pigments. Tiberon Minerals Ltd. controls a major prospect in Vietnam that has reported favorable assay results for tungsten, acid-grade fluorspar, as well as bismuth, copper, and gold. Nui Phao reportedly contains over 55 million metric tons of proven and probable reserves for an estimated mine life in excess of 16 years, making it one of the largest tungsten-fluorspar deposits located outside of China (Tiberon Minerals Ltd., 2006).

Fortune Minerals Ltd. (London, Ontario, Canada) continued to report progress at its NICO gold-cobalt-bismuth deposit, located 160 kilometers northwest of the City of Yellowknife, Northwest Territories. Fortune announced that it had entered into an agreement with Mindecom Industrial Contractors Ltd. to purchase the mill and certain other buildings from the Golden Giant Mine at Hemlo, Ontario, currently owned by Newmont Canada Ltd., for \$2.8 million. The Hemlo facilities would be purchased for use at Fortune's 81%-owned NICO deposit. The deposit was expected to be mined by a combination of underground and open pit methods, and the ore would be processed in a 3,000-metric-ton-per-day mill and hydrometallurgical plant to produce gold doré, cobalt cathode, and bismuth concentrate. The deposit was estimated to contain 34,500 t (76.5 million pounds) of bismuth. (Fortune Minerals Ltd., 2005).

Reports from China, the world's leading bismuth-producing country, indicated that raw material shortages continued to hamper bismuth smelters. Ore supply has become increasingly tight as existing mines are exhausted and new discoveries have not been made. China's leading bismuth producer, Hunan Shizhuyuan Nonferrous Metals Co., expected its bismuth production to be 10% lower in 2005 than in 2004 and another 20% lower in 2006 than in 2005. China's bismuth production is about 6,000 t/yr but is expected to decline in coming years owing to mine depletion and falling bismuth content in ores. While large producers are facing production cuts, some smaller privately owned smelters are struggling to survive. Yongxin

Daxin Nonferrous Metals Co., a private smelter in Chenzhou in central Hunan Province, may close at yearend 2005 because of difficulties in sourcing raw materials. Bismuth mines in China have largely been exhausted by overmining, and ores that are available domestically and from overseas, such as South America and Africa, are often too expensive (Metal Bulletin, 2005).

#### **Update**

On March 9, 2006, the Platts Metals Week price for bismuth was \$4.60 per pound.

#### **References Cited**

- Fortune Minerals Ltd., 2005, Fortune Minerals announces agreement to purchase Hemlo mill for NICO: London, Ontario, Canada, Fortune Minerals Ltd. press release, December 8, 2 p.
- Metal Bulletin, 2005, Ore shortages squeeze Chinese bismuth producers: Metal Bulletin, no. 8917, October 31, p. 24.
- Tiberon Minerals Ltd., 2006, Tiberon finalizes agreement with Sidech S.A. for 100% of Nui Phao bismuth production: Toronto, Ontario, Canada, Tiberon Minerals Ltd. press release, 4 p.

TABLE 1  
SALIENT BISMUTH STATISTICS<sup>1</sup>

(Kilograms unless otherwise specified)

	2004	2005				
		First quarter	Second quarter	Third quarter	Fourth quarter	Year to date
Consumption <sup>c</sup>	2,420,000	595,000	588,000	569,000	525,000	2,280,000
Exports <sup>2</sup>	109,000	22,000	33,000	33,600	53,000	142,000
Imports for consumption	1,980,000	720,000	527,000	714,000	567,000	2,530,000
Price per pound, dealer, average of period	\$3.35	\$3.55	\$3.52	\$4.18	\$4.57	\$3.91
Stocks, end of period, consumer	134,000	132,000	134,000	139,000	136,000	XX

<sup>c</sup>Estimated. XX Not applicable.

<sup>1</sup>Data are rounded to no more than three significant digits.

<sup>2</sup>Comprises bismuth metal and the bismuth content of alloys and waste and scrap.

TABLE 2  
ESTIMATED BISMUTH METAL CONSUMED IN THE UNITED STATES, BY USE<sup>1</sup>

(Kilograms)

Use	2004	2005				
		First quarter	Second quarter	Third quarter	Fourth quarter	Year to date
Chemicals <sup>2</sup>	584,000	146,000	146,000	124,000	83,500	500,000
Bismuth alloys	703,000	175,000	168,000	165,000	162,000	670,000
Metallurgical additives	1,110,000	271,000	270,000	275,000	274,000	1,090,000
Other	22,000	3,130	3,840	3,840	4,160	15,000
Total	2,420,000	595,000	588,000	569,000	525,000	2,280,000

<sup>1</sup>Data are rounded to no more than three significant digits, may not add to totals shown.

<sup>2</sup>Includes industrial and laboratory chemicals, cosmetics, and pharmaceuticals.

TABLE 3  
U.S. EXPORTS OF BISMUTH METAL, ALLOYS AND WASTE AND SCRAP, BY COUNTRY<sup>1</sup>

(Kilograms metal content)

Country	2005							Year to date
	2004	September	Third quarter	October	November	December	Fourth quarter	
Argentina	--	240	240	--	--	--	--	240
Belgium	2,720	--	--	--	16,900	--	16,900	17,000
Brazil	1,140	3,800	3,800	--	268	--	268	4,260
Canada	46,000	8,370	21,000	8,040	12,100	1,500	21,700	70,100
Chile	--	369	369	668	522	--	1,190	1,560
China	99	--	31	--	--	--	--	35
Colombia	--	--	--	--	--	--	39	39
Dominican Republic	11,100	1,260	2,480	64	191	458	713	5,420
France	--	--	--	--	--	--	--	10,100
Guatemala	229	--	--	--	--	--	--	--
Hong Kong	360	39	39	56	--	10	66	234
India	--	--	--	--	--	--	--	2,000
Ireland	--	309	309	--	--	--	--	618
Israel	--	50	50	--	--	--	--	50
Italy	113	--	--	--	--	--	--	--
Japan	5,320	--	--	--	--	--	--	2,100
Korea, Republic of	75	--	--	--	--	293	293	293
Malaysia	--	--	--	--	--	--	--	11
Mexico	28,500	--	4,540	2,000	--	2,290	4,280	17,400
Russia	2,090	--	--	--	--	--	--	--
Singapore	59	--	--	--	--	160	160	160
South Africa	--	--	--	--	--	--	--	98
Spain	--	--	--	--	--	--	--	1,000
Taiwan	--	--	20	--	--	--	--	49
United Kingdom	10,700	728	728	7,380	--	--	7,380	8,840
Total	109,000	15,200	33,600	18,200	30,000	4,700	53,000	142,000

-- Zero.

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

Source: U.S. Census Bureau.

TABLE 4  
U.S. IMPORTS FOR CONSUMPTION OF BISMUTH METAL, BY COUNTRY<sup>1</sup>

(Kilograms)

Country	2004	2005					Fourth quarter	Year to date
		September	Third quarter	October	November	December		
Bahamas, The	1,910	446	446	--	1,450	--	1,450	2,620
Belgium	793,000	54,400	246,000	51,400	108,000	80,500	240,000	1,050,000
Canada	8,760	--	2,030	--	597	--	597	7,370
China	169,000	118,000	268,000	59,200	20,900	20,000	100,000	667,000
Germany	162,000	--	18,200	48	39	--	87	18,500
Hong Kong	77,100	--	--	--	--	--	--	--
Italy	--	--	--	--	--	--	--	106
Mexico	495,000	40,000	99,800	20,000	40,000	80,800	141,000	480,000
Netherlands	232	--	--	--	--	--	--	4
Peru	39,800	--	--	--	--	--	--	--
Russia	52	--	--	--	--	--	--	--
Spain	500	--	400	--	--	--	--	700
United Kingdom	237,000	34,000	79,200	35,000	32,300	16,600	84,000	304,000
Total	1,980,000	247,000	714,000	166,000	204,000	198,000	567,000	2,530,000

-- Zero.

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

Source: U.S. Census Bureau.