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GEMSTONES

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GEMSTONES

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In 2005, the estimated value of natural gemstones produced in the United States was more than $13.4 million, and the estimated value of U.S. laboratory-created gemstone production was more than $51.1 million. The total estimated value of U.S. gemstone production was almost $64.6 million. The value of U.S. gemstone imports was $17.2 billion, and the value of combined U.S. gemstone exports and reexports was estimated to be $8.85 billion.

In this report, the terms “gem” and “gemstone” mean any mineral or organic material (such as amber, pearl, petrified wood, and shell) used for personal adornment, display, or object of art because it possesses beauty, durability, and rarity. Of more than 4,000 mineral species, only about 100 possess all these attributes and are considered to be gemstones. Silicates other than quartz are the largest group of gemstones in terms of chemical composition; oxides and quartz are the second largest (table 1). Gemstones are subdivided into diamond and colored gemstones, which in this report designates all natural nondiamond gems. In addition, laboratory-created gemstones, cultured pearls, and gemstone simulants are discussed but are treated separately from natural gemstones (table 2). Trade data in this report are from the U.S. Census Bureau. All percentages in the report were computed using unrounded data. Current information on industrial-grade diamond and industrial-grade garnet can be found in the U.S. Geological Survey (USGS) Minerals Yearbook, volume I, Metals and Minerals chapters on industrial diamond and industrial garnet, respectively.

Gemstones have fascinated humans since prehistoric times. They have been valued as treasured objects throughout history by all societies in all parts of the world. Amber, amethyst, coral, diamond, emerald, garnet, jade, jasper, lapis lazuli, pearl, rock crystal, ruby, serpentine, and turquoise are some of the first stones known to have been used for making jewelry. These stones served as symbols of wealth and power. Today, gems are worn more for pleasure or in appreciation of their beauty than to demonstrate wealth. In addition to jewelry, gemstones are used for collections, decorative art objects, and exhibits.

Legislation and Governments Programs

The Clean Diamond Trade Act was signed into law on April 25, 2003, by the President. This law provided the effective measures to stop trade in conflict diamonds in the United States, and its enactment made the United States a full participant in the Kimberley Process Certification Scheme (KPCS) (U.S. House of Representatives, 2003§). U.S. participation in the KPCS is critical to its success in excluding conflict diamonds from the legitimate supply chain because the United States is the world’s leading gem-quality diamond market. The industry and trade associations have played an active role in achieving this progress in ending the problem of conflict diamonds (Professional Jeweler, 2003§[1]).

Production

U.S. gemstone production data were based on a survey of more than 230 domestic gemstone producers conducted by the USGS. The survey provided a foundation for projecting the scope and level of domestic gemstone production during the year. However, the USGS survey did not represent all gemstone activity in the United States, which includes thousands of professional and amateur collectors. Consequently, the USGS supplemented its survey with estimates of domestic gemstone production from related published data, contacts with gemstone dealers and collectors, and information garnered at gem and mineral shows.

Commercial mining of gemstones has never been extensive in the United States. More than 60 varieties of gemstones have been produced commercially from domestic mines, but most of the deposits have been relatively small compared with other mining operations. In the United States, much of the current gemstone mining is conducted by individual collectors, gem clubs, and hobbyists rather than by businesses.

The commercial gemstone industry in the United States consists of individuals and companies that mine gemstones or harvest shell and pearl, firms that manufacture laboratory-created gemstones, and individuals and companies that cut and polish natural and laboratory-created gemstones. The domestic gemstone industry is focused on the production of colored gemstones and on the cutting and polishing of large diamond stones. Industry employment is estimated to range from 1,000 to 1,500 workers (U.S. International Trade Commission, 1997, p. 1).

Most natural gemstone producers in the United States are small businesses that are widely dispersed and operate independently. The small producers probably have an average of less than three employees, including those who only work part time. The number of gemstone mines operating from year to year fluctuates because the uncertainty associated with the discovery and marketing of gem-quality minerals makes it difficult to obtain financing for developing and sustaining economically viable operations (U.S. International Trade Commission, 1997, p. 23).

The total value of natural gemstones produced in the United States during 2005 was estimated to be more than $13.4 million (table 3). The production value decreased by 7% from that of the preceding year.

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

Natural gemstone materials indigenous to the United States are collected, produced, and/or marketed in every State. During 2005, all 50 States produced at least $1,000 worth of gemstone materials. Seven States accounted for 78% of the total value, as reported by survey respondents. These States, in order of declining value of production, were Tennessee, Arizona, Oregon, California, Arkansas, Montana, and Nevada. Some States were known for the production of a single gemstone material—Tennessee for freshwater pearls, for example. Other States produced a variety of gemstones, for example Arizona's gemstone deposits included agate, amethyst, azurite, chrysocolla, garnet, jade, jasper, malachite, obsidian, onyx, opal, peridot, petrified wood, smithsonite, and turquoise. There is also a wide variety of gemstones found and produced in California, Idaho, Montana, and North Carolina.

During 2005, the United States had only one operation in known diamond-bearing areas from which diamonds were produced. That diamond operation is in Crater of Diamonds State Park near Murfreesboro in Pike County, AR, where a dig-for-fee operation for tourists and rockhounds is maintained by the State of Arkansas. Crater of Diamonds is the only diamond mine in the world that is open to the public. The diamonds occur in a lamproite breccia tuff associated with a volcanic pipe and in the soil developed from the lamproite breccia tuff. In 2005, 536 diamond stones with an average weight of 0.193 carats were recovered at the Crater of Diamonds State Park. Since the diamond-bearing pipe and the adjoining area became a State park in 1972, 25,369 diamond stones with a total carat weight of 4,954.41 have been recovered (Tom Stolarz, park superintendent, Crater of Diamonds State Park, written commun., January 31, 2006). Exploration has demonstrated that there is about 78.5 million metric tons (Mt) of diamond-bearing rock in this diamond deposit (Howard, 1999, p. 62). An Arkansas law enacted early in 1999 prohibits commercial diamond mining in the park (Diamond Registry Bulletin, 1999).

There have been no commercially operated diamond mines in the United States since 2002. Diamond was produced at the Kelsey Lake diamond mine, located close to the Colorado-Wyoming State line near Fort Collins, CO, for several years until April 2002. The Kelsey Lake property includes nine known kimberlite pipes, three of which have been tested and have shown that diamonds are present. The remaining six pipes have yet to be fully explored and tested for their diamond potential. Of the diamonds recovered, 35% to 50% was industrial grade. The identified resources are at least 17 Mt grading an average of 4 carats per 100 metric tons (Taylor Hard Money Advisers, 2000§).

Studies by the Wyoming Geological Survey have shown that Wyoming has the potential for a $1 billion diamond mining business. Twenty diamondiferous kimberlite pipes and one diamondiferous mafic breccia pipe have been identified in southern Wyoming. Two of the largest kimberlite fields, State Line and Iron Mountain, and the largest lamproite field in the United States, Leucite Hills, are in Wyoming. Several diamond mining firms have been interested in the southern Wyoming and northern Colorado area, but the only diamond mine developed in the area thus far is the Kelsey Lake Mine (Associated Press, 2002§).

The success of Canadian diamond mines has stimulated interest in exploring for commercially feasible diamond deposits in the United States outside of Wyoming and Colorado. Australian and Canadian companies are now conducting diamond exploration in Alaska and Minnesota. Alaska has some similar geologic terrain to the Northwest Territories of Canada; in addition, certain varieties of garnet and other diamond indicator minerals as well as 17 microscopic diamonds have been found near Anchorage, AK. Two Canadian companies have invested $1 million in an exploratory drilling program. Geologists from the University of Minnesota teamed with an Australian mining company and were conducting a soil sampling program in Minnesota for mineral exploration, including diamond. The samples were being analyzed by Australia's WMC Resources Ltd. The scientists thought that there is a good chance of success owing to similarities between the geology in Minnesota and Canada (Diamond Registry Bulletin, 2005a).

In another exploration venture, Delta Mining and Exploration Corp. found a diamond-bearing kimberlite in an 32.4-hectare (80-acre) site known as the Homestead property near Lewistown, MT. Preliminary tests have shown the presence of microscopic diamonds. The company was planning a $700,000 soil sampling program as further exploration. Diamonds have been found in the stream beds and glacial valleys of Montana for years (Associated Press, 2004§).

In addition to natural gemstones, laboratory-created gemstones and gemstone simulants are produced in the United States. Laboratory-created or synthetic gemstones have the same chemical, optical, and physical properties as the natural materials. Simulants have an appearance similar to that of a natural gemstone material, but they have different chemical, optical, and physical properties. Laboratory-created gemstones produced in the United States include alexandrite, diamond, emerald, moissanite, ruby, sapphire, and turquoise. Simulants of coral, lapis lazuli, malachite, and turquoise also are manufactured in the United States. In addition, certain colors of laboratory-created sapphire and spinel, used to represent other gemstones, are classified as simulants.

Laboratory-created gemstone production in the United States was valued at more than $51.1 million during 2005; simulant gemstone output was even greater and was estimated to be valued at more than $100 million. Five companies in five States, representing virtually the entire U.S. laboratory-created gemstone industry, reported production to the USGS. The States with reported laboratory-created gemstone production, in descending order of production value, were North Carolina, Florida, Massachusetts, Michigan, and Arizona.

Gemesis Corp., a company in Sarasota, FL, consistently produced gem-quality laboratory-created diamond and reported a sixth year of production in 2005. The laboratory-created diamonds are produced using equipment, expertise, and technology developed by a team of scientists from Russia and the University of Florida. The weight of the laboratory-created diamond stones range from 1.5 to 2 carats, and most of the stones are yellow, brownish yellow, colorless, and green (Weldon, 1999§). Gemesis uses diamond-growing machines, each machine capable of growing 3-carat rough diamonds by generating high-pressure, high-temperature (HPHT) conditions that recreate the conditions in the Earth's mantle where natural diamonds form. Gemesis eventually plans to have 250 diamond-growing machines installed at the facility near Sarasota, FL (Davis, 2003); at that point, Gemesis could be producing as much as 30,000 to 40,000 stones each year, and annual revenues may reach $70 million to $80 million (Diamond Registry Bulletin, 2001). Gemesis diamonds became available for retail purchase in jewelry stores and on the Internet in fall 2003. The prices of the Gemesis laboratory-created diamonds are below those of natural diamond but above the prices of simulated diamond (Weldon, 2003§).

Apollo Diamond, Inc., near Boston, MA, has developed and patented a method for growing extremely pure, gem-quality diamond with flawless crystal structure by chemical vapor deposition (CVD). The CVD technique transforms carbon into plasma, which is then precipitated onto a substrate as diamond. CVD has been used for more than a decade to cover large surfaces with microscopic diamond crystals, but until this process, no one had discovered the combination of temperature, gas composition, and pressure that resulted in the growth of a single diamond crystal. CVD diamond precipitates as nearly 100% pure, almost flawless diamond, and therefore may not be distinguishable from natural diamond by some tests (Davis, 2003). In 2005, Apollo Diamond produced stones that range from 1 to 2 carats and expected to expand to larger stones in the future (Maney, 2005§). The company planned to start selling diamonds in the jewelry market at costs 10% to 30% below those of comparable natural diamonds (Hastings, 2005). Apollo planned to open the Apollo Diamond Web store to the general public in 2006 (Apollo Diamond, Inc., 2005§). Besides its use as a gemstone, CVD diamond's highest value is as a material for high-tech uses, such as in computer technology (Maney, 2005§).

In early 2004, scientists at the Carnegie Institution of Washington's Geophysical Laboratory published the results of a study in which researchers grew diamond crystals by a special CVD process at very high growth rates. They were able to grow gem-sized crystals in a day—a growth rate 100 times faster than other methods used before. This is a new way of producing diamond crystals for such new applications as diamond-base electronic devices and next generation cutting tools (Willis, 2004). By early 2005, the Geophysical Laboratory and the University of Alabama had jointly developed and patented the CVD process and apparatus to produce ½-inch-thick 10-carat single diamond crystals at very rapid growth rates (100 micrometers per hour). This faster CVD method uses microwave plasma technology and allows multiple crystals to be grown simultaneously. This size is about five times that of commercially available laboratory-created diamonds produced by HPHT methods and other CVD techniques. Dr. Russell Hemley, a researcher at the Carnegie Institution, stated, "High-quality crystals over 3 carats are very difficult to produce using the conventional approach. Several groups have begun to grow diamond single crystals by CVD, but large, colorless, and flawless ones remain a challenge. Our fabrication of 10-carat, half-inch CVD diamonds is a major breakthrough" (Willis, 2004; Carnegie Institution of Washington, 2005; Science Blog, 2005§).

Both Apollo Diamond and the Carnegie Institution have noted that their diamonds produced by the CVD method are harder than natural diamonds and diamonds produced by HPHT methods.

In 2005, the North Carolina company Charles & Colvard, Ltd. entered its eighth year of producing and marketing moissanite, a gem-quality laboratory-created silicon carbide. Moissanite is also an excellent diamond simulant, but it is being marketed for its own gem qualities. Moissanite exhibits a higher refractive index (brilliance) and higher luster than diamond. Its hardness is between those of corundum (ruby and sapphire) and diamond, which gives it durability (Charles & Colvard, Ltd., 2005§).

Although U.S. shell production decreased by 11% in 2005 compared with that of 2004, shell is not expected to ever be the large segment of U.S. gemstone production it was for several years in the past. U.S. shell material from mussels is used as seed material for culturing pearls. The lower shell production is owing to overharvesting in past years, the killing off of U.S. native mussel species by invasive exotic species, and a decline in market demand. During the past 10 years, the United States has lost about three-quarters of the native mussel population, and one-half of the approximately 300 total U.S. native mussel species are now listed as endangered species. The zebra mussel is the invasive exotic species that has done most of the damage, and it has been introduced into U.S. rivers and waterways in discharged ballast water from transoceanic ships (Iowa Department of Natural Resources, 2001§; Scott Gritterf, fisheries biologist, Iowa Department of Natural Resources, oral commun., November 14, 2002). The market still has not completely recovered from the die-off of Japanese oysters. Seed material had been stockpiled in Japan, and now producers in Japan are using manmade seed materials or seed materials from China and other sources in addition to the stockpiled material. There also has been an increase in the popularity of darker and colored pearls that do not use U.S. seed material (Ted Kroll, assistant director of fisheries, Kentucky Department of Fish and Wildlife, oral commun., November 15, 2002). In some regions of the United States, shell from mussels is beginning to be used as a gemstone based on its own merit rather than as seed material for pearls. This shell material is being used in beads, jewelry, and watch faces.

Consumption

Although the United States accounted for little of the total global gemstone production, it was the world's leading gemstone market. U.S. gemstone markets accounted for more than an estimated 35% of world gemstone demand in 2005. The U.S. market for unset gem-quality diamond during the year was estimated to have exceeded $16.2 billion. Domestic markets for natural, unset nondiamond gemstones totaled more than $996 million.

In the United States, about two-thirds of domestic consumers designate diamond as their favorite gemstone when surveyed. In 2005, the top 10 selling colored gemstones, in descending order, were blue sapphire; ruby; blue topaz; fancy sapphire; amethyst; peridot; tanzanite; emerald; aquamarine, citrine, and opal (tied for ninth place); and rhodolite garnet. Pink tourmaline and pearl dropped out of the top 10 from the previous year. During 2005, 50% of the jewelry retailers said their sales were up compared with 45% of retailers in 2004 (Prost, 2005; Wade, 2006). U.S. retail jewelry sales reached approximately $60 billion in 2005, with about 56% of that value involving diamond jewelry (SeekingAlpha, 2006§). U.S. online jewelry sales increased by more than 25% in 2005 to nearly $2.1 billion; this represents about 3.5% of all jewelry sold in the United States (IDEX Magazine, 2006§). The U.S. market accounted for more than 50% of the global diamond jewelry retail market in 2005.

The U.S. colored gemstone market posted an overall increase in sales during 2005 compared with the previous year's sales. The popularity of colored gemstones, colored laboratory-created gemstones, and "fancy" colored diamonds continued to increase in 2005. This was indicated by increased values of U.S. imports for consumption in most colored stone categories (emerald, coral, rubies, sapphires, other precious and semiprecious stones, and laboratory-created gems) in 2005 compared with the values from the previous year (table 10). Colored stone popularity also was evidenced by their general sales increase in 2005 (Wade, 2006).

The Gemological Institute of America (GIA) terminated the employment of four of its graders for improprieties in its New York, NY, laboratory, and the lab chief resigned. The improprieties were violations of the GIA code of ethics by clients of the lab, in particular, improper attempts to influence the outcome of grading reports. GIA is the world's foremost authority in gemology, diamond and gem grading and identification, jewelry education, and gemology research. The majority of GIA employees remain above reproach, and the GIA remains the leading lab in the industry. The incident had the potential to damage confidence in gem grading, but because of a thorough and immediate investigation into the situation, that did not happen (Diamond Registry Bulletin, 2005c, f).

Prices

Gemstone prices are governed by many factors and qualitative characteristics, including beauty, clarity, defects, demand, durability, and rarity. Diamond pricing, in particular, is complex; values can vary significantly depending on time, place, and the subjective valuations of buyers and sellers. There are more than 14,000 categories used to assess rough diamond and more than 100,000 different combinations of carat, clarity, color, and cut values used to assess polished diamond (Pearson, 1998).

Colored gemstone prices are generally influenced by market supply and demand considerations, and diamond prices are supported by producer controls on the quantity and quality of supply. Values and prices of gemstones produced and/or sold in the United States are listed in tables 3 through 5. In addition, customs values for diamonds and other gemstones imported, exported, or reexported are listed in tables 6 through 10.

De Beers Group companies are a significant force affecting the price of gem-quality diamond worldwide because they mine more than 40% of the gem-quality diamond produced each year (De Beers Group, 2005§). De Beers companies also sort and valuate about two-thirds (by value) of the world's annual supply of rough diamond through De Beers' subsidiary Diamond Trading Co. (DTC), which has marketing agreements with other producers (De Beers Group, 2003§).

The yearly average diamond price index of the Diamond High Council of Antwerp increased in 2005 by 7.8% to 330.4 for 1-carat diamonds and by 1.3% to 262.2 for ½-carat diamonds. The diamond price index measures price changes relative to the baseline of 100 set by the 1985 price (Diamond Registry Bulletin, 2006c).

Foreign Trade

During 2005, total U.S. gemstone trade with all countries and territories was valued at more than $26.0 billion, which was an increase of 17.7% from that of the previous year. Diamond accounted for about 95% of the 2005 gemstone trade total. In 2005, U.S. exports and reexports of diamond were shipped to 89 countries and territories, and imports of all gemstones were received from 103 countries and territories (tables 6-10). During 2005, U.S. trade in cut diamond and unworked diamond increased by 14.6% and 21.9% respectively, compared with the previous year. The United States remained the world's leading diamond importer. The United States is a significant international diamond transit center as well as the world's leading gem-quality diamond market. The large volume of reexports shipped to other centers reveals the significance that the United States has in the world's diamond supply network (table 6).

Trade in laboratory-created gemstone increased by 0.3% for the United States in 2005 compared with the previous year. Laboratory-created gemstone imports from Austria, China, France, Germany, Hong Kong, Sri Lanka, Switzerland, and Thailand made up almost 93% (by value) of the total domestic imports of laboratory-created gemstones during the year. Prices of certain imported laboratory-created gemstones, such as amethyst, were very competitive. The marketing of imported laboratory-created gemstones and enhanced gemstones as natural gemstones and the mixing of laboratory-created materials with natural stones in imported parcels continued to be problems for some domestic producers in 2005. There also were problems with some simulants being marketed as laboratory-created gemstones during the year.

World Industry Structure

The gemstone industry worldwide has two distinct sectors—diamond mining and marketing and colored gemstone production and sales. Most diamond supplies are controlled by a few major mining companies; prices are supported by managing the quality and quantity of the gemstones relative to demand, a function performed by De Beers through DTC. Unlike diamond, colored gemstones are primarily produced at relatively small, low-cost operations with few dominant producers; prices are influenced by consumer demand and supply availability.

In 2005, world natural diamond production totaled about 183 million carats—102 million carats gem quality and 81.0

million carats industrial grade (table 11). Most production was concentrated in a few regions—Africa [Angola, Botswana, Congo (Kinshasa), Namibia, and South Africa], Asia (northeastern Siberia and Yakutia in Russia), Australia, North America (Northwest Territories in Canada), and South America (Brazil and Venezuela). In 2005, Australia led the world in total diamond output quantity (combined gemstone and industrial). Botswana was the world's leading gemstone diamond producer, followed by Russia, Australia, Canada, Congo (Kinshasa), South Africa, and Angola in descending quantity order. These seven countries produced 95.1% of the world's gemstone diamond output in 2005.

De Beers reported that its sales of rough diamond for 2005 were $6.54 billion, which was up by 15% from $5.7 billion in 2004 (Diamond Registry Bulletin, 2004a, 2005b, 2006b).

In 2002, the international rough-diamond certification system KPCS was implemented to solve the problem of conflict diamonds—rough diamonds used by rebel forces and their allies in several countries to help finance warfare aimed at subverting governments recognized as legitimate by the United Nations (UN). The KPCS was agreed upon by UN member nations, the diamond industry, and involved nongovernmental organizations. The KPCS includes the following key elements: the use of forgery-resistant certificates and tamper-proof containers for shipments of rough diamonds; internal controls and procedures that provide credible assurance that conflict diamonds do not enter the legitimate diamond market; a certification process for all exports of rough diamonds; the gathering, organizing, and sharing of import and export data on rough diamonds with other participants of relevant production; credible monitoring and oversight of the international certification scheme for rough diamonds; effective enforcement of the provisions of the certification scheme through dissuasive and proportional penalties for violations; self regulation by the diamond industry that fulfills minimum requirements; and sharing information with all other participants on relevant rules, procedures, and legislation as well as examples of national certificates used to accompany shipments of rough diamonds (Weldon, 2001§). Canada acted as the chair and secretariat of the KPCS for the first 2 years, and in October 2004, Russia assumed these duties. For the KPCS to be fully implemented, all participating countries must pass the necessary laws to carry it out. In 2005, Indonesia and Lebanon joined the list of countries participating in the KPCS, amounting to a total of 45 nations that have signed the agreement; participating nations in the KPCS account for approximately 98% of the global production and trade of rough diamonds (Diamond Registry Bulletin, 2005h; Kimberley Process, 2005§). Discussions about the possible participation of several other countries are ongoing.

Worldwide, the value of production of natural gemstones other than diamond was estimated to have exceeded $2 billion in 2005. Most nondiamond gemstone mines are small, low-cost, and widely dispersed operations in remote regions of developing nations. Foreign countries with major gemstone deposits other than diamond are Afghanistan (aquamarine, beryl, emerald, kunzite, lapis lazuli, ruby, and tourmaline), Australia (beryl, opal, and sapphire), Brazil (agate, amethyst, beryl, ruby, sapphire, topaz, and tourmaline), Burma (beryl, jade, ruby, sapphire, and topaz), Colombia (beryl, emerald, and sapphire), Kenya (beryl, garnet, and sapphire), Madagascar (beryl, rose quartz, sapphire, and tourmaline), Mexico (agate, opal, and topaz), Sri Lanka (beryl, ruby, sapphire, and topaz), Tanzania (garnet, ruby, sapphire, tanzanite, and tourmaline), and Zambia (amethyst and beryl). In addition, pearls are cultured throughout the South Pacific and in other equatorial waters; Australia, China, French Polynesia, and Japan are key producers.

World Review

Canada.—The Ekati Diamond Mine, Canada's first operating commercial diamond mine, completed its seventh full year of production. In 2005, Ekati produced 3.23 million carats of diamond from 4.44 Mt of ore (BHP Billiton Ltd., 2006b). BHP Billiton Ltd. has an 80% controlling ownership in Ekati, which is in the Northwest Territories. Ekati has estimated reserves of 60.3 Mt of ore in kimberlite pipes that contain 54.3 million carats of diamond, and BHP Billiton projected the mine life to be 25 years. The Ekati Mine is now producing from the Koala, Panda, and Misery kimberlite pipes. BHP Billiton is using underground mining techniques to recover diamonds from deeper portions of the Panda kimberlite pipe (BHP Billiton Ltd., 2004). Underground mining of the deeper portions of the Koala kimberlite pipe has been approved and is expected to begin in December 2007 (BHP Billiton Ltd., 2006a). The Koala and Panda kimberlite pipes were first open pit mined (Diamond Registry Bulletin, 2002). Approximately one-third of the Ekati diamond production is industrial-grade material (Darren Dyck, senior project geologist, BHP Diamonds, Inc., oral commun., May 27, 2001).

The Diavik Diamond Mine, also in the Northwest Territories, completed its third full year of production. In 2005, Diavik produced 8.3 million carats of diamond from its A154 North ore body and the adjacent A154 South pipe. Both pipes are located within the same pit (Diavik Diamond Mines Inc., 2006). Diavik has estimated the mine's remaining proven and probable reserves to be 29.8 Mt of ore in kimberlite pipes, containing 95.6 million carats of diamond, and projected the mine life to be 16 to 22 years (Diavik Diamond Mines Inc., 2005). The mine is an unincorporated joint venture between Diavik Diamond Mines Inc. (60%) and Aber Diamond Mines Ltd. (40%). The mine is expected to produce a total of about 107 million carats of diamond at a rate of 8 million carats per year worth about $63 per carat during the entire mine life, which began production in December 2002 (Diavik Diamond Mines Inc., 2000, p. 10-12).

Diamond exploration is continuing in Canada, with several other commercial diamond projects and additional discoveries located in Alberta, British Columbia, the Northwest Territories, the Nunavut Territory, Ontario, and Quebec. Canada produced about 7% of the world's combined natural gemstone and industrial diamond production in 2005. Canadian diamond discoveries continue to be made and production continues to increase, and Canada is now fourth ranked in production of gemstone diamond after Botswana, Russia, and Australia.

Guyana.—A report by Partnership Africa Canada (PAC) stated that nearly 20% of diamonds mined in Guyana evade the KPSC by being smuggled to Brazil and cited weak controls in

Brazil and Venezuela as the problem. The situation exposes the entire industry to laundered diamonds from other countries, such as Côte d'Ivoire and Congo (Kinshasa). The report called for the expulsion of Brazil and Venezuela from the KPSC if the situation is not corrected (Diamond Registry Bulletin, 2006a).

Israel.—Polished diamond net exports for the 12-month period through October 2005 increased by 4.2% to $6.33 billion compared with the same period in 2004, and exports of rough diamond increased by 22.2% to $3 billion for the same period. Polished diamond net imports for the first 10 months of 2005 decreased by 18.4% to $264 million compared with those of the first 10 months of 2004, while net imports of rough diamond increased by 2.2% to $4.5 billion for the same 10-month period (Diamond Registry Bulletin, 2005d). The United States remained the leading diamond trading partner for Israel (Diamond Registry Bulletin, 2005e).

Russia.—Diamond production figures were released for the first time in December 2004. Production information had been kept as a state secret since the first diamond discovery in Siberia in 1955 (Diamond Registry Bulletin, 2005g).

Sierra Leone.—During the civil war in Sierra Leone, official diamond exports had plunged to $1.5 million a year. However, since the implementation of the KPSC and the end of the civil war diamond exports for 2005 were reported at $142 million (Diamond Registry Bulletin, 2006d).

Outlook

There are indications that there may be continued growth in the U.S. diamond and jewelry markets in 2006. Historically, diamonds have proven to hold their value despite wars or economic depressions (Schumann, 1998, p. 8).

Independent producers, such as Argyle Diamond Mines in Australia and Ekati and Diavik in Canada, will continue to bring a greater measure of competition to global markets. More competition presumably will bring more supplies and lower prices. Further consolidation of diamond producers and larger amounts of rough diamond being sold outside DTC will continue as the diamond industry adjusts to De Beers' reduced influence on the industry.

More laboratory-created gemstones, simulants, and treated gemstones will enter the marketplace and necessitate more transparent trade industry standards to maintain customer confidence.

During 2005, online sales rose by 25%, representing 3.5% of all retail jewelry sales for the year, and Internet sales of diamonds, gemstones, and jewelry will continue to grow and increase in popularity, as will other forms of e-commerce that emerge to serve the diamond and gemstone industry. This will take place as the gemstone industry and its customers become more comfortable with and learn the applications of new e-commerce tools (Diamond Registry Bulletin, 2004b, c; IDEX Magazine, 2006§).

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TABLE 1
GUIDE TO SELECTED GEMSTONES AND GEM MATERIALS USED IN JEWELRY

Name	Composition	Color	Practical size[1]	Cost[2]	Mohs	Specific gravity	Refraction	Refractive index	May be confused with	Recognition characteristics
Amber	Hydrocarbon	Yellow, red, green, blue	Any	Low to medium	2.0-2.5	1.0-1.1	Single	1.54	Synthetic or pressed plastics, kaurigum	Fossil resin, color, low density, soft and trapped insects.
Apatite	Chlorocalcium phosphate	Colorless, pink, yellow, green, blue, violet	Small	Low	5.0	3.16-3.23	Double	1.63-1.65	Amblygonite, andalusite, brazilianite, precious beryl, titanite, topaz, tourmaline	Crystal habit, color, hardness, appearance.
Azurite	Copper carbonate hydroxide	Azure, dark blue, pale blue	Small to medium	do.	3.5-4.0	3.7-3.9	do.	1.72-1.85	Dumortierite, hauynite, lapis lazuli, lazulite, sodalite	Color, softness, crystal habits and associated minerals.
Benitoite	Barium titanium silicate	Blue, purple, pink, colorless	do.	High	6.0-6.5	3.64-3.68	do.	1.76-1.80	Sapphire, tanzanite, blue diamond, blue tourmaline, cordierite	Strong blue in ultraviolet light.
Beryl:										
Aquamarine	Beryllium aluminum silicate	Blue-green to light blue	Any	Medium to high	7.5-8.0	2.63-2.80	do.	1.58	Synthetic spinel, blue topaz	Double refraction, refractive index.
Bixbite	do.	Red	Small	Very high	7.5-8.0	2.63-2.80	do.	1.58	Pressed plastics, tourmaline	Refractive index.
Emerald, natural	do.	Green	Medium	do.	7.5	2.63-2.80	do.	1.58	Fused emerald, glass, tourmaline, peridot, green garnet doublets	Emerald filter, dichroism, refractive index.
Emerald, synthetic	do.	do.	Small	High	7.5-8.0	2.63-2.80	do.	1.58	Genuine emerald	Lack of flaws, brilliant fluorescence in ultraviolet light.
Golden (heliodor)	do.	Yellow to golden	Any	Low to medium	7.5-8.0	2.63-2.80	do.	1.58	Citrine, topaz, glass, doublets	Weak-colored.
Goshenite	do.	Colorless	do.	Low	7.5-8.0	2.63-2.80	do.	1.58	Quartz, glass, white sapphire, white topaz	Refractive index.
Morganite	do.	Pink to rose	do.	do.	7.5-8.0	2.63-2.80	do.	1.58	Kunzite, tourmaline, pink sapphire	Do.
Calcite:										
Marble	Calcium carbonate	White, pink, red, blue, green, or brown	do.	do.	3.0	2.72	Double (strong)	1.49-1.66	Silicates, banded agate, alabaster gypsum	Translucent.
Mexican onyx	do.	do.	do.	do.	3.0	2.72	do.	1.60	do.	Banded, translucent.
Charoite	Hydrated sodium calcium hydroxi-fluoro-silicate	Lilac, violet, or white	Small to medium	do.	5.0-6.0	2.54-2.78	XX	1.55-1.56	Purple marble	Color, locality.
Chrysoberyl:										
Alexandrite	Beryllium aluminate	Green by day light, red by artificial light	Small (CIS[3]); medium (Sri Lanka)	High	8.5	3.50-3.84	Double	1.75	Synthetic	Strong dichroism, color varies from red to green, hardness.

See footnotes at end of table.

TABLE 1—Continued
GUIDE TO SELECTED GEMSTONES AND GEM MATERIALS USED IN JEWELRY

Name	Composition	Color	Practical size[1]	Cost[2]	Mohs	Specific gravity	Refraction	Refractive index	May be confused with	Recognition characteristics
Chrysoberyl—Continued:										
Cats-eye	Beryllium aluminate	Greenish to brownish	Small to large	High	8.5	3.50-3.84	Double	1.75	Synthetic, shell	Density, translucence, chatoyance.
Chrysolite	do.	Yellow, green, and/or brown	Medium	Medium	8.5	3.50-3.84	do.	1.75	Tourmaline, peridot	Refractive index, silky.
Chrysocolla	Hydrated copper silicate	Green, blue	Any	Low	2.0-4.0	2.0-2.4	XX	1.46-1.57	Azurite, dyed chalcedony, malachite, turquoise, variscite	Lack of crystals, color, fracture, low density and softness.
Coral	Calcium carbonate	Orange, red, white, black, purple, or green	Branching, medium	do.	3.5-4.0	2.6-2.7	Double	1.49-1.66	False coral	Dull translucent.
Corundum:										
Ruby	Aluminum oxide	Rose to deep purplish red	Small	Very high	9.0	3.95-4.10	do.	1.78	Synthetics, including spinel, garnet	Inclusions, fluorescence.
Sapphire, blue	do.	Blue	Medium	High	9.0	3.95-4.10	do.	1.78	do.	Inclusions, double refraction, dichroism.
Sapphire, fancy	do.	Yellow, pink, colorless, orange, green, or violet	Medium to large	Medium	9.0	3.95-4.10	do.	1.78	Synthetics, glass and doublets, morganite	Inclusions, double refreaction, refractive index.
Sapphire or ruby, stars	do.	Red, pink, violet, blue, or gray	do.	High to low	9.0	3.95-4.10	do.	1.78	Star quartz, synthetic stars	Shows asterism, color side view.
Sapphire or ruby, synthetic	do.	Yellow, pink, or blue	Up to 20 carats	Low	9.0	3.95-4.10	do.	1.78	Synthetic spinel, glass	Curved striae, bubble inclusions.
Cubic zirconia	Zirconium and yttrium oxides	Colorless, pink, blue, lavender, yellow	Small	do.	8.25-8.5	5.8	Single	2.17	Diamond, zircon, titania, moissanite	Hardness, density, lack of flaws and inclusions, refractive index.
Diamond	Carbon	White, blue-white, yellow, brown, green, red, pink, blue	Any	Very high	10.0	3.516-3.525	do.	2.42	Zircon, titania, cubic zirconia, moissanite	High index, dispersion, hardness, luster.
Feldspar:										
Amazonite	Alkali aluminum silicate	Green-blue	Large	Low	6.0-6.5	2.56	XX	1.52	Jade, turquoise	Cleavage, sheen, vitreous to pearly, opaque, grid.
Labradorite	do.	Gray with blue and bronze sheen color play (schiller)	do.	do.	6.0-6.5	2.56	XX	1.56	do.	Do.
Moonstone	do.	Colorless, white, gray, or yellow with white, blue, or bronze schiller	do.	do.	6.0-6.5	2.77	XX	1.52-1.54	Glass, chalcedony, opal	Pale sheen, opalescent.
Sunstone	do.	Orange, red brown, colorless with gold or red glittery schiller	Small to medium	do.	6.0-6.5	2.77	XX	1.53-1.55	Aventurine, glass	Red glittery schiller.

See footnotes at end of table.

TABLE 1—Continued
GUIDE TO SELECTED GEMSTONES AND GEM MATERIALS USED IN JEWELRY

Name	Composition	Color	Practical size[1]	Cost[2]	Mohs	Specific gravity	Refraction	Refractive index	May be confused with	Recognition characteristics
Garnet	Complex silicate	Brown, black, yellow, green, red, or orange	Small to medium	Low to high	6.5-7.5	3.15-4.30	Single strained	1.79-1.98	Synthetics, spinel, glass	Single refraction, anomalous strain.
Hematite	Iron oxide	Black, black-gray, brown-red	Medium to large	Low	5.5-6.5	5.12-5.28	XX	2.94-3.22	Davidite, cassiterite, magnetite, neptunite, pyrolusite, wolframite	Crystal habit, streak, hardness.
Jade:										
Jadeite	Complex silicate	Green, yellow, black, white, or mauve	Large	Low to very high	6.5-7.0	3.3-3.5	Crypto-crystalline	1.65-1.68	Nephrite, chalcedony, onyx, bowenite, vesuvianite, grossularite	Luster, spectrum, translucent to opaque.
Nephrite	Complex hydrous silicate	do.	do.	do.	6.0-6.5	2.96-3.10	do.	1.61-1.63	Jadeite, chalcedony, onyx, bowenite, vesuvianite, grossularite	Do.
Jet (gagate)	Lignite	Deep black, dark brown	do.	Low	2.5-4.0	1.19-1.35	XX	1.64-1.68	Anthracite, asphalt, cannel coal, onyx, schorl, glass, rubber	Luster, color.
Lapis lazuli	Sodium calcium aluminum silicate	Dark azure-blue to bright indigo blue or even a pale sky blue.	do.	do.	5.0-6.0	2.50-3.0	XX	1.50	Azurite, dumortierite, dyed howlite, lazulite, sodalite, glass	Color, crystal habit, associated minerals, luster, and localities.
Malachite	Hydrated copper carbonate	Light to black-green banded	do.	do.	3.5-4.0	3.25-4.10	XX	1.66-1.91	Brochantite, chrysoprase, opaque green gemstones	Color banding, softness, associated minerals.
Moissanite	Silicon carbide	Colorless and pale shades of green, blue, yellow	Small	Low to medium	9.25	3.21	Double	2.65-2.69	Diamond, zircon, titania, cubic zirconia	Hardness, dispersion, lack of flaws and inclusions, refractive index.
Obsidian	Amorphous, variable (usually felsic)	Black, gray, brown, dark green, white, transparent	Large	Low	5.0-5.5	2.35-2.60	XX	1.45-1.55	Aegirine-augite, gadolinite, gagate, hematite, pyrolusite, wolframite	Color, conchoidal fracture, flow bubbles, softness, and lack of crystal faces.
Opal	Hydrated silica	Reddish orange, colors flash in white gray, black, red, or yellow	do.	Low to high	5.5-6.5	1.9-2.3	Single	1.45	Glass, synthetics, triplets, chalcedony	Color play (opalescence).
Peridot	Iron magnesium silicate	Yellow and/or green	Any	Medium	6.5-7.0	3.27-3.37	Double (strong)	1.65-1.69	Tourmaline, chrysoberyl	Strong double refraction, low dichroism.
Quartz:										
Agate	Silicon dioxide	Any	Large	Low	7.0	2.58-2.64	XX	XX	Glass, plastic, Mexican onyx	Cryptocrystalline, irregularly banded, dendritic inclusions.

See footnotes at end of table.

TABLE 1—Continued
GUIDE TO SELECTED GEMSTONES AND GEM MATERIALS USED IN JEWELRY

Name	Composition	Color	Practical size[1]	Cost[2]	Mohs	Specific gravity	Refraction	Refractive index	May be confused with	Recognition characteristics
Quartz—Continued:										
Amethyst	Silicon dioxide	Purple	Large	Medium	7.0	2.65-2.66	Double	1.55	Glass, plastic, fluorite	Macrocrystalline, color, refractive index, transparent, hardness.
Aventurine	do.	Green, red-brown, gold-brown, with metallic iridescent reflection	do.	Low	7.0	2.64-2.69	do.	1.54-1.55	Iridescent analcime, aventurine feldspar, emerald, aventurine glass	Macrocrystalline, color, metallic iridescent flake reflections, hardness.
Cairngorm	do.	Smoky orange or yellow	do.	do.	7.0	2.65-2.66	do.	1.55	do.	Macrocrystalline, color, refractive index, transparent, hardness.
Carnelian	do.	Flesh red to brown red	do.	do.	6.5-7.0	2.58-2.64	do.	1.53-1.54	Jasper	Cryptocrystalline, color, hardness.
Chalcedony	do.	Bluish, white, gray	do.	do.	6.5-7.0	2.58-2.64	do.	1.53-1.54	Tanzanite	Do.
Chrysoprase	do.	Green, apple-green	do.	do.	6.5-7.0	2.58-2.64	do.	1.53-1.54	Chrome chalcedony, jade, prase opal, prehnite, smithsonite, variscite, artifically colored green chalcedony	Do.
Citrine	Silica	Yellow	do.	do.	7.0	2.65-2.66	do.	1.55	do.	Macrocrystalline, color, refractive index, transparent, hardness.
Crystal:										
Rock	do.	Colorless	do.	do.	7.0	2.65-2.66	do.	1.55	Topaz, colorless sapphire	Do.
Jasper	do.	Any, striped, spotted, or sometimes uniform	do.	do.	7.0	2.58-2.66	XX	XX	do.	Cryptocrystalline, opaque, vitreous luster, hardness.
Onyx	do.	Many colors	do.	do.	7.0	2.58-2.64	XX	XX	do.	Cryptocrystalline, uniformly banded, hardness.
Petrified wood	do.	Brown, gray, red, yellow	do.	do.	6.5-7.0	2.58-2.91	Double	1.54	Agate, jasper	Color, hardness, wood grain.
Rose	do.	Pink, rose red	do.	do.	7.0	2.65-2.66	do.	1.55	do.	Macrocrystalline, color, refractive index, transparent, hardness.
Tiger's eye	do.	Golden yellow, brown, red, blue-black	do.	do.	6.5-7.0	2.58-2.64	XX	1.53-1.54	XX	Macrocrystalline, color, hardness, hatoyancy.

See footnotes at end of table.

TABLE 1—Continued
GUIDE TO SELECTED GEMSTONES AND GEM MATERIALS USED IN JEWELRY

Name	Composition	Color	Practical size[1]	Cost[2]	Mohs	Specific gravity	Refraction	Refractive index	May be confused with	Recognition characteristics
Rhodochrosite	Manganese carbonate	Rose-red to yellowish, stripped	Large	Low	4.0	3.45-3.7	Double	1.6-1.82	Fire opal, rhodonite, tugtupite, tourmaline	Color, crystal habit, reaction to acid, perfect rhombohedral cleavage.
Rhodonite	Manganese iron calcium silicate	Dark red, flesh red, with dendritic inclusions of black manganese oxide	do.	do.	5.5-6.5	3.40-3.74	do.	1.72-1.75	Rhodochrosite, thulite, hessonite, spinel, pyroxmangite, spessartine, tourmaline	Color, black inclusions, lack of reaction to acid, hardness.
Shell:										
Mother-of-pearl	Calcium carbonate	White, cream, green, blue-green, with iridescent play of color	Small	do.	3.5	2.6-2.85	XX	XX	Glass and plastic imitation	Luster, iridescent play of color.
Pearl	do.	White, cream to black, sometimes with hint of pink, green, purple	do.	Low to high	2.5-4.5	2.6-2.85	XX	XX	Cultured and glass or plastic imitation	Luster, iridescence, x-structure, ray.
Spinel	Magnesium aluminum oxide	Any	Small to medium	Medium	8.0	3.5-3.7	Single	1.72	Synthetic, garnet	Refractive index, single refraction, inclusions.
Spinel, synthetic	do.	do.	Up to 40 carats	Low	8.0	3.5-3.7	Double	1.73	Spinel, corundum, beryl, topaz, alexandrite	Weak double refraction, curved striae, bubbles.
Spodumene:										
Hiddenite	Lithium aluminum silicate	Yellow to green	Medium	Medium	6.5-7.0	3.13-3.20	do.	1.66	Synthetic spinel	Refractive index, color, pleochroism.
Kunzite	do.	Pink to lilac	do.	do.	6.5-7.0	3.13-3.20	do.	1.66	Amethyst, morganite	Do.
Tanzanite	Complex silicate	Blue to lavender	Small	High	6.0-7.0	3.30	do.	1.69	Sapphire, synthetics	Strong trichroism, color.
Topaz	do.	White, blue, green, pink, yellow, gold	Medium	Low to medium	8.0	3.4-3.6	do.	1.62	Beryl, quartz	Color, density, hardness, refractive index, perfect in basal cleavage.
Tourmaline	do.	Any, including mixed	do.	do.	7.0-7.5	2.98-3.20	do.	1.63	Peridot, beryl, garnet corundum, glass	Double refraction, color, refractive index.
Turquoise	Copper aluminum phosphate	Blue to green with black, brown-red inclusions	Large	Low	6.0	2.60-2.83	do.	1.63	Chrysocolla, dyed howlite, dumortierite, glass, plastics, variscite	Difficult if matrix not present, matrix usually limonitic.
Unakite	Granitic rock, feldspar, epidote, quartz	Olive green, pink, and blue-gray	do.	do.	6.0-7.0	2.60-3.20	XX	XX	XX	Olive green, pink, gray-blue colors.
Zircon	Zirconium silicate	White, blue, brown, yellow, or green	Small to medium	Low to medium	6.0-7.5	4.0-4.8	Double (strong)	1.79-1.98	Diamond, synthetics, topaz, aquamarine	Double refraction, strongly dichroic, wear on facet edges.

XX Not applicable.

[1]Small: up to 5 carats; medium: 5 to 50 carats; large: more than 50 carats.

[2]Low: up to $25 per carat; medium: up to $200 per carat; high: more than $200 per carat.

[3]Commonwealth of Independent States.

TABLE 2
LABORATORY-CREATED GEMSTONE PRODUCTION METHODS

Gemstone	Production method	Company/producer	Date of first production
Alexandrite	Flux	Creative Crystals	1970s.
Do.	Melt pulling	J.O. Crystal	1990s.
Do.	do.	Kyocera	1980s.
Do.	Zone melt	Seiko	1980s.
Cubic zirconia	Skull melt	Various producers	1970s.
Emerald	Flux	Chatham	1930s.
Do.	do.	Gilson	1960s.
Do.	do.	Kyocera	1970s.
Do.	do.	Seiko	1980s.
Do.	do.	Lennix	1980s.
Do.	do.	Russia	1980s.
Do.	Hydrothermal	Lechleitner	1960s.
Do.	do.	Regency	1980s.
Do.	do.	Biron	1980s.
Do.	do.	Russia	1980s.
Ruby	Flux	Chatham	1950s.
Do.	do.	Kashan	1960s.
Do.	do.	J.O. Crystal	1980s.
Do.	do.	Douras	1990s.
Do.	Zone melt	Seiko	1980s.
Do.	Melt pulling	Kyocera	1970s.
Do.	Verneuil	Various producers	1900s.
Sapphire	Flux	Chatham	1970s.
Do.	Zone melt	Seiko	1980s.
Do.	Melt pulling	Kyocera	1980s.
Do.	Verneuil	Various producers	1900s.
Star ruby	do.	Linde	1940s.
Do.	Melt pulling	Kyocera	1980s.
Do.	do.	Nakazumi	1980s.
Star sapphire	Verneuil	Linde	1940s.

TABLE 3
VALUE OF U.S. GEMSTONE PRODUCTION, BY TYPE[1]

(Thousand dollars)

Gem materials	2004	2005
Beryl	18	48
Coral, all types	261	216
Diamond	(2)	(2)
Garnet	207	46
Gem feldspar	659	626
Geode/nodules	212	214
Opal	137	140
Quartz:		
Macrocrystalline[3]	206	196
Cryptocrystalline[4]	383	427
Sapphire/ruby	473	450
Shell	4,000	3,560
Topaz	(2)	(2)
Tourmaline	45	39
Turquoise	699	511
Other	7,170 r	6,960
Total	14,500	13,400

See footnotes at end of table.

TABLE 3—Continued

VALUE OF U.S. GEMSTONE PRODUCTION, BY TYPE[1]

[r]Revised.

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

[2]Included with "Other."

[3]Macrocrystalline quartz (crystals recognizable with the naked eye) includes amethyst, amethyst quartz, aventurine, blue quartz, citrine, hawk's eye, pasiolite, prase, quartz cat's eye, rock crystal, rose quartz, smoky quartz, and tiger's eye.

[4]Cryptocrystalline (microscopically small crystals) includes agate carnelian, chalcedony, chrysoprase, fossilized wood, heliotrope, jasper, moss agate, onyx, and sard.

TABLE 4

PRICES OF U.S. CUT DIAMONDS, BY SIZE AND QUALITY IN 2005[1]

Carat weight	Description, color[2]	Clarity[3] (GIA terms)	Representative prices January[4]	June[5]	December[6]
0.25	G	VS1	$1,200	$1,200	$1,200
do.	G	VS2	1,150	1,150	1,150
do.	G	SI1	975	975	975
do.	H	VS1	1,100	1,100	1,100
do.	H	VS2	1,000	1,000	1,000
do.	H	SI1	925	925	925
0.50	G	VS1	3,200	3,200	3,200
do.	G	VS2	2,800	2,800	2,800
do.	G	SI1	2,400	2,400	2,400
do.	H	VS1	2,800	2,800	2,800
do.	H	VS2	2,400	2,400	2,400
do.	H	SI1	2,200	2,200	2,200
0.75	G	VS1	3,600	3,600	3,600
do.	G	VS2	3,500	3,500	3,500
do.	G	SI1	3,200	3,200	3,200
do.	H	VS1	3,300	3,300	3,300
do.	H	VS2	3,200	3,200	3,200
do.	H	SI1	2,900	2,900	2,900
1.00	G	VS1	5,800	5,800	5,800
do.	G	VS2	5,500	5,500	5,500
do.	G	SI1	4,800	4,800	4,800
do.	H	VS1	5,200	5,200	5,200
do.	H	VS2	4,900	4,900	4,900
do.	H	SI1	4,700	4,700	4,700

[1]Data are rounded to no more than three significant digits.

[2]Gemological Institute of America (GIA) color grades: D—colorless; E—rare white; G, H, I—traces of color.

[3]Clarity: IF—no blemishes; VVS1—very, very slightly included; VS1—very slightly included; VS2—very slightly included, but not visible; SI1—slightly included.

[4]Source: Jewelers' Circular Keystone, v. 174, no. 2, February 2003, p. 44.

[5]Source: Jewelers' Circular Keystone, v. 174, no. 7, July 2003, p. 52.

[6]Source: Jewelers' Circular Keystone, v. 175, no. 1, January 2004, p. 28.

TABLE 5
PRICES PER CARAT OF U.S. CUT COLORED GEMSTONES IN 2005

Gemstone	Price range per carat	
	January[1]	December[2]
Amethyst	$7-15	$7-15
Blue sapphire	625-1,250	625-1,250
Blue topaz	3-5	3-5
Emerald	1,900-3,200	1,900-3,200
Green tourmaline	45-60	45-60
Pearl:[3]		
Cultured saltwater	5	5
Natural	210	210
Pink tourmaline	60-125	60-125
Rhodolite garnet	18-30	18-30
Ruby	900-1,125	900-1,125
Tanzanite	250-375	250-400

[1]Source: The Guide, spring/summer 2005, p. 14, 30, 45, 61, 72, 86, 96, 98, 104, 123, and 135. These figures are approximate current wholesale purchase prices paid by retail jewelers on a per stone basis for fine-quality stones.

[2]Source: The Guide, fall/winter 2005-2006, p. 14, 30, 45, 61, 72, 86, 96, 98, 104, 123, and 135. These figures are approximate current wholesale purchase prices paid by retail jewelers on a per stone basis for fine-quality stones.

[3]Prices are per 4.6-millimeter pearl.

TABLE 6

U.S. EXPORTS AND REEXPORTS OF DIAMOND (EXCLUSIVE OF INDUSTRIAL DIAMOND), BY COUNTRY[1]

Country	2004 Quantity (carats)	2004 Value[2] (millions)	2005 Quantity (carats)	2005 Value[2] (millions)
Exports:				
Australia	7,570	$7	33,700	$7
Belgium	189,000	100 r	1,300,000	538
Canada	68,500	47	84,200	56
Costa Rica	31,800	3	37,200	3
France	16,300	11	90,000	51
Hong Kong	529,000	219	1,030,000	294
India	151,000	31	206,000	57
Israel	352,000 r	208 r	1,890,000	1,090
Japan	22,600	26	52,400	53
Mexico	397,000	124	1,080,000	144
Netherlands	421	3	27,600	8
Netherlands Antilles	47,200	23	35,500	33
Singapore	12,300	5	54,000	19
South Africa	498	(3)	21,100	4
Switzerland	19,000 r	47	108,000	82
Taiwan	11,000	6	16,700	4
Thailand	68,500	15	98,000	28
United Arab Emirates	15,700	4	101,000	43
United Kingdom	26,300	28	78,800	22
Other	52,200 r	29 r	87,200	46
Total	2,020,000 r	936 r	6,430,000	2,580
Reexports:				
Armenia	69,500 r	3	44,300	3
Australia	19,100	7	40,300	8
Belgium	4,780,000 r	1,370 r	3,920,000	1,100
Canada	223,000 r	107 r	247,000	136
Dominican Republic	104,000	23	153,000	33
France	155,000	32 r	88,200	16
Guatemala	91,100	8	107,000	12
Hong Kong	2,690,000 r	490 r	2,500,000	618
India	2,200,000 r	345 r	1,840,000	387
Israel	7,650,000 r	2,690 r	7,670,000	2,640
Japan	207,000 r	47 r	150,000	33
Malaysia	41,100	9	34,900	5
Mexico	37,000	5	57,700	11
Singapore	264,000 r	46	218,000	35
South Africa	78,000 r	48 r	47,600	36
Switzerland	563,000 r	289 r	638,000	303
Thailand	285,000 r	70	290,000	83
United Arab Emirates	477,000 r	108 r	612,000	142
United Kingdom	490,000 r	171	540,000	211
Other	147,000 r	59 r	122,000	87
Total	20,600,000 r	5,930 r	19,300,000	5,890
Grand total	22,600,000 r	6,870 r	25,700,000	8,470

[r]Revised.

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

[2]Customs value.

[3]Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 7

U.S. IMPORTS FOR CONSUMPTION OF DIAMOND, BY KIND, WEIGHT, AND COUNTRY[1]

Kind, range, and country of origin	2004 Quantity (carat)	2004 Value[2] (millions)	2005 Quantity (carat)	2005 Value[2] (millions)
Rough or uncut, natural:[3]				
Angola	6,590	$19	19,400	$57
Australia	12,200	8	62,400	8
Botswana	144,000	48	274,000	132
Brazil	9,530	8	24,600	2
Canada	36,500	38	57,600	62
Congo (Kinshasa)	20,900	17	44,300	116
Ghana	1,910	(4)	58,000	3
Guyana	157,000	16	68,400	8
India	34,500	3	29,200	(4)
Namibia	28,700	1	10,700	1
Russia	250,000	20	45,500	13
South Africa	430,000	508	347,000	413
Other	74,400 r	68 r	16,800	49
Total	1,210,000	753	1,060,000	864
Cut but unset, not more than 0.5 carat:				
Belgium	786,000	275	530,000	197
Canada	4,800	4	7,890	9
China	67,100	10	78,900	13
Dominican Republic	37,200	4	57,100	5
Hong Kong	200,000	43	228,000	58
India	9,720,000	1,770	8,780,000	1,820
Israel	969,000	477	843,000	425
Mauritius	1,890	4	10,400	15
Mexico	14,400	(4)	247,000	35
Singapore	9,460	2	6,180	2
South Africa	8,410	3	5,330	2
Switzerland	7,390	2	33,600	18
Thailand	189,000	36	71,500	18
United Arab Emirates	122,000	24	91,600	23
Other	67,700 r	15 r	28,600	13
Total	12,200,000	2,670	11,000,000	2,650
Cut but unset, more than 0.5 carat:				
Belgium	1,230,000	2,450	1,160,000	2,620
Canada	23,600	67	15,200	50
Hong Kong	71,300	111	83,400	162
India	1,530,000	1,080	1,340,000	1,260
Israel	3,080,000	6,660	3,070,000	7,670
Mexico	16	(4)	49,900	37
Russia	62,200	121	57,600	126
South Africa	40,500	242	46,300	336
Switzerland	20,100	155	16,600	138
Thailand	21,300	23	21,200	20
United Arab Emirates	23,800	21	50,300	64
Other	88,200 r	272 r	67,000	235
Total	6,190,000	11,200	5,980,000	12,700

rRevised.

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

[2]Customs value.

[3]Includes some natural advanced diamond.

[4]Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 8
U.S. IMPORTS FOR CONSUMPTION OF GEMSTONES, OTHER THAN
DIAMOND, BY KIND AND COUNTRY[1]

	2004		2005	
Kind and country	Quantity (carats)	Value[2] (millions)	Quantity (carats)	Value[2] (millions)
Emerald:				
Argentina	--	--	12,500	(3)
Belgium	25,200	$2	4,230	$1
Brazil	355,000	4	83,600	5
Canada	412	(3)	6,430	(3)
China	227,000	1	17,900	(3)
Colombia	677,000	47	456,000	54
France	745	1	2,360	7
Germany	7,440	1	93,600	1
Hong Kong	57,100	4	86,100	8
India	1,880,000	18	1,340,000	17
Israel	259,000	21	139,000	22
Italy	865	(3)	3,120	2
Namibia	--	--	4,590	(3)
Switzerland	9,450	7	18,500	8
Thailand	424,000	8	348,000	7
United Kingdom	851	2	2,520	2
Other	74,600	6	4,770	2
Total	4,000,000	122	2,620,000	137
Ruby:				
Belgium	6,450	2	11,600	1
China	21,700	(3)	29,700	(3)
Dominican Republic	4,920	(3)	23,600	(3)
France	786	1	2,300	5
Germany	19,400	1	77,600	1
Hong Kong	52,100	4	119,000	7
India	1,300,000	4	935,000	5
Israel	41,300	1	8,840	1
Italy	6,570	(3)	4,340	1
Kenya	526	(3)	33,500	(3)
Sri Lanka	5,260	1	4,080	1
Switzerland	2,230	11	89,300	29
Thailand	2,090,000	43	3,030,000	48
United Arab Emirates	7,700	1	3,340	1
Other	186,000	2	8,630	2
Total	3,750,000	72	4,380,000	102
Sapphire:				
Australia	5,300	(3)	57,900	1
Austria	947	(3)	29,600	1
Belgium	4,480	1	7,120	1
China	120,000	(3)	84,100	(3)
Dominican Republic	3,750	(3)	24,500	(3)
Germany	41,000	2	72,700	5
Hong Kong	138,000	7	272,000	15
India	1,040,000	9	987,000	6
Israel	56,600	3	31,600	3
Italy	4,130	(3)	5,880	(3)
Singapore	379	(3)	5,350	(3)
Sri Lanka	455,000	42	448,000	45
Switzerland	29,900	11	49,000	9
Thailand	5,470,000	78	5,620,000	81

See footnotes at end of table.

TABLE 8—Continued
U.S. IMPORTS FOR CONSUMPTION OF GEMSTONES, OTHER THAN DIAMOND, BY KIND AND COUNTRY[1]

	2004		2005	
Kind and country	Quantity (carats)	Value[2] (millions)	Quantity (carats)	Value[2] (millions)
Sapphire—Continued:				
United Arab Emirates	7,360	(3)	2,490	(3)
United Kingdom	7,820	$3	2,550	(3)
Other	113,000	4	14,700	$5
Total	7,500,000	163	7,710,000	174
Other:				
Rough, uncut:				
Australia	NA	3	NA	2
Brazil	NA	8	NA	10
Canada	NA	3	NA	4
China	NA	3	NA	4
Colombia	NA	1	NA	1
Czech Republic	NA	(3)	NA	2
Germany	NA	2	NA	3
India	NA	1	NA	1
Japan	NA	(3)	NA	1
Mexico	NA	1	NA	1
Netherlands	NA	1	NA	1
Pakistan	NA	1	NA	1
South Africa	NA	7	NA	1
Tanzania	NA	1	NA	3
United Kingdom	NA	(3)	NA	1
Other	NA	5 r	NA	5
Total	NA	39	NA	40
Cut, set and unset:				
Australia	NA	9	NA	9
Austria	NA	3	NA	4
Brazil	NA	13	NA	18
Canada	NA	1	NA	1
China	NA	45	NA	57
France	NA	1	NA	3
Germany	NA	38	NA	33
Hong Kong	NA	35	NA	49
India	NA	82	NA	93
Israel	NA	4	NA	5
Italy	NA	1	NA	1
South Africa	NA	5	NA	3
Sri Lanka	NA	7	NA	7
Switzerland	NA	10	NA	19
Taiwan	NA	2	NA	2
Tanzania	NA	7	NA	7
Thailand	NA	46	NA	40
United Arab Emirates	NA	2	NA	1
United Kingdom	NA	1	NA	1
Other	NA	7 r	NA	7
Total	NA	320	NA	360

[r]Revised. NA Not available. -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Customs value.
[3]Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 9
VALUE OF U.S. IMPORTS OF LABORATORY-CREATED AND IMITATION GEMSTONES, BY COUNTRY[1,2]

(Thousand dollars)

Country	2004	2005
Laboratory-created, cut but unset:		
Austria	2,410	3,700
Brazil	225	151
Canada	98	133
China	14,100	15,200
Cyprus	246	86
Czech Republic	114	91
France	989	945
Germany	13,800	12,200
Hong Kong	1,500	1,580
India	261	526
Ireland	7	69
Italy	75	131
Japan	112	110
Korea, Republic of	649	468
Netherlands	232	296
South Africa	--	87
Sri Lanka	1,290	1,300
Switzerland	3,340	2,050
Taiwan	197	238
Thailand	1,090	1,420
United Arab Emirates	--	70
Other	158 r	253
Total	40,900	41,100
Imitation:[3]		
Austria	60,800	73,600
Brazil	8	16
China	4,660	3,500
Czech Republic	7,000	11,000
France	16	13
Germany	974	1,160
Hong Kong	700	271
India	207	361
Italy	100	222
Japan	1,110	474
Korea, Republic of	774	619
Philippines	16	15
Russia	53	17
Spain	165	256
Taiwan	220	179
Thailand	31	52
United Kingdom	--	24
Other	227 r	109
Total	77,000	91,900

[r]Revised. -- Zero.

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

[2]Customs value.

[3]Includes pearls.

Source: U.S. Census Bureau.

TABLE 10

U.S. IMPORTS FOR CONSUMPTION OF GEMSTONES[1]

(Thousand carats and thousand dollars)

Stones	2004		2005	
	Quantity	Value[2]	Quantity	Value[2]
Diamonds:				
Rough or uncut	1,210	753,000	1,060	864,000
Cut but unset	18,400	13,900,000	17,000	15,400,000
Emeralds, cut but unset	4,000	122,000	2,630	137,000
Coral and similar materials, unworked	6,120	11,500	5,520	12,200
Rubies and sapphires, cut but unset	11,200	234,000	12,100	275,000
Pearls:				
Natural	NA	15,500 r	NA	21,800
Cultured	NA	29,500	NA	27,100
Imitation	NA	3,780	NA	4,170
Other precious and semiprecious stones:				
Rough, uncut	1,130,000	25,200	1,630,000	22,900
Cut, set and unset	NA	279,000	NA	319,000
Other	NA	5,680	NA	7,200
Laboratory-created:				
Cut but unset	249,000	40,900	196,000	41,100
Other	NA	8,110	NA	10,300
Imitation gemstone[3]	NA	73,300	NA	87,700
Total	XX	15,500,000 r	XX	17,200,000

[r]Revised. NA Not available. XX Not applicable.

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

[2]Customs value.

[3]Does not include pearls.

Source: U.S. Census Bureau.

TABLE 11

NATURAL DIAMOND: WORLD PRODUCTION, BY COUNTRY AND TYPE[1, 2, 3]

(Thousand carats)

Country and type[4]	2001	2002	2003	2004	2005
Gemstones:					
Angola[e]	4,643 r	4,520	5,130 r	5,490 r	5,580
Australia	14,397 r	15,136 r	13,981 r	20,602 r	20,000 e
Botswana[e]	19,812 r, 5	21,297 r, 5	22,800	23,300	23,900
Brazil[e]	700	500 5	400 r	300 r, 5	300
Canada	3,716	4,937	10,756 r	12,618	12,300
Central African Republic[e]	340	312	250	263 r	265
China[e]	100 r	100 r	100 r	100 r	100
Congo (Kinshasa)	3,638	4,223 r	5,381 r	6,180 r	6,300 e
Côte d'Ivoire	207 e	205 r	154 r	201 r, e	201 e
Ghana	936 e	770 e	675 r	690 r	760 e
Guinea[e]	273	368	484 6	354 r, 6	411 6
Guyana	179	248	413	455 r	357
Liberia[e]	100	48	36	18	18
Namibia	1,487	1,562	1,481	2,004 r	1,900 e
Russia[e]	17,500	17,400	20,000	21,400	23,000
Sierra Leone	102 r	162 r	233 r, e	318 r, e	318 e
South Africa	4,465 r	4,351 r	5,144 r	5,780 e	5,780 e
Tanzania[e]	216 5	204	201	258 r	175
Venezuela	14	46	11	40 e	46 e
Other[7]	54 r	42 r	44 r	74 r	110
Total	72,900 r	76,400 r	87,700 r	100,000 r	102,000
Industrial:					
Angola[e]	516	502	570 r	610 r	620
Australia	11,779 r	18,500	17,087 r	22,709 r	20,000 e
Botswana[e]	6,604 r, 5	7,100	7,600	7,800	8,000
Brazil[e]	600	600	600	600	600
Central African Republic[e]	113	104	83	88 r	88
China[e]	950	955	955	960	960
Congo (Kinshasa)	14,560	17,456	21,600	24,700 r	25,200 e
Côte d'Ivoire	102	101 r	76 r	99 r, e	99 e
Ghana[e]	234	193	225 r	230 r	253
Guinea[e]	91	123	161 6	118 r, 6	137 6
Liberia[e]	70	32	24	12	12
Russia[e]	11,700	11,600	13,000	14,200	15,000
Sierra Leone	120 r	190 r	274 r, e	374 r, e	374 e
South Africa	6,698 r	6,526 r	7,540 r	8,500 r, e	9,380 e
Tanzania	38	36	36	46 r	30
Venezuela	28	61	24	60 e	69 e
Other[8]	91 r	81 r	82 r	121 r	190
Total	54,300 r	64,200 r	69,900 r	81,200 r	81,000
Grand total	127,000	141,000 r	158,000 r	182,000 r	183,000

[e]Estimated. [r]Revised.

[1]World totals and estimated data are rounded to no more than three significant digits; may not add to totals shown.

[2]Table includes data available through June 5, 2006.

[3]In addition to the countries listed, Nigeria produces natural diamond, but information is inadequate to formulate reliable estimates of output levels.

[4]Includes near-gem and cheap-gem qualities.

[5]Reported figure.

[6]Exports.

[7]Includes Cameroon, Congo (Brazzaville), Gabon (unspecified), India, Indonesia, and Zimbabwe.

[8]Includes Congo (Brazzaville), India, Indonesia, and Zimbabwe.