2006 Minerals Yearbook

GEMSTONES

U.S. Department of the Interior
U.S. Geological Survey

May 2008

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In 2006, the estimated value of natural gemstones produced in the United States was more than $11.3 million, and the estimated value of U.S. laboratory-created gemstone production was more than $52.1 million. The total estimated value of U.S. gemstone production was almost $63.4 million. The value of U.S. gemstone imports was $18.3 billion, and the value of combined U.S. gemstone exports and reexports was estimated to be $9.93 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.

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 gathered 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 2006 was estimated to be more than $11.3 million (table 3). The production value decreased by 16% from that of 2005.

Natural gemstone materials indigenous to the United States are collected, produced, and/or marketed in every State. During 2006, all 50 States produced at least $1,000 worth of gemstone materials. Nine States accounted for 82% of the total value, as reported by survey respondents. These States were, in order of declining value of production, Tennessee, Oregon, Arizona, California, Arkansas, Alabama, Idaho, 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 2006, 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 2006, 488 diamond stones with an average weight of 0.241 carats were recovered at the Crater of Diamonds State Park. Of the 488 diamond stones recovered, 15 weighed more than 1 carat. Since the diamond-bearing pipe and the adjoining area became a State park in 1972, 25,857 diamond stones with a total carat weight of 5,071.92 have been recovered (Tom Stolarz, Park Superintendent, Crater of Diamonds State Park, written commun., January 31, 2007). 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 has now been fully reclaimed.

Studies by the Wyoming Geological Survey have shown that Wyoming has the potential for a $1 billion diamond mining business. Wyoming has many of the same geologic conditions that are found in the diamond-producing areas of Canada, and there is evidence of hundreds of kimberlite pipes in the State. There have been 20 diamondiferous kimberlite pipes and 1 diamondiferous mafic breccia pipe identified in southern Wyoming. The State Line and the Iron Mountain kimberlite fields of Wyoming are two of the largest kimberlite fields in the United States, and the Leucite Hills lamproite field in Wyoming is the largest lamproite field in the United States. Several diamond mining firms have shown interest in the northern Colorado and southern Wyoming area (Associated Press, 2002).

The success of Canadian diamond mines has stimulated some interest in exploring for commercially feasible diamond deposits in the United States outside of Colorado and Wyoming, in Alaska, Minnesota, and Montana. Parts of Alaska have similar geologic terrain to the Northwest Territories; and some diamond indicator minerals, as well as some microscopic diamonds have been found near Anchorage, AK. This has lead to exploratory drilling by two Canadian companies. University of Minnesota geologists teamed with an Australian mining company to conduct a soil sampling program in Minnesota exploring for diamond and other mineral deposits. The samples were being analyzed by Australia's BHP Billiton Plc., and the chances of success were thought to be good owing to similarities between the geology in Canada and Minnesota (Diamond Registry Bulletin, 2005a). Diamond deposit exploration is also being conducted near Lewistown, MT; a diamond-bearing kimberlite was found in a 32.4-hectare site known as the Homestead property. Preliminary tests have shown the presence of microscopic diamonds. 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 gemstones. Simulants have an appearance similar to that of a natural gemstone material, but they have different chemical, optical, and physical properties. Laboratory-created gemstones that have been produced in the United States include alexandrite, diamond, emerald, garnet, moissanite, ruby, sapphire, spinel, turquoise, and zirconia. However, during 2006, only diamond, garnet, moissanite, and turquoise were produced commercially. 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 $52.1 million during 2006, which was a slight increase over that of 2005. The value of U.S. simulant gemstone output was estimated to be 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 were, in descending order of production value, North Carolina, Florida, Massachusetts, Michigan, and Arizona.

Gemesis Corp. in Sarasota, FL, consistently produced gem-quality laboratory-created diamond and reported a seventh year of production in 2006. 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 (Davis, 2003). 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 are available for retail purchase in jewelry stores and on the Internet, and 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, 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 temperature, gas composition, and pressure combination 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 2006, Apollo Diamond Inc. produced laboratory-created stones that range from 1 to 2 carats and expected to expand to larger stones in the future. Late in 2006, Apollo started selling jewelry directly to consumers through a jeweler in Boston, MA. In 2007, the company hoped to increase production of large stones, while expanding distribution to other jewelers and selling online through an Apollo Diamond

Web store (O'Connell, 2007). Apollo planned to start selling diamonds in the jewelry market at costs 10% to 30% below those of comparable natural diamonds (Hastings, 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).

The Carnegie Institution of Washington 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. 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). Apollo Diamond and the Carnegie Institution have noted that diamonds produced by the CVD method are harder than natural diamonds and diamonds produced by HPHT methods.

In 2006, the North Carolina company Charles & Colvard, Ltd. entered its ninth 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., 2007).

U.S. shell production decreased by 8% in 2006 compared with that of 2005. U.S. shell mussels is used as a source of mother-of-pearl and as seed material for culturing pearls. The lower shell production is because of overharvesting in past years, the killing off of U.S. native mussel species by invasive exotic species, and a decline in market demand. Pearl 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. In some regions of the United States, shell from mussels is being used more as a gemstone based on its own merit rather than as seed material for pearls. This shell material is being processed into mother-of-pearl and 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 2006. The U.S. market for unset gem-quality diamond during the year was estimated to be about $17.3 billion. Domestic markets for natural, unset nondiamond gemstones totaled approximately $1.07 billion.

In the United States, about two-thirds of domestic consumers designate diamond as their favorite gemstone when surveyed. In 2006, the top-selling colored gemstones were, in descending order, blue sapphire, blue topaz, emerald, ruby, fancy sapphire, amethyst, pink tourmaline, peridot and citrine (tied for eighth place), rhodolite garnet, and green tourmaline. Aquamarine, opal, and tanzanite from the previous year dropped out of the top 10. During 2006, 42% of the jewelry retailers said their sales were up compared with 50% of retailers in 2005 (Wade, 2006; Zborowski, 2007).

The U.S. colored gemstone market posted an overall increase in sales during 2006 compared with the sales in 2005. The popularity of colored gemstones, colored laboratory-created gemstones, and "fancy" colored diamonds continued to increase in 2006. This was indicated by increased values of U.S. imports for consumption in some colored stone categories (emerald, coral, pearls, other precious and semiprecious stones, and laboratory-created gems) in 2006 compared with the values from 2005 (table 10). Colored stone popularity also was evidenced by their general sales increase in 2006 (Zborowski, 2007).

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 remain a significant force affecting the price of gem-quality diamond worldwide because they mine about 40% of the gem-quality diamond produced each year (De Beers Group, 2005; Diamond Registry Bulletin, 2007b). 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).

In 2006, there were about 200,000 diamond jewelry retail outlets worldwide. From these retail outlets, about 45% of diamond jewelry was sold in the United States, 33% in Asia, and 11% in Europe. Increase in sales was approximately 6% compared with that of 2005. The value of the entire market was more than $62 billion (De Beers Group, 2006).

The International Diamond and Jewelry Exchange (IDEX) diamond price index showed the following price trends in polished stones from June 2005 to June 2006. Larger polished diamonds and very small diamonds (less than 0.1 carat) rose in price while diamonds in the 0.5- to 1-carat range declined slightly in price; the price of 1.5-carat diamonds increased 2.8%, and the price of 2-carat diamonds increased 5.5%. The decline in prices of diamonds in the 0.5- to 1-carat range had been an ongoing trend for many months. About 30% of the polished diamond market's total dollar value falls into the 0.5- to 2-carat size range. Among very large diamonds, round cut 5-carat polished diamonds had risen a dramatic 17% in price since June 2005. These diamonds represent less than 1% of the market. The IDEX diamond price index measures price changes relative to the baseline of 100 set by the June 2004 price (Diamond News, 2006).

Foreign Trade

During 2006, total U.S. gemstone trade with all countries and territories was valued at more than $27.9 billion, which was an increase of 8.5% from that of 2005. Diamond accounted for about 96% of the 2006 gemstone trade total. In 2006, U.S. exports and reexports of diamond were shipped to 87 countries and territories, and imports of all gemstones were received from 104 countries and territories (tables 6-10). During 2006, U.S. trade in cut diamond and unworked diamond increased slightly and by 13.4%, respectively, compared with that of 2005. The United States remained the world's leading diamond importer and 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).

Imports of laboratory-created gemstone increased by 2.9% for the United States in 2006 compared with trade in 2005. Laboratory-created gemstone imports from Austria, China, Germany, Hong Kong, India, Sri Lanka, Switzerland, and Thailand, with more than $500,000 in imports from each country, made up about 92% (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 2006. There also were problems with some simulants being marketed as laboratory-created gemstones during the year.

World Review

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 2006, world natural diamond production totaled about 171 million carats—91.3 million carats gem quality and 79.9 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 2006, 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, Canada, Australia, Angola, South Africa, Congo (Kinshasa), and Namibia in descending quantity order. These eight countries produced 96.5% (by quantity) of the world's gemstone diamond output in 2006. In 2006, the total estimated value of global gem diamond production was $12.0 billion; this was a 4.3% increase compared with that of 2005 (De Beers Group, 2006).

De Beers reported that its sales of rough diamond for 2006 were $6.15 billion, which was a decrease of 6% from $6.54 billion in 2005 (JCK Online, 2007).

In 2002, the international rough-diamond certification system, the Kimberley Process Certification Scheme (KPCS), was agreed upon by United Nations (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. The list of participating countries has expanded to include 42 nations that have met the minimum requirements of the agreement. The rough diamond-trading entity of Chinese Taipei has also met the minimum requirements of the KPCS. The 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 UN. The participating nations in the KPCS account for approximately 98% of the global production and trade of rough diamonds (Diamond Registry Bulletin, 2005b; Kimberley Process, 2007). Discussions about the possible participation of several other countries are ongoing.

Globally, the value of production of natural gemstones other than diamond was estimated to have exceeded $2 billion in 2006. 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.

Canada.—The Ekati Diamond Mine, Canada's first operating commercial diamond mine, completed its eighth full year of production in 2006. Ekati produced 2.52 million carats of diamond from 4.48 Mt of ore (BHP Billiton Ltd., 2007). BHP Billiton Ltd. has an 80% controlling ownership in Ekati, which is in the Northwest Territories in Canada. 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. 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 fourth full year of production. In 2006, Diavik produced 9.8 million carats of diamond from two adjacent kimberlite pipes located within the same pit (Diavik Diamond Mines Inc., 2007). The mine will also be producing from a third kimberlite pipe by yearend 2007. Diavik has estimated the mine's remaining proven and probable reserves to be 24.5 Mt of ore in kimberlite pipes, containing 81.7 million carats of diamond, and projected the mine life to be 16 to 22 years (Diavik Diamond Mine Dialogue, 2007). 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 110 million carats of diamond at a rate of 8 million carats per year (Diavik Diamond Mines Inc., 2000, p. 10-12; Diavik Diamond Mine Dialogue, 2007).

Canada's third diamond mine, the Jericho Diamond Mine (wholly owned by Tahera Diamond Corp.), began production of rough diamonds during the first quarter of 2006 and declared commercial production on July 1, 2006. The Jericho mine is located in Nunavut. Jericho experienced startup difficulties, which persisted throughout 2006, but 539,000 t of kimberlite ore was processed, resulting in production of 296,000 carats. Tahera estimated the Jericho Diamond Mine's reserves to be 2.6 Mt of ore and 3.11 million carats of diamond (Tahera Diamond Corp., 2007).

Diamond exploration is continuing in Canada, with several other commercial diamond projects and additional discoveries located in Alberta, British Columbia, the Northwest Territories, Nunavut, Ontario, and Quebec. Canada produced about 7% of the world's combined natural gemstone and industrial diamond production in 2006.

Canadian diamond discoveries continue to be made and production continues to increase. Canada ranked third in quantity produced of gemstone diamond in 2006 after Botswana and Russia.

Côte d'Ivoire.—In September, the UN Security Council unanimously upheld resolution 1643 (2005), which requires nations to prevent the import of all rough diamonds from Côte d'Ivoire into their territory. The UN Security Council deemed Côte d'Ivoire to be a threat to international peace and security. The effect of this action is the continued embargo against diamond trade from Côte d'Ivoire (Diamond Registry Bulletin, 2006b).

Ghana.—In late 2006, the Minister of Mines and Energy of Ghana reported that the country had put new "conflict diamond" controls in place and was now in accord with the Kimberley Process. These controls became necessary after it was discovered that rebels in northern Côte d'Ivoire were mining diamonds and selling them in Ghana (Diamond Registry Bulletin, 2007a).

Liberia.—The UN Security Council extended the ban on Liberian diamond exports through the end of 2006. The ban was put into place by the UN in May 2001. Members of the UN Security Council urged the Liberian Government to accelerate the implementation of reform measures so that they could join the Kimberley Process (Diamond Registry Bulletin, 2006a).

Russia.—The historic Malysheva Emerald mine in central Russia officially reopened on October 9. The mine is now owned by Emerite Co. (a wholly owned Russian subsidiary company of the Tsar Emerald Corp). The deposit was first discovered in 1833, and mining began a year later. Over time, the Malysheva became well know for its deposits of high-quality gemstones, which included emerald, alexandrite, topaz, citrine, and a variety of beryl. The mine's production has been curtailed several times throughout its history for various political reasons. The most recent closure was in 1995 following the collapse of the Soviet Union. In 2000, the mine resumed limited production, but full-scale mining could not be achieved. The Tsar Emerald Corp. has now completed a 3-year rehabilitation of the mine, and the Malysheva has been restored to its former status. With the reopening in October, came the first recovery of underground emerald ore in recent years (Co, 2006; Colored Stone, 2007).

Tanzania.—The violet-blue gemstone tanzanite was discovered in 1967 near the village of Merelani in northern Tanzania. From its discovery until the early 1990s, tanzanite was mined by local small-scale miners without the aid of modern technology or investment capital. Then, tanzanite began to increase significantly in mainstream popularity. African Gem Resources Ltd. (a South African company), which later became TanzaniteOne Ltd., moved in and set up a modern mechanized mining operation that was well-funded by international investors on a large central portion of the Merelani tanzanite mining district. The company promoted their operation to the world as an alternative to the existing tanzanite supply chain, with no child labor, no unsafe working conditions, and no illegal smuggling. The local miners saw this as an attempt to force them out, control tanzanite trade, and keep the profits for themselves. Local miners clashed violently and repeatedly with the TanzaniteOne workers. In February 2006, TanzaniteOne announced an international promotional campaign and the establishment of a brand for tanzanite. The campaign would promote tanzanite to customers worldwide, especially in the United States, Europe, and South Africa. The branding proposal included certificates of authenticity, which signified that the tanzanite was purchased from TanzaniteOne or one of its partners. The certifications are managed by the Tanzanite Foundation (a nonprofit organization funded by TanzaniteOne and its customers). The Tanzanite Foundation recommends that tanzanite consumers insist on receiving a "Certificate of Authenticity." The announcement reportedly was well received by most of the local miners of the Merelani gem community because, in promoting tanzanite to the world, local miners would also benefit, and local companies could create brands of their own. TanzaniteOne started regular purchases from local small-scale miners and won their respect by offering prices much higher than most foreign dealers pay (Kondo, 2007; Tanzanite Foundation, The, 2007).

Outlook

There are indications of possible continued growth in the U.S. diamond and jewelry markets in 2007. Historically, diamonds have proven to hold their value despite wars or economic depressions (Schumann, 1998, p. 8).

Independent producers, such as Argyle Diamond 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 2006, online sales rose by 25%, representing 3.5% of all retail jewelry sales for the year, and Internet sales of diamonds, gemstones, and jewelry are expected to continue to grow and increase in popularity, as will other forms of e-commerce that emerge to serve the diamond and gemstone industry. This is likely to take place as the gemstone industry and its customers become more comfortable with and learn the applications of new e-commerce tools (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 to medium	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, natural	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 Inc.	1970s.
Do.	Melt pulling	J.O. Crystal Co., Inc.	1990s.
Do.	do.	Kyocera Corp.	1980s.
Do.	Zone melt	Seiko Corp.	1980s.
Cubic zirconia	Skull melt	Various producers	1970s.
Emerald	Flux	Chatham Created Gems	1930s.
Do.	do.	Gilson	1960s.
Do.	do.	Kyocera Corp.	1970s.
Do.	do.	Seiko Corp.	1980s.
Do.	do.	Lennix	1980s.
Do.	do.	Russia	1980s.
Do.	Hydrothermal	Lechleitner	1960s.
Do.	do.	Regency	1980s.
Do.	do.	Biron Corp.	1980s.
Do.	do.	Russia	1980s.
Ruby	Flux	Chatham Created Gems	1950s.
Do.	do.	Kashan Created Ruby	1960s.
Do.	do.	J.O. Crystal Co., Inc.	1980s.
Do.	do.	Douras	1990s.
Do.	Zone melt	Seiko Corp.	1980s.
Do.	Melt pulling	Kyocera Corp.	1970s.
Do.	Verneuil	Various producers	1900s.
Sapphire	Flux	Chatham Created Gems	1970s.
Do.	Zone melt	Seiko Corp.	1980s.
Do.	Melt pulling	Kyocera Corp.	1980s.
Do.	Verneuil	Various producers	1900s.
Star ruby	do.	Linde Air Products Co.	1940s.
Do.	Melt pulling	Kyocera Corp.	1980s.
Do.	do.	Nakazumi Earth Crystals Co.	1980s.
Star sapphire	Verneuil	Linde Air Products Co.	1940s.

TABLE 3

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

(Thousand dollars)

Gem materials	2005	2006
Beryl	48	21
Coral, all types	216	106
Diamond	(2)	(2)
Garnet	46	44
Gem feldspar	626	1,190
Geode/nodules	214	47
Opal	140	380
Quartz:		
Macrocrystalline[3]	196	228
Cryptocrystalline[4]	427	147
Sapphire/ruby	450	198
Shell	3,560	3,270
Topaz	(2)	(2)
Tourmaline	39	55
Turquoise	511	202
Other	6,960	5,440
Total	13,400	11,300

[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 2006[1]

Carat weight	Description, color[2]	Clarity[3] (GIA terms)	Representative prices January[4]	June[5]	December[6]
0.25	G	VS1	$1,300	$1,300	$1,300
do.	G	VS2	1,200	1,200	1,200
do.	G	SI1	1,100	1,100	1,100
do.	H	VS1	1,150	1,150	1,150
do.	H	VS2	1,050	1,050	1,050
do.	H	SI1	1,000	1,000	1,000
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	3,800	3,800	3,800
do.	G	VS2	3,600	3,600	3,600
do.	G	SI1	3,300	3,300	3,300
do.	H	VS1	3,500	3,500	3,500
do.	H	VS2	3,300	3,300	3,300
do.	H	SI1	3,000	3,000	3,000
1.00	G	VS1	6,500	6,500	6,500
do.	G	VS2	6,100	6,100	6,100
do.	G	SI1	5,000	5,000	5,000
do.	H	VS1	5,500	5,500	5,500
do.	H	VS2	5,300	5,300	5,300
do.	H	SI1	4,600	4,600	4,600

[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. 177, no. 2, February 2006, p. 136.

[5]Source: Jewelers' Circular Keystone, v. 177, no. 7, July 2006, p. 169.

[6]Source: Jewelers' Circular Keystone, v. 178, no. 1, January 2007, p. 137.

TABLE 5

PRICES PER CARAT OF U.S. CUT COLORED GEMSTONES IN 2006

Gemstone	Price range per carat January[1]	December[2]
Amethyst	$7-15	$7-15
Blue sapphire	675-1,250	700-1,375
Blue topaz	5-10	5-10
Emerald	2,400-3,500	2,400-4,000
Green tourmaline	45-60	45-60
Cultured saltwater pearl[3]	5	5
Pink tourmaline	60-125	60-125
Rhodolite garnet	18-30	18-30
Ruby	900-1,125	1,725-2,000
Tanzanite	275-425	300-450

[1]Source: The Guide, spring/summer 2006, p. 14, 31, 45, 61, 72, 86, 96, 98, 104, and 123. These figures are approximate current wholesale purchase prices paid by retail jewelers on a per stone basis for 1 to <2 carat, fine-quality stones.

[2]Source: The Guide, fall/winter 2006-2007, p. 22, 37, 51, 65, 74, 85, 95, 98, 104, and 119. These figures are approximate current wholesale purchase prices paid by retail jewelers on a per stone basis for 1 to <2 carat, 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	2005 Quantity (carats)	2005 Value[2] (millions)	2006 Quantity (carats)	2006 Value[2] (millions)
Exports:				
Australia	33,700	$7	50,100	$19
Belgium	1,300,000	538	2,480,000	725
Canada	84,200	56	82,900	90
Costa Rica	37,200	3	67,700	7
France	90,000	51	189,000	64
Hong Kong	1,030,000	294	1,620,000	419
India	206,000	57	706,000	232
Israel	1,890,000	1,090	3,820,000	1,700
Japan	52,400	53	74,900	43
Mexico	1,080,000	144	864,000	129
Netherlands	27,600	8	27,600	6
Netherlands Antilles	35,500	33	15,500	51
Singapore	54,000	19	83,300	14
South Africa	21,100	4	32,000	13
Switzerland	108,000	82	142,000	129
Taiwan	16,700	4	21,800	4
Thailand	98,000	28	121,000	34
United Arab Emirates	101,000	43	226,000	61
United Kingdom	78,800	22	88,600	66
Other	87,200	46	220,000	74
Total	6,430,000	2,580	10,900,000	3,890
Reexports:				
Armenia	44,300	3	54,300	5
Australia	40,300	8	16,500	6
Belgium	3,920,000	1,100	4,340,000	1,070
Canada	247,000	136	260,000	162
Dominican Republic	153,000	33	107,000	15
France	88,200	16	11,500	1
Guatemala	107,000	12	96,800	10
Hong Kong	2,500,000	618	3,470,000	771
India	1,840,000	387	1,910,000	369
Israel	7,670,000	2,640	8,770,000	2,310
Japan	150,000	33	91,700	23
Malaysia	34,900	5	28,100	6
Mexico	57,700	11	31,500	7
Singapore	218,000	35	173,000	37
South Africa	47,600	36	396,000	55
Switzerland	638,000	303	453,000	345
Thailand	290,000	83	243,000	62
United Arab Emirates	612,000	142	513,000	131
United Kingdom	540,000	211	525,000	213
Other	122,000	87	176,000	58
Total	19,300,000	5,890	21,700,000	5,660
Grand total	25,700,000	8,470	32,600,000	9,540

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

Source: U.S. Census Bureau.

TABLE 7
U.S. IMPORTS FOR CONSUMPTION OF DIAMOND, BY KIND, WEIGHT, AND COUNTRY[1]

	2005		2006	
Kind, range, and country of origin	Quantity (carats)	Value[2] (millions)	Quantity (carats)	Value[2] (millions)
Rough or uncut, natural:[3]				
Angola	19,400	$57	42,600	$34
Australia	62,400	8	1,350	1
Botswana	274,000	132	172,000	162
Brazil	24,600	2	5,840	5
Canada	57,600	62	45,300	41
Congo (Kinshasa)	44,300	116	45,800	66
Ghana	58,000	3	38,700	1
Guyana	68,400	8	24,500	3
India	29,200	(4)	12,300	1
Namibia	10,700	1	4,050	2
Russia	45,500	13	443,000	27
South Africa	347,000	413	332,000	384
Other	16,800	49	31,900	74
Total	1,060,000	864	1,200,000	801
Cut but unset, not more than 0.5 carat:				
Belgium	530,000	197	526,000	203
Canada	7,890	9	10,500	14
China	78,900	13	62,600	16
Dominican Republic	57,100	5	64,200	6
Hong Kong	228,000	58	390,000	70
India	8,780,000	1,820	8,560,000	1,780
Israel	843,000	425	843,000	426
Mauritius	10,400	15	5,370	11
Mexico	247,000	35	453,000	58
Singapore	6,180	2	979	1
South Africa	5,330	2	3,350	2
Switzerland	33,600	18	53,800	25
Thailand	71,500	18	102,000	21
United Arab Emirates	91,600	23	131,000	35
Other	28,600	13	65,000	26
Total	11,000,000	2,650	11,300,000	2,690
Cut but unset, more than 0.5 carat:				
Belgium	1,160,000	2,620	1,120,000	2,600
Canada	15,200	50	18,800	66
Hong Kong	83,400	162	65,600	154
India	1,340,000	1,260	1,390,000	1,480
Israel	3,070,000	7,670	2,870,000	8,140
Mexico	49,900	37	9,480	1
Russia	57,600	126	53,600	132
South Africa	46,300	336	78,200	559
Switzerland	16,600	138	11,000	191
Thailand	21,200	20	16,900	24
United Arab Emirates	50,300	64	82,500	111
Other	67,000	235	83,000	298
Total	5,980,000	12,700	5,790,000	13,800

[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.

Source: U.S. Census Bureau.

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

Kind and country	2005 Quantity (carats)	2005 Value[2] (millions)	2006 Quantity (carats)	2006 Value[2] (millions)
Emerald:				
Argentina	12,500	(3)	--	--
Belgium	4,230	$1	137,000	$1
Brazil	83,600	5	206,000	8
Canada	6,430	(3)	993	(3)
China	17,900	(3)	5,000	(3)
Colombia	456,000	54	1,020,000	86
France	2,360	7	1,020	2
Germany	93,600	1	12,400	2
Hong Kong	86,100	8	439,000	5
India	1,340,000	17	1,450,000	19
Israel	139,000	22	138,000	22
Italy	3,120	2	7,590	3
Namibia	4,590	(3)	--	--
Switzerland	18,500	8	28,200	19
Thailand	348,000	7	420,000	7
United Kingdom	2,520	2	1,320	1
Other	4,770	2	37,400	(3)
Total	2,620,000	137	3,910,000	175
Ruby:				
Belgium	11,600	1	1,760	1
China	29,700	(3)	17,000	(3)
Dominican Republic	23,600	(3)	15,700	(3)
France	2,300	5	2,840	4
Germany	77,600	1	9,590	2
Hong Kong	119,000	7	129,000	6
India	935,000	5	1,930,000	3
Israel	8,840	1	4,810	1
Italy	4,340	1	3,280	1
Kenya	33,500	(3)	2,000	(3)
Sri Lanka	4,080	1	2,120	1
Switzerland	89,300	29	15,000	12
Thailand	3,030,000	48	1,510,000	53
United Arab Emirates	3,340	1	2,220	(3)
Other	8,630	2	24,600	3
Total	4,380,000	102	3,680,000	87
Sapphire:				
Australia	57,900	1	2,100	(3)
Austria	29,600	1	3,060	(3)
Belgium	7,120	1	2,860	1
China	84,100	(3)	35,000	(3)
Dominican Republic	24,500	(3)	44,300	(3)
Germany	72,700	5	119,000	3
Hong Kong	272,000	15	336,000	9
India	987,000	6	1,680,000	5
Israel	31,600	3	26,700	2
Italy	5,880	(3)	2,860	(3)
Singapore	5,350	(3)	2,840	(3)
Sri Lanka	448,000	45	363,000	49
Switzerland	49,000	9	43,200	10
Thailand	5,620,000	81	4,150,000	75

See footnotes at end of table.

TABLE 8—Continued

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

	2005		2006	
Kind and country	Quantity (carats)	Value[2] (millions)	Quantity (carats)	Value[2] (millions)
Sapphire—Continued:				
United Arab Emirates	2,490	(3)	6,130	$1
United Kingdom	2,550	(3)	4,220	1
Other	14,700	$5	39,500	6
Total	7,710,000	174	6,860,000	162
Other:				
Rough, uncut:				
Australia	NA	2	NA	5
Brazil	NA	10	NA	11
Canada	NA	4	NA	4
China	NA	4	NA	4
Colombia	NA	1	NA	2
Czech Republic	NA	2	NA	2
Germany	NA	3	NA	1
India	NA	1	NA	7
Japan	NA	1	NA	1
Mexico	NA	1	NA	(3)
Netherlands	NA	1	NA	(3)
Pakistan	NA	1	NA	2
South Africa	NA	1	NA	(3)
Tanzania	NA	3	NA	1
United Kingdom	NA	1	NA	(3)
Other	NA	5	NA	13
Total	NA	40	NA	52
Cut, set and unset:				
Australia	NA	9	NA	13
Austria	NA	4	NA	2
Brazil	NA	18	NA	18
Canada	NA	1	NA	1
China	NA	57	NA	71
France	NA	3	NA	4
Germany	NA	33	NA	44
Hong Kong	NA	49	NA	50
India	NA	93	NA	86
Israel	NA	5	NA	6
Italy	NA	1	NA	1
South Africa	NA	3	NA	3
Sri Lanka	NA	7	NA	11
Switzerland	NA	19	NA	13
Taiwan	NA	2	NA	2
Tanzania	NA	7	NA	6
Thailand	NA	40	NA	57
United Arab Emirates	NA	1	NA	1
United Kingdom	NA	1	NA	2
Other	NA	7	NA	14
Total	NA	360	NA	405

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	2005	2006
Laboratory-created, cut but unset:		
Austria	3,700	882
Brazil	151	361
Canada	133	124
China	15,200	14,900
Cyprus	86	(3)
Czech Republic	91	112
France	945	354
Germany	12,200	12,700
Hong Kong	1,580	1,830
India	526	1,000
Ireland	69	(3)
Italy	131	51
Japan	110	75
Korea, Republic of	468	468
Netherlands	296	436
South Africa	87	(3)
Sri Lanka	1,300	2,210
Switzerland	2,050	4,550
Taiwan	238	197
Thailand	1,420	778
United Arab Emirates	70	60
Other	253	1,170
Total	41,100	42,300
Imitation:[4]		
Austria	73,600	72,600
Brazil	16	12
China	3,500	3,850
Czech Republic	11,000	9,250
France	13	118
Germany	1,160	1,760
Hong Kong	271	250
India	361	434
Italy	222	214
Japan	474	269
Korea, Republic of	619	689
Philippines	15	(3)
Russia	17	7
Spain	256	170
Taiwan	179	66
Thailand	52	49
United Kingdom	24	139
Other	109	135
Total	91,900	90,100

[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.

[4]Includes pearls.

Source: U.S. Census Bureau.

TABLE 10

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

(Thousand carats and thousand dollars)

Stones	2005		2006	
	Quantity	Value[2]	Quantity	Value[2]
Diamonds:				
Rough or uncut	1,060	$864,000	1,200	$801,000
Cut but unset	17,000	15,400,000	17,100	16,400,000
Emeralds, cut but unset	2,630	137,000	3,910	175,000
Coral and similar materials, unworked	5,520	12,200	5,600	24,900
Rubies and sapphires, cut but unset	12,100	275,000	10,500	249,000
Pearls:				
Natural	NA	21,800	NA	23,600
Cultured	NA	27,100	NA	44,300
Imitation	NA	4,170	NA	4,100
Other precious and semiprecious stones:				
Rough, uncut	1,630,000	22,900	2,270,000	31,400
Cut, set and unset	NA	319,000	NA	363,000
Other	NA	7,200	NA	9,250
Laboratory-created:				
Cut but unset	196,000	41,100	194,000	42,300
Other	NA	10,300	NA	11,400
Imitation gemstone[3]	NA	87,700	NA	86,000
Total	XX	17,200,000	XX	18,300,000

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]	2002	2003	2004	2005	2006
Gemstones:					
Angola[e]	4,520	5,130	5,490	6,300 r	7,000
Australia	15,136	13,981	6,058	8,577 r	7,305
Botswana[e]	21,297	22,800	23,300	23,900	24,000
Brazil[e]	500 5	400	300 5	300	300
Canada	4,937	10,756	12,618	12,300 e	12,350
Central African Republic[e]	312	250	263	285 r	315
China[e]	100	100	100	100	100
Congo (Kinshasa)	4,223	5,381	6,180	6,100 r, e	5,600
Côte d'Ivoire	205	154	201 e	201 e	200
Ghana	770	724 r	725 r	850 r	780
Guinea	368	500 r	555 r	413 r	355
Guyana	248	413	445 r	340 r, e	300
Liberia[e]	52 r	26 r	7 r	7 r	7
Namibia	1,562	1,481	2,004	1,902 r	2,200
Russia[e]	17,400	20,000	21,400	23,000	23,400
Sierra Leone[e]	162 5	233	318	395	360
South Africa	4,351	5,144	5,800 r, e	6,400 r, e	6,240 e
Tanzania[e]	204 5	201	258	185 r	195
Venezuela	46	11	40 e	46 e	45 e
Other[6]	42	131 r	186 r	241 r	236
Total	76,400	87,800 r	86,200 r	91,800 r	91,300
Industrial:					
Angola[e]	502	570	610	700 r	800
Australia	18,500	17,087	18,172 r	25,730 r	21,915
Botswana[e]	7,100	7,600	7,800	8,000	8,000
Brazil[e]	600	600	600	600	600
Central African Republic[e]	104	83	88	95 r	105
China[e]	955	955	960	960	965
Congo (Kinshasa)	17,456	21,600	24,700	24,200 r, e	22,400 e
Côte d'Ivoire	101	76	99 e	99 e	99 e
Ghana[e]	193	180 r	180 r	213 r	190
Guinea[e]	123	167 r	185 r	138 r	118
Liberia[e]	28	14 r	4 r	4 r	4
Russia[e]	11,600	13,000	14,200	15,000	15,000
Sierra Leone	190	274 e	374 e	274 r	252
South Africa	6,526	7,540	8,500 e	9,400 r, e	9,130
Tanzania[e]	36	36	46	35 r	35
Venezuela	61	24	60 e	69 e	70 e
Other[7]	81	82	121	190	189
Total	64,200	69,900	76,700 r	85,700 r	79,900
Grand total	141,000	158,000	163,000 r	178,000 r	171,000

[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, 2007.

[3]In addition to the countries listed, Nigeria and the Republic of Korea produce natural diamond and synthetic diamond, respectively, but information is inadequate to formulate reliable estimates of output levels.

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

[5]Reported figure.

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

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