



# 2006 Minerals Yearbook

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## MEXICO

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# THE MINERAL INDUSTRY OF MEXICO

By Ivette E. Torres

Mexico is one of the leading mineral producers in Latin America and a significant producer in the world for a number of mineral commodities. In 2006, the country was the world's second ranked producer of bismuth, fluorspar, and silver; and the third ranked producer of strontium (celestite). Mexico also was the fourth ranked producer of fuller's earth; the fifth ranked producer of arsenic and lead ore; the sixth ranked producer of bentonite, cadmium, and zinc ore; the seventh ranked producer of diatomite, gypsum, and salt; the eighth ranked producer of kaolin, manganese, and molybdenum; and the tenth ranked producer of cement (Brooks, 2008a, b; Carlin, 2008; Corathers, 2008; Dolley, 2008; Kostick, 2008; Magyar, 2008; Miller, 2008; Ober, 2008; Olson, 2008; Smith, 2008; Tolcin, 2008a, b; van Oss, 2008; Virta, 2008).

## Minerals in the National Economy

During 2006, Mexico's mineral industry was characterized by significant growth in employment, investment, and production. The mineral sector also provided a significant contribution to the reduction in the country's trade deficit. Higher international metal prices contributed significantly to the increased value of mineral production. Compared with 2005, the value of nonferrous metals increased by 62%, and the value of precious metal production increased by 61%. The value of steel-related minerals (coal, coke, iron, and manganese) increased by 16%. The increase in the value of industrial minerals was more modest, but still significant at 12.6% (Secretaría de Economía, 2007, p. 65).

Of the minerals produced in Mexico, copper had the highest value, representing 37% of the total. This was despite a significant decrease in production at Mexico's two top-producing mines, Cananea and La Caridad, which were owned by Grupo México S.A.B. de C.V. Silver had the second highest value with 24% of the total mining production value. Zinc, gold, and molybdenum followed with 15%, 12%, and 5.6% of the total, respectively (Secretaría de Economía, 2007, p. 65).

In terms of value, the State of Sonora produced almost 24% of Mexico's total nonfuel mineral production. The States of Chihuahua and Zacatecas followed with 13% each. The States of Coahuila, Durango, and San Luis Potosí also contributed significantly to the value of nonfuel mineral production (Secretaría de Economía, 2007, p. 22).

In 2006, Mexico's total exports were valued at \$249.9 billion. Exports of crude oil and products were valued at \$39 billion and the total value of nonfuel mineral trade was \$15.9 billion, which was 40.9% higher than that of 2005. Nonfuel mineral exports increased to \$8.1 billion in 2006 compared with \$5.2 billion in 2005. Of this amount, \$7.2 billion was from metals and \$823 million was from industrial minerals. Iron accounted for almost 30% of the total value of exports followed by copper (16.8%), silver (12.9%), and zinc (11.7%) (Secretaría de Economía, 2007, p. 31-32; Instituto Nacional de Estadística, Geografía e Informática, 2008).

Total imports in 2006 were valued at \$256.1 billion, of which nonfuel minerals accounted for \$7.8 billion. Aluminum, iron ore, and copper, in order of value, were the leading nonfuel mineral imports (Secretaría de Economía, 2007, p. 218; Instituto Nacional de Estadística, Geografía e Informática, 2008).

## Production

Labor disputes at the Cananea and La Caridad Mines, which were Mexico's leading copper producers, resulted in a significant decrease in national copper output. The strike at La Caridad lasted more than 3 months, and the production from this mine decreased significantly to about 58,000 metric tons (t) from about 122,000 t in 2005 (Area Minera, 2006; Grupo México S.A.B. de C.V., 2007).

Production of gold in Mexico increased significantly in 2006. A large portion of the increase was because of the production increase from the mines owned by Goldcorp Inc. The company's El Sauzal mine produced more than 9,300 kilograms (kg). The Nukay, the San Dimas, and the San Martín Mines, which were operated by Goldcorp subsidiary Luismin S.A. de C.V., produced more than 6,400 kg of gold in 2006. Another reason for the increase in national gold production was the commissioning of the Ocampo gold and silver mine, which was owned by Gammon Lake de México S.A. de C.V., in the State of Chihuahua. The Ocampo Mine produced its first doré in February 2006; commercial production began on January 1, 2007. Gold production from the mine totaled about 1,340 kg in 2006. Ore from El Cubo Mine of Cia. Minera El Cubo, S.A. de C.V., which was a sister company of Gammon Lake, also was processed at the Ocampo facility (Gammon Lake Resources Inc., 2007).

Gold output was expected to continue to increase in the near future as a number of projects neared completion. One of these new projects, the Peñasquito, which was located in the State of Zacatecas, was expected to begin commercial production in 2008. Glamis Gold Ltd., which initiated the development of the Peñasquito project, was acquired by Goldcorp in 2006. Peñasquito had proven and probable reserves of 310,000 kg of gold, 17.9 million kg of silver, and considerable values of lead and zinc. Production was expected to average about 12,100 kilograms per year (kg/yr) of gold, about 710,000 kg/yr of silver, 71,100 metric tons per year (t/yr) of lead, and 137,800 t/yr of zinc. Goldcorp subsidiary Luismin also owned Los Filos gold deposit in the State of Guerrero. Los Filos was expected to begin production in 2007 and to achieve an output level of more than 9,300 kg/yr of gold when in full production (Glamis Gold Ltd, 2006; Goldcorp Inc., 2006; 2007, p. 4, 17).

## Structure of the Mineral Industry

A significant portion of Mexico's mineral output was produced by a few large domestic companies. Many industrial

minerals, however, were produced by medium- and small-size companies. The petroleum sector was controlled by state-owned Petróleos Mexicanos.

The Secretaría de Economía (2007, p. 36-37, 40, 531-533) reported that a total of 204 mining companies with direct foreign investment had 390 ongoing projects in Mexico in 2006. The State of Sonora attracted 95 of the projects; Chihuahua, 59; and Durango, 51. Subsidiaries of more than 150 Canadian mining companies were active in Mexico, and subsidiaries of companies based in the United States accounted for 31 of the international mining companies. Of the 390 projects, 327 were still in the exploration phase. Gold and silver were the primary targets for 312 of the 390 projects. Investment during the year was \$1.9 billion, which exceeds the \$1.27 reported to the Cámara Minera de México (CAMIMEX). Of the amount reported to CAMIMEX, 40% was for new projects, 25% was for equipment, 15% was for exploration, and 14% was for capacity expansion. Employment in the mineral sector increased by 5.5% and totaled almost 279,000.

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TABLE 1  
MEXICO: PRODUCTION OF MINERAL COMMODITIES<sup>1</sup>

(Metric tons unless otherwise specified)

| Commodity <sup>2</sup>                          | 2002                 | 2003    | 2004    | 2005                | 2006                 |         |
|---|----------------------|---------|---------|---------------------|----------------------|---------|
| <b>METALS</b>                                   |                      |         |         |                     |                      |         |
| <b>Aluminum, metal:</b>                         |                      |         |         |                     |                      |         |
| Primary   | 39,000               | --      | --      | --                  | --                   |         |
| Secondary                                       | 253,500              | 495,900 | 519,500 | 574,100             | 600,000 <sup>e</sup> |         |
| Total   | 292,500              | 495,900 | 519,500 | 574,100             | 600,000 <sup>e</sup> |         |
| Antimony <sup>3</sup>                           | 155                  | 434     | 503     | 565 <sup>r</sup>    | 778                  |         |
| Arsenic <sup>4</sup>                            | 1,946                | 1,729   | 1,829   | 1,664               | 1,595                |         |
| <b>Bismuth:</b>                                 |                      |         |         |                     |                      |         |
| Mine output, Bi content <sup>5</sup>            | 1,126                | 1,064   | 1,014   | 970                 | 1,186                |         |
| Metal, refined                                  | 1,126                | 1,064   | 1,014   | 970                 | 1,186                |         |
| <b>Cadmium:</b>                                 |                      |         |         |                     |                      |         |
| Mine output, Cd content                         | 1,609                | 1,616   | 1,662   | 1,627               | 1,399                |         |
| Metal, refined                                  | 1,382                | 1,590   | 1,594   | 1,627               | 1,396                |         |
| <b>Copper:</b>                                  |                      |         |         |                     |                      |         |
| Mine output, Cu content:                        |                      |         |         |                     |                      |         |
| By concentration or cementation                 | 260,574              | 279,254 | 327,432 | 336,367             | 245,053              |         |
| Leaching, electrowon                            | 69,300               | 76,399  | 78,108  | 92,675              | 89,076               |         |
| Total   | 329,874              | 355,653 | 405,540 | 429,042             | 334,129              |         |
| Metal:  |                      |         |         |                     |                      |         |
| Anode and blister, primary                      | 260,700              | 220,100 | 271,000 | 301,200             | 260,200              |         |
| Refined:  |                      |         |         |                     |                      |         |
| Primary   | 349,200              | 314,399 | 368,308 | 410,375             | 373,400 <sup>e</sup> |         |
| Secondary <sup>c</sup>                          | 6,000                | 6,000   | 6,000   | 6,000               | 6,000                |         |
| Total   | 355,200              | 320,399 | 374,308 | 416,375             | 379,400 <sup>e</sup> |         |
| <b>Gold:</b>                                    |                      |         |         |                     |                      |         |
| Mine output, Au content                         | kilograms            | 21,324  | 20,406  | 21,824              | 30,356               | 38,961  |
| Metal, refined                                  | do.                  | 23,594  | 22,177  | 24,496              | 26,782 <sup>r</sup>  | 35,899  |
| <b>Iron and steel:</b>                          |                      |         |         |                     |                      |         |
| Iron ore, mine output: <sup>6</sup>             |                      |         |         |                     |                      |         |
| Gross weight                                    | thousand metric tons | 9,941   | 11,265  | 11,483              | 11,687               | 10,983  |
| Fe content                                      | do.                  | 5,965   | 6,759   | 6,890               | 7,012                | 6,590   |
| Metal:  |                      |         |         |                     |                      |         |
| Pig iron  | do.                  | 3,996   | 4,183   | 4,278               | 4,047                | 3,790   |
| Direct-reduced iron                             | do.                  | 4,740   | 5,473   | 6,345               | 5,973                | 6,167   |
| Total   | do.                  | 8,736   | 9,656   | 10,623              | 10,020               | 9,957   |
| Ferroalloys, electric arc furnace: <sup>7</sup> |                      |         |         |                     |                      |         |
| Ferromanganese                                  | do.                  | 39      | 56      | 72                  | 90                   | 62      |
| Silicomanganese                                 | do.                  | 73      | 81      | 103                 | 105                  | 97      |
| Total   | do.                  | 112     | 137     | 175                 | 195                  | 159     |
| Crude steel                                     | do.                  | 14,010  | 15,159  | 16,737 <sup>r</sup> | 16,202 <sup>r</sup>  | 16,313  |
| Rolled products <sup>8</sup>                    | do.                  | 11,639  | 12,214  | 13,126              | 13,702 <sup>r</sup>  | 14,454  |
| <b>Lead:</b>                                    |                      |         |         |                     |                      |         |
| Mine output, Pb content                         |                      | 138,707 | 139,348 | 118,484             | 134,388              | 135,025 |
| Metal:  |                      |         |         |                     |                      |         |
| Smelter:  |                      |         |         |                     |                      |         |
| Primary <sup>9</sup>                            |                      | 128,241 | 137,483 | 107,414             | 116,539              | 117,315 |
| Secondary <sup>c</sup>                          |                      | 110,000 | 110,000 | 110,000             | 110,000              | 110,000 |
| Total <sup>e</sup>                              |                      | 238,000 | 247,000 | 217,000             | 227,000              | 227,000 |
| Refined:  |                      |         |         |                     |                      |         |
| Primary <sup>10</sup>                           |                      | 128,201 | 137,483 | 107,414             | 103,691              | 117,315 |
| Secondary <sup>c</sup>                          |                      | 110,000 | 110,000 | 110,000             | 110,000              | 110,000 |
| Total <sup>e</sup>                              |                      | 238,000 | 247,000 | 217,000             | 214,000              | 227,000 |

See footnotes at end of table.

TABLE 1--Continued  
MEXICO: PRODUCTION OF MINERAL COMMODITIES<sup>1</sup>

(Metric tons unless otherwise specified)

| Commodity <sup>2</sup>   | 2002            | 2003                | 2004                | 2005                 | 2006                   |
|--|-----------------|---------------------|---------------------|----------------------|------------------------|
| METALS--Continued  |                 |                     |                     |                      |                        |
| Manganese ore: <sup>11</sup>                                   |                 |                     |                     |                      |                        |
| Gross weight <sup>e</sup>                                      | 245,000         | 320,000             | 377,000             | 369,000              | 346,000                |
| Mn content   | 88,358          | 114,550             | 135,893             | 132,872              | 124,417                |
| Mercury, mine output, Hg content <sup>e</sup>                  | 15              | 15                  | 15                  | 15                   | 15                     |
| Molybdenum, mine output, Mo content                            | 3,428           | 3,524               | 3,731               | 4,245                | 2,519                  |
| Silver:  |                 |                     |                     |                      |                        |
| Mine output, Ag content kilograms                              | 2,746,989       | 2,568,877           | 2,569,478           | 2,894,161            | 2,969,845              |
| Metallurgical products, Ag content:                            |                 |                     |                     |                      |                        |
| In copper bars do.   | 208,360         | 236,468             | 235,970             | 251,838              | 272,432                |
| Mixed gold and silver bars do.                                 | 183,383         | 193,453             | 189,128             | 83,076               | 147,089                |
| Metal, refined, primary do.                                    | 2,500,652       | 2,310,283           | 1,860,996           | 2,014,304            | 1,749,144              |
| Tin:   |                 |                     |                     |                      |                        |
| Mine output, Sn content  | 1               | 2                   | NA                  | NA                   | NA                     |
| Metal, smelter, primary  | 1,756           | 1,790               | 25                  | 17                   | 25                     |
| Zinc:  |                 |                     |                     |                      |                        |
| Mine output, Zn content  | 446,104         | 413,991             | 426,360             | 455,625 <sup>r</sup> | 453,893                |
| Metal, refined, primary  | 302,122         | 320,364             | 316,834             | 327,205              | 279,734                |
| INDUSTRIAL MINERALS  |                 |                     |                     |                      |                        |
| Abrasives, natural <sup>12</sup>                               | NA <sup>r</sup> | NA                  | NA                  | NA                   | NA                     |
| Barite   | 163,620         | 287,451             | 306,668             | 268,657              | 199,605                |
| Cement, hydraulic <sup>13</sup> thousand metric tons           | 33,372          | 33,593              | 34,992              | 37,452               | 40,362                 |
| Clays:   |                 |                     |                     |                      |                        |
| Bentonite  | 488,215         | 464,056             | 564,017             | 425,629              | 435,273                |
| Common   | 13,258,195      | 13,242,893          | 15,127,163          | 41,190,217           | 38,527,423             |
| Fuller's earth   | 147,064         | 152,917             | 129,502             | 107,265              | 102,400                |
| Kaolin   | 745,498         | 798,407             | 654,711             | 877,147              | 961,800                |
| Diatomite  | 62,322          | 53,395              | 59,818              | 62,132               | 62,948                 |
| Feldspar   | 332,101         | 346,315             | 364,166             | 373,411              | 459,209                |
| Fluorspar:   |                 |                     |                     |                      |                        |
| Acid-grade thousand metric tons                                | 343             | 409                 | 402                 | 325                  | 466                    |
| Metallurgical-grade do.  | 279             | 347                 | 441                 | 551                  | 470                    |
| Total do.  | 622             | 756                 | 843                 | 876                  | 936                    |
| Graphite, natural, amorphous                                   | 14,065          | 8,730               | 14,769              | 12,357               | 11,773                 |
| Gypsum and anhydrite, crude (yeso)                             | 6,739,834       | 6,986,491           | 9,221,458           | 6,251,969            | 6,075,893              |
| Lime, hydrated and quicklime <sup>e</sup> thousand metric tons | 6,500           | 6,500               | 6,500               | 6,500                | 6,500                  |
| Magnesium compounds:   |                 |                     |                     |                      |                        |
| Magnesite  | --              | --                  | --                  | 27,900 <sup>r</sup>  | 33,000                 |
| Magnesia <sup>14</sup>   | 40,194          | 53,885 <sup>r</sup> | 76,356 <sup>r</sup> | 89,957 <sup>r</sup>  | 87,520                 |
| Mica, all grades   | 456             | 506                 | 424                 | 120                  | 150                    |
| Nitrogen, N content of ammonia                                 | 558,960         | 438,948             | 559,782             | 422,508 <sup>r</sup> | 486,624                |
| Perlite  | 85,703          | 194,463             | 188,027             | 91,724               | 41,219                 |
| Phosphate rock <sup>15</sup>                                   | 4,764           | 5,500               | 350                 | 350                  | 7,500                  |
| Salt, all types thousand metric tons                           | 7,802           | 7,547               | 8,566               | 9,508                | 8,371                  |
| Sodium compounds: <sup>e</sup>                                 |                 |                     |                     |                      |                        |
| Carbonate, soda ash, synthetic                                 | 290,000         | 290,000             | 290,000             | 290,000              | 290,000                |
| Sulfate, natural, bloedite <sup>16</sup>                       | 591,500         | 626,100             | 648,000             | 647,000              | 654,000                |
| Stone, sand and gravel:  |                 |                     |                     |                      |                        |
| Calcite, common  | 2,935,127       | 3,425,623           | 18,545,973          | 3,712,097            | 1,934,483              |
| Dolomite   | 457,665         | 565,896             | 1,158,929           | 1,308,977            | 1,282,590              |
| Limestone thousand metric tons                                 | 59,421          | 56,253              | 72,763              | 57,568               | 69,822                 |
| Marble   | 3,615,728       | 3,529,274           | 2,824,181           | 3,595,970            | 3,600,000 <sup>e</sup> |
| Quartz, quartzite, glass sand (silica)                         | 1,778,715       | 1,689,042           | 2,055,940           | 2,120,878            | 2,661,770              |
| Sand thousand metric tons                                      | 63,576          | 62,060              | 63,059              | 62,199               | 62,248                 |
| Gravel do.   | 68,239          | 76,332              | 74,224              | 65,927               | 68,017                 |
| Strontium minerals, celestite                                  | 94,015          | 130,329             | 87,610              | 110,833              | 128,321                |

See footnotes at end of table.

TABLE 1--Continued  
MEXICO: PRODUCTION OF MINERAL COMMODITIES<sup>1</sup>

(Metric tons unless otherwise specified)

| Commodity <sup>2</sup>                     | 2002                       | 2003      | 2004      | 2005                | 2006                   |           |
|--|----------------------------|-----------|-----------|---------------------|------------------------|-----------|
| <b>INDUSTRIAL MINERALS--Continued</b>      |                            |           |           |                     |                        |           |
| Sulfur, elemental, byproduct:              |                            |           |           |                     |                        |           |
| Of metallurgy <sup>c</sup>                 | thousand metric tons       | 575       | 575       | 575                 | 575                    |           |
| Of petroleum and natural gas               | do.                        | 887       | 1,052     | 1,122               | 1,074                  |           |
| Total <sup>c</sup>                         | do.                        | 1,460     | 1,630     | 1,700               | 1,650                  |           |
| Talc                                       |                            | 111,621   | 114,870   | 101,896             | 64,827                 | 6,834     |
| Vermiculite                                |                            | 300       | 312       | 218                 | 140,276                | 177       |
| Wollastonite                               |                            | 42,756    | 31,234    | 28,224              | 27,132                 | 44,280    |
| <b>MINERAL FUELS AND RELATED MATERIALS</b> |                            |           |           |                     |                        |           |
| Coal:                                      |                            |           |           |                     |                        |           |
| Run of mine:                               |                            |           |           |                     |                        |           |
| Metallurgical                              | thousand metric tons       | 5,097     | 6,648     | 5,786               | 4,653                  | 4,309     |
| Steam                                      | do.                        | 6,308     | 6,530     | 5,687               | 7,097                  | 6,573     |
| Total                                      | do.                        | 11,405    | 13,178    | 11,473              | 11,750                 | 10,882    |
| Washed metallurgical coal <sup>f</sup>     | do.                        | 2,000     | 2,000     | 2,000               | 2,000                  | 2,000     |
| Coke: <sup>17</sup>                        |                            |           |           |                     |                        |           |
| Metallurgical                              | do.                        | 1,412     | 1,414     | 1,401               | 1,447 <sup>r</sup>     | 1,529     |
| Breeze                                     | do.                        | 39        | 49        | 44                  | 45                     | 40        |
| Total                                      | do.                        | 1,451     | 1,463     | 1,445               | 1,492 <sup>r</sup>     | 1,569     |
| Gas, natural:                              |                            |           |           |                     |                        |           |
| Gross                                      | million cubic meters       | 45,716    | 46,509    | 47,269              | 49,803 <sup>r</sup>    | 55,364    |
| Marketable (dry)                           | do.                        | 30,147    | 31,323    | 32,499 <sup>r</sup> | 32,530 <sup>r</sup>    | 35,610    |
| Petroleum:                                 |                            |           |           |                     |                        |           |
| Crude                                      | thousand 42-gallon barrels | 1,159,642 | 1,230,415 | 1,234,795           | 1,216,545 <sup>r</sup> | 1,188,440 |
| Condensate, natural gas liquids            | do.                        | 148,920   | 152,570   | 161,330             | 155,490 <sup>r</sup>   | 155,855   |
| Total                                      | do.                        | 1,308,562 | 1,382,985 | 1,396,125           | 1,372,035 <sup>r</sup> | 1,344,295 |
| Refinery products:                         |                            |           |           |                     |                        |           |
| Liquefied petroleum gas                    | do.                        | 11,425    | 12,410    | 10,220              | 11,169                 | 9,271     |
| Motor gasoline                             | do.                        | 145,343   | 162,425   | 170,346             | 166,112                | 166,513   |
| Jet fuel                                   | do.                        | 20,696    | 21,900    | 22,667              | 23,105                 | 23,652    |
| Distillate fuel oil, diesel                | do.                        | 97,419    | 112,420   | 118,516             | 116,143                | 119,757   |
| Lubricants                                 | do.                        | 1,789     | 1,825     | 1,971               | 1,898                  | 1,862     |
| Residual fuel oil                          | do.                        | 164,104   | 144,905   | 134,320             | 128,042                | 118,698   |
| Asphalt                                    | do.                        | 10,512    | 9,490     | 9,928               | 10,695                 | 11,790    |
| Other, refinery fuel and losses            | do.                        | 14,416    | 5,840     | 28,870              | 31,316                 | 33,798    |
| Total                                      | do.                        | 465,704   | 471,215   | 496,838             | 488,480                | 485,341   |

<sup>6</sup>Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. <sup>r</sup>Revised. NA Not available. -- Zero.

<sup>1</sup>Table includes data available through September 30, 2007.

<sup>2</sup>In addition to the commodities listed, additional types of crude construction materials are produced, but output is not reported, and available information is inadequate to make estimates of output.

<sup>3</sup>Sb content of antimonial lead.

<sup>4</sup>Arsenic content of white arsenic.

<sup>5</sup>Refined metal. Bismuth content of impure smelter products no longer reported.

<sup>6</sup>Iron ore pellets.

<sup>7</sup>Reported by Cámara Nacional del Hierro y del Acero.

<sup>8</sup>Includes flat, nonflat, and seamless pipe steel products.

<sup>9</sup>Lead content of impure bar, antimonial lead, and refined metal.

<sup>10</sup>Includes lead content of antimonial lead.

<sup>11</sup>Mostly oxide nodules; includes smaller quantities of direct-shipping carbonates and oxide ores for metallurgical and battery applications.

<sup>12</sup>The previous series, which was based on exports comprising mostly pumice stone and emery (a granular, impure variety of corundum), is believed to be incomplete. Available information is inadequate to make estimates of output.

<sup>13</sup>Includes grey and white portland and masonry cement.

<sup>14</sup>Reported by Industrias Peñoles, S.A. de C.V. as the only major producer. Includes caustic, electromelt, hydroxide, and refractory.

<sup>15</sup>Includes only output used to manufacture fertilizers.

<sup>16</sup>Series reflects output reported by Industrias Peñoles, S.A. de C.V. plus an additional 40,000 metric tons of estimated output by other producers.

<sup>17</sup>Includes coke made from imported metallurgical coal.

TABLE 2  
MEXICO: STRUCTURE OF THE MINERAL INDUSTRY IN 2006

(Thousand metric tons unless otherwise specified)

| Commodity         | Major operating companies and major equity owners   | Location of main facilities <sup>1</sup>   | Annual capacity   |
|-------------------|---|--|---|
| Aluminum, primary | Aluminio y Derivados de Veracruz, S.A. de C.V. (private Mexican, 100%)  | Smelter in Veracruz, Ver.  | 65.   |
| Antimony          | Cía. Minera y Refinadora Mexicana, S.A. (private Mexican, 51%, and Cookson Ltd., 49%)                                     | San Jose Mine, Catorce, S.L.P.   | 365.  |
| Barite            | Barita de Sonora, S.A. [Grupo Acerero del Norte, S.A. de C.V. (GAN), 100%]  | Mazatan, Son.  | 219.  |
| Do.               | Minerales y Arcillas, S.A. de C.V. (private Mexican, 100%)  | San Francisco del Huerto Mine in San Pedro, Coah., La Escondida and Angelita Mines and plant in Galeana  | 55.   |
| Do.               | Barita de Santa Rosa, S.A. de C.V. (private Mexican, 100%)  | Muzquiz, Coah.   | 256.  |
| Bismuth           | metric tons<br>Met-Mex Peñoles, S.A. de C.V. (Industrias Peñoles, S.A. de C.V., 100%)                                     | Torreon, Coah.   | 1,200.  |
| Cement            | CEMEX México (CEMEX, S.A. B de C.V., 100%)  | Ensenada, B.C.N.; Torreon, Coah.; Barrientos, D.F.; Arotonilco and Huichapan, Hgo.; Guadalajara and Zapotilic, Jal.; Hidalgo and Monterrey, N.L.; Tepeaca, Pue.; Tamuin and Valles, S.L.P.; Hermosillo and Yaqui, Son.; and Merida, Yuc. | 26,650.   |
| Do.               | Cementos Apasco, S.A. de C.V. (Holcim Group, 49%, and other, 51%)   | Apasco, Mex.; Ramos Arizpe, Coah.; Macuspana, Tab.; Tecoman, Col.; Orizaba, Ver.; and Acapulco, Gro.   | 8,900.  |
| Do.               | Cooperativa La Cruz Azul, S.C.L. (private Mexican, 100%)  | Cruz Azul, Hgo., Lagunas, Oax.   | 5,000.  |
| Do.               | Cementos de Chihuahua, S.A. de C.V. (CEMEX México, 36%, and private Mexican, 64%)   | Chihuahua, Ciudad Juarez, and Samalayuca, Chih.  | 2,000.  |
| Do.               | Lafarge México (Lafarge Group, 100%)  | Vito, Hgo.   | 600.  |
| Do.               | Corporación Moctezuma, S.A. (Cementos Molins, S.A., 50%, and Buzzi Unicem SpA, 50%)                                       | Tepetzingo, Mor.   | 2,400.  |
| Do.               | Corporación Moctezuma, S.A. (Cementos Molins, S.A., 50%, and Buzzi Unicem SpA, 50%)                                       | Cerritos, S.L.P.   | 2,400.  |
| Coal              | Minera Monclova, S.A. [Altos Hornos de México, S.A. de C.V. (AHMSA), 100%]  | Mimosa and Palau Mines and Muzquiz washing plant at Palau, Coah., and coking plant at Monclova, Coah.  | 3,000.  |
| Do.               | Carbonifera de San Patricio, S.A. de C.V. (private Mexican, 100%)   | Progreso, Coah.  | 1,314.  |
| Do.               | Industrial Minera México, S.A. de C.V. (IMMSA) (Grupo México, S.A.B. de C.V., 90%)  | Nueva Rosita, Coah.  | 1,500.  |
| Do.               | Minera Carbonifera Río Escondido, S.A. [Grupo Acerero del Norte, S.A. de C.V. [Altos Hornos de México (AHMSA), 100%]      | Mina I, Mina II, and Tajo I at Nava and Piedras Negras, Coah.  | 6,500.  |
| Copper            | Mexicana de Cobre, S.A. de C.V. (Grupo México, S.A.B. de C.V., 90%)   | La Caridad Mine, smelter, refinery, SX-EW <sup>2</sup> plant, and rod plant at Nacozeni de Garcia, Son.  | 350 smelter,<br>50 SX-EW, <sup>2</sup><br>300 refinery,<br>150 rod plant. |
| Do.               | Mexicana de Cananea, S.A. de C.V. (Grupo México, S.A.B. de C.V., 90%)   | Mine and SX-EW <sup>2</sup> plant at Cananea, Son.   | 29,200 mill,<br>33 SX-EW. <sup>2</sup>                                    |
| Do.               | Minera María S.A. de C.V. (Grupo Frisco, 100%)  | Mine and SX-EW <sup>2</sup> plant at Cananea, Son.   | 20 SX-EW. <sup>2</sup>  |
| Do.               | Cobre de México, S.A. de C.V. (Grupo Conduxex)  | Primary refinery in Mexico City and secondary refinery in Villagran, Gto.  | 150.  |
| Ferroalloys       | Cía. Minera Autlán, S.A. de C.V. (Grupo Ferrominero, S.A. de C.V., 54%; Minas de Basis, S.A. de C.V., 32%; BHP Ltd., 14%) | Plant in Tamos, Ver.   | 140.  |
| Do.               | do.   | Plant in Teziutlan, Pue.   | 38.   |
| Do.               | do.   | Plant in Gomez Palacio, Dgo.   | 35.   |

See footnotes at end of table.

TABLE 2--Continued  
MEXICO: STRUCTURE OF THE MINERAL INDUSTRY IN 2006

(Thousand metric tons unless otherwise specified)

| Commodity     |           | Major operating companies and major equity owners   | Location of main facilities <sup>1</sup>  | Annual capacity                        |
|---------------|-----------|---|---|--|
| Fluorspar     |           | Cía. Minera Las Cuevas, S.A. de C.V. (Mexichem, S.A. de C.V.)   | Salitera (Zaragoza), S.L.P.   | 520.                                   |
| Do.           |           | Fluorita de México, S.A. de C.V. (Corp. Alfil, 51%, and Applied Industrial Minerals Corp., 49%)                 | Mines at La Encantada district and plant at Muzquiz, Coah.  | 150.                                   |
| Gold, mine    | kilograms | Minera Fresnillo, S.A. de C.V. (Industrias Peñoles, S.A. de C.V., 100%)   | Proaño (Fresnillo) Mine, Zac.   | 1,200.                                 |
| Do.           | do.       | Minas de las Altas Pimerías, S.A. de C.V. (Goldcorp Inc., 100%)   | El Sauzal Mine, Chih.   | 10,000.                                |
| Do.           | do.       | Peñoles, S.A. de C.V., 56%, and Newmont Mining Corporation, 44%   | La Herradura Mine, Son.   | 6,900.                                 |
| Do.           | do.       | Luismin, S.A. de C.V. (Goldcorp Inc., 100%)   | San Dimas Gold, Dgo. (two mines)  | 6,500.                                 |
| Do.           | do.       | Gammon Lake de Mexico, S.A. de C.V. (Gammon Lake Resources Inc., 100%)  | Ocampo Mine, Chih.  | 5,000.                                 |
| Do.           | do.       | Minera Mexicana La Ciénega, S.A. de C.V. (Industrias Peñoles, S.A. de C.V., 100%)                               | La Ciénega Mine, Dgo.   | 4,500.                                 |
| Do.           | do.       | Cía. Minera de Santa Gertrudis (Grupo Ariztegui, 51%, and Phelps Dodge Corp., 49%)                              | Santa Gertrudis Mine, Son.  | 1,600.                                 |
| Do.           | do.       | Cía. Minera El Cubo, S.A. de C.V. (Gammon Lake Resources Inc., 100%)  | El Cubo Mine, Gto.  | 1,200.                                 |
| Do.           | do.       | Exploraciones El Dorado, S.A. de C.V., 70%, and Minerales Sotula, 30%   | La Colorada Mine, Son.  | 800.                                   |
| Do.           | do.       | Alamos Gold Inc.  | Mulatos Mine, Son.  | 4,700.                                 |
| Do.           | do.       | Sociedad Cooperativa Minero Metalúrgica Santa Fe de Guanajuato (private Mexican, 100%)                          | Guanajuato, Gto.  | 438.                                   |
| Gold, refined | do.       | Met-Mex Peñoles, S.A. de C.V. (Industrias Peñoles, S.A. de C.V., 100%)  | Torreón, Coah.  | 22,700.                                |
| Graphite      |           | Grafitos Mexicanos, S.A. (Cummings Moore Graphite Co. of the United States, 25%, and private Mexican, 75%)      | Lourdes and San Francisco Mines, Son.   | 60.                                    |
| Do.           |           | Grafito Superior, S.A. de C.V. (Superior Graphite Co., 100%)  | Covalmar, Santa Clara, and Rio Mayo Mines, and plant in Son.  | 25.                                    |
| Gypsum        |           | Cía. Occidental Mexicana, S.A. (private Mexican, 51%, and Domtar, Ltd. of Canada, 49%)                          | Santa Rosalia on San Marcos Island, B.C.S.  | 2,500.                                 |
| Iron ore      |           | Consorcio Minero Benito Juárez Peña Colorada, S.A. de C.V. (Hylsamex, S.A. de C.V., 51%, and Mittal Steel, 49%) | Peña Colorada mine and pellet plant near Manzanillo, Col.   | 3,500.                                 |
| Do.           |           | Altos Hornos de Mexico, S.A. de C.V. (AHMSA) [Grupo Acerero del Norte, S.A. de C.V. (GAN), 78.9%]               | La Perla Mine, Chih.; Hercules Mine, Coah.; and Cerro de Mercado Mine, Dgo.   | 5,000.                                 |
| Do.           |           | Siderúrgica Lázaro Cárdenas-Las Truchas, S.A. de C.V. (SICARTSA) (Grupo Villacero, 100%)                        | Ferrotepec, Volcan, and Mango deposits in Las Truchas project area and pellet plant, Mich.  | 2,350.                                 |
| Do.           |           | Hylsamex, S.A. de C.V. (Ternium S.A., 86.68%)   | Cerro Nahuatl, Col. and Aquila Mine, Mich.  | 1,500.                                 |
| Lead and zinc |           | Industrial Minera México, S.A. de C.V. [(IMMSA) (Grupo México, S.A.B. de C.V., 90%)                             | Charcas, S.L.P.; San Martín, Zac.; Santa Eulalia, Chih.; Taxco, Gro.; Rosario, Sin.; Santa Barbara, Chih.; Velardena, Dgo; lead refinery at Monterrey, N.L.; and zinc refinery at S.L.P.  | 70 lead, mine;<br>110 refined zinc.    |
| Do.           |           | Industrias Peñoles, S.A. de C.V. (private Mexican, 97%, and private United States, 3%)                          | Mines at La Encantada, Coah.; Fresnillo, Zac.; Naica, Chih.; Bismark, Son; Rey de Plata, Gro. (Peñoles, 51%; Dowa Mining Co., 39%); metallurgical complex at Torreón, Coah., with silver, lead, and zinc smelter and refineries operated by Met-Mex Peñoles (Peñoles, 100%) | 180 refined lead,<br>240 refined zinc. |

See footnotes at end of table.



TABLE 2--Continued  
MEXICO: STRUCTURE OF THE MINERAL INDUSTRY IN 2006

(Thousand metric tons unless otherwise specified)

| Commodity                 |                          | Major operating companies and major equity owners   | Location of main facilities <sup>1</sup>   | Annual capacity            |
|---------------------------|--------------------------|---|--|----------------------------|
| Lead and zinc--Continued. |                          | Industrias Peñoles, S.A. de C.V. (private Mexican, 97%, and private United States, 3%)                  | Francisco I. Madero Mine, Zac.   | 100,000 zinc.              |
| Do.                       |                          | Minera San Francisco del Oro, S.A. de C.V. (Empresas Frisco, S.A. de C.V., 100%)                        | San Francisco del Oro, near Hidalgo del Parral, Chih.  | 15 lead, 21 zinc.          |
| Manganese                 |                          | Cía. Minera Autlán, S.A. de C.V. (Grupo Ferrominero, S.A. de C.V., 81.75%, and private Mexican, 18.25%) | Molango, Naopa, and Nonoalco Mines, Hgo.   | 600 ore and concentrate.   |
| Molybdenum                |                          | Mexicana de Cobre, S.A. (Grupo México, S.A.B. de C.V., more than 90%)                                   | La Caridad Mine and molybdenum plant, Son.   | 6.                         |
| Petroleum                 | thousand barrels per day | Petróleos Mexicanos, S.A. de C.V. (PEMEX) (Government, 100%)  | Comalcalco, Poza Rica, Ver., and Gulf of Campeche, Cam., Districts   | 3,500.                     |
| Salt                      |                          | Exportadora de Sal, S.A. (Fideicomiso de Fomento 51%, and Mitsubishi Corp., 49%)                        | Solar salt complex at Guerrero Negro, B.C.S.   | 6,000.                     |
| Silver                    | kilograms                | Minera Fresnillo, S.A. de C.V. (Industrias Peñoles, S.A. de C.V., 100%)                                 | Proaño (Fresnillo) Mine, Zac.  | 1,100,000.                 |
| Do.                       | do.                      | Minera Mexicana La Ciénega, S.A. de C.V. (Industrias Peñoles, S.A. de C.V., 100%)                       | La Cienega Mine, Dgo.  | 65,800.                    |
| Do.                       | do.                      | Minera Bismark, S.A. de C.V. (Industrias Peñoles, S.A. de C.V., 100%)                                   | Bismark Mine, Chih.  | 7,000.                     |
| Do.                       | do.                      | Co. Minera Sabinas, S.A. de C.V. (Industrias Peñoles, S.A. de C.V., 100%)                               | Sabinas Mine, Zac.   | 157,000.                   |
| Do.                       | do.                      | Minera Tizapa, S.A. de C.V. (Industrias Peñoles, S.A. de C.V., 50%)                                     | Tizapa Mine, Mex.  | 140,000.                   |
| Do.                       | do.                      | Minas Peñoles S.A. de C.V. (Industrias Peñoles, S.A. de C.V., 50%)                                      | Francisco I. Madero Mine, Zac.   | 63,000.                    |
| Do.                       | do.                      | Industrial Minera México, S.A. de C.V. (IMMSA) (Grupo México, S.A.B. de C.V., 90%)                      | San Martin Mine, Sombrerete, Zac.; Taxco, Gro.; Charcas, S.L.P.; Santa Eulalia, Chih.; and refinery at Monterrey, N.L. | 335,000.                   |
| Do.                       | do.                      | Pan American Silver Corp.   | La Colorada Mine, Zac.   | 100,000.                   |
| Do.                       | do.                      | Met-Mex Peñoles, S.A. de C.V. (Industrias Peñoles, S.A. de C.V., 100%)                                  | Torreón, Coah.   | 2,900,000 refinery.        |
| Do.                       | do.                      | Mexicana de Cobre, S.A. de C.V. (Grupo México, S.A.B. de C.V., 100%)                                    | La Caridad metallurgical complex, Son.   | 466,500.                   |
| Sodium sulfate            |                          | Química del Rey, S.A. de C.V. (Industrias Peñoles, S.A. de C.V., 100%)                                  | Plant at Laguna del Rey, Coah.   | 620.                       |
| Steel                     |                          | Altos Hornos de Mexico, S.A. de C.V. (AHMSA) [Grupo Acerero del Norte, S.A. de C.V. (GAN), 78.9%]       | Steelworks at Monclova, Coah.  | 3,316 steel, 3,800 pellet. |
| Do.                       |                          | Hylsamex, S.A. de C.V. (Ternium S.A., 86.68%)   | Steel works and direct-reduction units at Monterrey, N.L., and Puebla, Pue.; pelletizing plant in Col.                 | 3,100 steel, 1,500 pellet. |
| Do.                       |                          | DEACERO, S.A. de C.V. (private Mexican, 100%)   | Steelworks at Saltillo, Coah., and Celaya, Gto.  | 1,450.                     |
| Do.                       |                          | Mittal Steel Lazaro Cardenas (Mittal Steel, 100%)   | Facilities at Lazaro Cardenas, Mich.   | 5,300 steel, 4,000 pellet. |
| Do.                       |                          | Siderúrgica Lázaro Cárdenas-Las Truchas, S.A. de C.V. (SICARTSA) (Grupo Villacero, 100%)                | Port Lazaro Cardenas, Mich.  | 2,350 steel, 1,850 pellet. |
| Do.                       |                          | Tubos de Acero de México, S.A. (private Mexican, 100%)  | Veracruz, Ver.   | 1,000.                     |

See footnotes at end of table.

TABLE 2--Continued  
MEXICO: STRUCTURE OF THE MINERAL INDUSTRY IN 2006

(Thousand metric tons unless otherwise specified)

| Commodity             | Major operating companies and major equity owners | Location of main facilities <sup>1</sup> | Annual capacity |
|-----------------------|---|--|-----------------|
| Strontium (celestite) | Cía. Minera La Valenciana (private Mexican, 100%) | San Agustin Mine, Torreon, Coah.         | 50.             |
| Sulfur                | Petróleos Mexicanos, S.A. de C.V. (PEMEX)         | Nationwide petroleum operations          | 890.            |
| Tin <sup>4</sup>      | Fundidora Marni, S.A.                             | San Luis Potosi, S.L.P.                  | NA.             |
| Do.                   | PIZUTO, S.A.                                      | do.                                      | NA.             |

NA Not available.

<sup>1</sup>State abbreviations used in this table include the following: Baja California Norte (B.C.N.), Baja California Sur (B.C.S.), Campeche (Cam.), Chihuahua (Chih.), Coahuila (Coah.), Colima (Col.), Distrito Federal (D.F.), Durango (Dgo.), Guanajuato (Gto.), Guerrero (Gro.), Hidalgo (Hgo.), Jalisco (Jal.), Mexico (Mex.), Michoacan (Mich.), Morelos (Mor.), Nuevo Leon (N.L.) Oaxaca (Oax.), Puebla (Pue.), Queretaro (Qro.), San Luis Potosi (S.L.P.), Sinaloa (Sin.), Sonora (Son.), Tabasco (Tab.), Veracruz (Ver.), Yucatan (Yuc.), and Zacatecas (Zac.).

<sup>2</sup>Solvent extraction-electrowinning.

<sup>3</sup>Petróleos Mexicanos, S.A. de C.V. operated six refineries with an installed capacity of 1.68 million barrels per day.

<sup>4</sup>Smelter output from mostly imported concentrates.