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GEMSTONES [ADVANCE RELEASE]

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Gemstones

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In 2012, the estimated value of natural gemstones produced in the United States was $11.3 million (table 3) and the estimated value of U.S. laboratory-created gemstone production was $31.2 million. The total estimated value of U.S. gemstone production was $42.6 million. The value of U.S. gemstone imports was $21.3 billion (table 10) and the value of combined U.S. gemstone exports and reexports was estimated to be $16.9 billion (table 6). In 2012, world natural diamond production totaled 128 million carats, of which an estimated 92 million carats were gem quality (table 11).

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 250 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 are relatively small compared with those of 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 be between 1,200 and 1,500 individuals.

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 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.

The total value of natural gemstones produced in the United States was estimated to be $11.3 million during 2012 (table 3). This production value was a 3% increase from that of 2011.

Natural gemstone materials indigenous to the United States are collected or produced in every State. During 2012, each of the 50 States produced at least $1,410 worth of gemstone materials. There were 11 States that accounted for 90% of the total value, as reported by survey respondents. These States were, in descending order of production value, Arizona, North Carolina, Oregon, California, Utah, Tennessee, Montana, Colorado, Arkansas, Idaho, and Maine. 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. A wide variety of gemstones also was found and produced in California, Idaho, Montana, and North Carolina.

In 2012, the United States had only one active operation in a known diamond-bearing area in Crater of Diamonds State Park near Murfreesboro in Pike County, AR. The State of Arkansas maintains a dig-for-fee operation for tourists and amateur collectors at the park; 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 2012, 530 diamond stones with an average weight of 0.180 carat were recovered at the Crater of Diamonds State Park. Of the 530 diamond stones recovered, 13 weighed more than 1 carat. Since the diamond-bearing pipe and the adjoining area became a State park in 1972 through yearend 2012, 30,436 diamond stones with a total weight of 6,076.5 carats have been recovered (Margi Jenks, park interpreter, Crater of Diamonds State Park, written commun., January 22, 2013). Exploration has demonstrated that this diamond deposit contains about 78.5 million metric tons (Mt) of diamond-bearing rock (Howard, 1999, p. 62). An Arkansas law enacted early in 1999 prohibits commercial diamond mining in the park.

In addition to natural gemstones, laboratory-created gemstones and gemstone simulants were produced in the United States in 2012. Laboratory-created or synthetic gemstones have the same chemical, optical, and physical properties as 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, cubic zirconia, diamond, emerald, garnet, moissanite, ruby, sapphire, spinel, and turquoise. However, during 2012, only cubic zirconia, diamond, moissanite, and turquoise were produced commercially. Simulants of amber, chrysocolla, coral, lapis lazuli, malachite, travertine, and turquoise also were 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 $31.2 million during 2012, which was a slight decrease compared with that of 2011. 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, Florida, New York, North Carolina, South Carolina, and Arizona.

Since the 1950s, when scientists manufactured the first laboratory-created bits of diamond grit using a high-pressure, high-temperature (HPHT) method, this method of growing diamonds has become relatively commonplace in the world as a technology for laboratory-created diamonds, so much so that thousands of small plants throughout China were using the HPHT method and producing laboratory-created diamonds suitable for cutting as gemstones. Gem-quality diamonds of 1 carat or more are harder to manufacture because at that size, it is difficult to consistently produce diamonds of high quality, even in the controlled environment of a laboratory using the HPHT method. After more than 50 years of development, several laboratory-created diamond companies were able to produce relatively large high-quality diamonds that equaled those produced from mines (Park, 2007).

Gemesis Corp. (Sarasota, FL) reported production of gem-quality laboratory-created diamond in 2012. The weight of the laboratory-created diamond stones ranged from 1.5 to 2 carats, and most of the stones were brownish yellow, colorless, green, or yellow. Gemesis uses diamond-growing machines capable of growing 3-carat rough diamonds by generating HPHT conditions that recreate the conditions in the Earth's mantle where natural diamonds form (Davis, 2003). The prices of the Gemesis laboratory-created diamonds are lower than those of comparable natural diamond but above the prices of simulated diamond.

In the early 2000s, Apollo Diamond, Inc., near Boston, MA, developed and patented a method for growing single, extremely pure, gem-quality diamond crystals by chemical vapor deposition (CVD). The CVD technique transforms carbon into plasma, which is then precipitated onto a substrate as diamond. CVD had been used for more than a decade to cover large surfaces with microscopic diamond crystals, but in developing this process, Apollo Diamond discovered the temperature, gas composition, and pressure combination that resulted in the growth of a single diamond crystal. Apollo Diamond was able to produce laboratory-created stones that ranged from 1 to 2 carats. During 2011, Apollo Diamond ceased manufacture of single-crystal CVD diamond for gemstone and industrial use. During 2011 and 2012, SCIO Diamond Technology Corp. (Greenville, SC) acquired all diamond growing equipment and machines, cultured diamond gemstone-related technology, inventory, and various intellectual property rights from Apollo Diamond (SCIO Diamond Technology Corp., 2012). SCIO Diamond Technology Corp. and Gemesis Corp. prefer to call their diamonds "cultured" rather than laboratory-created, referring to the fact that the diamonds are grown much like a cultured pearl is grown. Scio Diamond designed and built a new production facility in Greenville, SC, and relocated all production equipment from Massachusetts to South Carolina. Production began in July 2012, and over the next 6 months, Scio Diamond produced more than 15,000 carats of laboratory-created single crystal rough diamond. Scio Diamond began shipping laboratory-created CVD rough diamonds in September 2012 (SCIO Diamond Technology Corp., 2013).

Charles & Colvard, Ltd. in North Carolina was the world's only manufacturer of moissanite, a gem-quality laboratory-created silicon carbide. Moissanite is 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., 2010). Charles & Colvard reported that moissanite sales increased by 40% to just more than $22.4 million in 2012 compared with $16.0 million in 2011 (Charles & Colvard, Ltd., 2013).

U.S. mussel shells are used as a source of mother-of-pearl and as seed material for culturing pearls. U.S. shell production decreased slightly in 2012 compared with that of 2011. This decrease was owing to decreased demand for U.S. shell materials that was caused by the use of manmade seed materials and seed materials from China and other sources by pearl producers in Japan. The popularity of darker and colored pearls and freshwater pearls that do not use U.S. seed material has also contributed to decreased demand for U.S. shell materials. In some regions of the United States, shell from mussels was being used more as a gemstone based on its own merit rather than as seed material for pearls. This shell material was being processed into mother-of-pearl and used in beads, jewelry, and watch faces.

Consumption

Historically, diamond gemstones have proven to hold their value despite wars or economic depressions, but this did not hold true during the recent worldwide economic recession. Diamond and colored gemstones value and sales in the United States decreased during the economic downturn in 2008 and continued into 2009, returned to pre-downturn levels during 2010, and again declined by about 10% from 2010 to 2012.

Although the United States accounted for little of the total global gemstone production, it was the world's leading diamond and nondiamond gemstone market. It was estimated that U.S. gemstone markets accounted for more than 35% of world gemstone demand in 2012. The U.S. market for unset gem-quality diamond during the year was estimated to be $20.2 billion, a decrease of 10% compared with that of 2011. Domestic markets for natural, unset nondiamond gemstones totaled $772 million in 2012, which was a 35% decrease from that of 2011.

In the United States, the majority of domestic consumers designate diamond as their favorite gemstone. This popularity of diamonds is evidenced by the diamond market accounting for 96% of the total value of the U.S. gemstone market. Colored natural gemstones, colored laboratory-created gemstones, and "fancy" colored diamonds were popular in 2012, although the values of the domestic consumption for almost all types of colored natural, unset nondiamond gemstones decreased from the 2011 values.

The estimated U.S. retail jewelry sales were a record $71.3 billion in 2012, an increase of 5.9% from sales of $67.3 billion in 2011 (Gassman, 2013). U.S. jewelers reported jewelry sales during the 2012 holiday shopping season increased 8.9% to $20.6 billion from $18.9 billion in sales during the 2011 holiday shopping season (IDEX Magazine, 2013).

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. More than 14,000 categories are used to assess rough diamond and more than 100,000 different combinations of carat, clarity, color, and cut values can be used to assess polished diamond.

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 remained a significant force, influencing the price of gem-quality diamond sales worldwide during 2012 because the companies mine a significant portion of the world's gem-quality diamond produced each year. In 2012, De Beers production from its independently owned and joint-venture operations in Botswana, Canada, Namibia, and South Africa decreased 10.9% to 27.9 million carats (Mct), compared with 31.3 Mct in 2011. De Beers companies also sorted and valuated a large portion (by value) of the world's annual supply of rough diamond through De Beers' subsidiary Diamond Trading Co. (DTC). DTC sales of rough diamonds decreased by 15% during 2012 to $5.5 billion compared with $6.5 billion during 2011. In 2012, De Beers had total diamond and jewelry sales of $6.1 billion, which was a decrease of 16% compared with those of 2011 (Greve, 2013).

Foreign Trade

During 2012, total U.S. gemstone trade with all countries and territories was valued at about $38.3 billion, which was a decrease of 8% from that of 2011. Diamond accounted for about 97% of the 2012 gemstone trade total value. In 2012, U.S. exports and reexports of diamond were shipped to 90 countries and territories, and imports of all gemstones were received from 95 countries and territories (tables 6–10). In 2012, U.S. import quantities in cut diamond decreased by 10% compared with those of 2011, and their value decreased by 9%. U.S. import quantities in rough and unworked diamond increased by 15%, although their value decreased by 13% (table 7, 10). The United States remained the world's leading diamond importer and was a significant international diamond transit center as well as the world's leading gem-quality diamond market. In 2012, U.S. export and reexport quantities of gem-grade diamond increased by 43% compared with those of 2011, but their value decreased by 7%. The large volume of reexports revealed the significance of the United States in the world's diamond supply network (table 6).

Import values of laboratory-created gemstone decreased slightly for the United States in 2012 compared with those of 2011 (table 10). Laboratory-created gemstone imports from Austria, Belgium, China, Germany, India, and Malaysia, with more than $26.7 million in imports, accounted for about 80% (by value) of total domestic imports of laboratory-created gemstones during the year (table 9). 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 an issue for some domestic producers in 2012. In addition, problems continued with some simulants being marketed as laboratory-created gemstones during the year.

World Review

The worldwide gemstone industry 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 2012, world natural diamond production totaled 128 Mct—92 Mct gem quality and 36 Mct 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 2012, Russia led the world in total natural diamond output quantity (combined gemstone and industrial) with 27.3% of the estimated world production. Congo (Brazzaville) was the world's leading gemstone diamond producer with 23.4%; followed by Russia, 22.5%; Botswana, 15.6%; Zimbabwe, 11.9%; Canada, 11.3%; Angola, 8.1%; South Africa, 3.1%; and Namibia, 1.8%. These eight countries produced 98% (by quantity) of the world's gemstone diamond output in 2012.

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 to prevent the shipment and sale of conflict diamonds. Conflict diamonds are diamonds that originate from areas controlled by forces or factions opposed to legitimate and internationally recognized governments, and are used to fund military action in opposition to those governments, or in contravention of the decisions of the UN Security Council. 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. The United States assumed the chair of KPCS for January 1 through December 31, 2012, the tenth country or organization in succession to hold the chair after Congo (Kinshasa), Israel, Namibia, India, South Africa, Canada, Russia, Botswana, and the European Commission. The 54 participants represented 80 nations (including the 27 member nations of the European Community) plus the rough diamond-trading entity of Taipei. During 2012, Côte d'Ivoire continued to be under UN sanctions and was not trading in rough diamonds, and Venezuela voluntarily suspended exports and imports of rough diamonds until further notice. The participating nations in the KPCS account for approximately 99.8% of the global production and trade of rough diamonds (Kimberley Process, undated).

Globally, the value of production of natural gemstones other than diamond was estimated to be more than $2.5 billion in 2012. 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 were key producers in 2012.

Worldwide diamond exploration spending increased 16% in 2012 with 65 companies allocating $520 million, compared with 70 companies allocating $449 million during 2011. The diamond share of overall worldwide mineral exploration spending was 2.5%. Africa was the leading diamond exploration location (SNL Metals Economics Group, 2012).

Worldwide in 2012, average diamond values decreased 13.9% to $100.00 per carat from the 2011 average value of $116.19 per carat. This decrease was influenced the first half of the year by fears of global recession stalling demand in the Far East and India. The second half of the year was influenced by slow growth in China and more declines in India (SNL Metals Economics Group, 2013).

Two new diamond projects were commissioned in 2012. The Karowe Mine in Botswana began operation, and the expansion of the Koidu Mine in Sierra Leone was commissioned in early 2012 (SNL Metals Economics Group, 2013).

Botswana.—Commissioning of the Karowe Mine, owned by Lucara Diamond Corp. was completed in May and commercial production began in July. During 2012, production was 303,060 carats, and when ramped up to full capacity in 2013, production was expected to be 400,000 carats per year (SNL Metals Economics Group, 2013).

Canada.—Canadian diamond production was 10.5 Mct during 2012, a decrease of 3% compared with that of 2011. Diamond exploration continued in Canada, with several commercial diamond projects and additional discoveries in Alberta, British Columbia, the Northwest Territories, the Nunavut Territory, Ontario, and Quebec. In 2012, Canada produced 8% of the world's combined natural gemstone and industrial diamond output.

The Ekati Diamond Mine, Canada's first operating commercial diamond mine, completed its 14th full year of production in 2012. Ekati produced 1.45 Mct of diamond from 4.24 Mt of ore. This was a 29% decrease compared with that of 2011. Approximately 21% of the Ekati 2011 diamond production was industrial-grade material (BHP Billiton Ltd., 2013, p. 10). During 2012, Harry Winston Diamond Corp.

entered into an agreement with BHP Billiton Canada Inc. to purchase BHP Billiton's diamond assets, which included its 80% controlling interest in the Ekati Diamond Mine and its diamond sorting and sales facilities for $500 million (DeMarco, 2012).

The Diavik Diamond Mine, Canada's second diamond mine, also located in the Northwest Territories, completed its 10th full year of production. Diavik produces an average of 2 Mt of ore annually, grading an average of 3.1 carats per ton. During 2012, Diavik produced 7.2 Mct of rough diamond. At yearend 2012, Diavik estimated the mine's remaining proven and probable reserves to be 18.3 Mt of ore in kimberlite pipes containing 2.9 carats of diamond per ton and projected the total mine life to be 16 to 22 years. Diavik began developing an underground mine and substantially completed construction on the project during 2009. The first ore was produced from the underground mine during the first quarter of 2010, with full production expected in 2013. The mine is an unincorporated joint venture between Diavik Diamond Mine Inc. (60%) and Harry Winston Diamond Mines Ltd. (40%) (Diavik Diamond Mine Inc., 2013, p. 6).

The Snap Lake Mine, in the Northwest Territories, is wholly owned by De Beers Canada Inc. The Snap Lake deposit is a tabular-shaped kimberlite dyke rather than the typical kimberlite pipe. The dyke is 2.5 meters thick and dips at an angle of 12° to 15°. The deposit was mined using a modified room and pillar underground mining method in 2012. The Snap Lake Mine started mining operations in October 2007, reached commercial production levels in the first quarter of 2008, and officially opened June 25, 2008. The mine was expected to produce 1.4 Mct per year of diamond, and the mine life was expected to be about 20 years. The mine's production for 2012 was 870,000 carats (De Beers Canada Inc., 2011; De Beers Group Inc., 2013, p. 23).

The Victor Mine, in northern Ontario on the James Bay coast, also is wholly owned by De Beers Canada. The Victor kimberlite consists of two pipes with a total surface area of 15 hectares. The Victor Mine initiated mining operations at yearend 2007 and was officially opened on July 26, 2008. The Victor Mine has 27.4 Mt of reserves with average ore grade of 0.23 carat per ton. At full capacity, the open pit mine was expected to produce 600,000 carats per year, and the mine life was expected to be about 12 years. In 2012, the mine's production was 690,000 carats (De Beers Group Inc., 2013, p.23; De Beers Canada Inc., undated).

Sierra Leone.—An expansion of the Koidu Mine, which is wholly owned by Koidu Holdings SA, involved the redevelopment of the K1 kimberlite pipe and commissioning of a new plant to increase capacity to 500,000 carats per year from 120,000 carats per year. The plant was commissioned in September 2012 (SNL Metals Economics Group, 2013, p. 26).

Outlook

As the domestic and global economies improve, Internet sales of diamonds, gemstones, and jewelry were expected to continue to expand and increase in popularity, as were other forms of e-commerce that emerge to serve the diamond and gemstone industry. Internet sales are expected to add to and partially replace "brick-and-mortar" sales. 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, such as sales Web sites and online social networking Web sites (PR Newsline Services, 2012).

As more independent producers, such as Ekati and Diavik in Canada, come online they will bring a greater measure of competition to global markets that presumably will result in increased supply and lower prices. Further consolidation of diamond producers and larger quantities of rough diamond being sold outside DTC is expected to continue as the diamond industry adjusts to De Beers' reduced influence on the industry.

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

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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, 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, 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 direct sunlight, or incandescent light, red by indirect sunlight or fluorescent light	do.	High	8.5	3.50–3.84	Double	1.75	Synthetic	Strong dichroism, color varies from red to green, hardness.
Cat's eye	do.	Greenish to brownish	Small to large	do.	8.5	3.50–3.84	do.	1.75	Synthetic, shell	Density, translucence, chatoyance.

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										
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, 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 refraction, 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, blue, green, orange, violet, or red	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.
Garnet	Complex silicate	Brown, black, yellow, green, red, or orange	do.	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.

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
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, 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, 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.
Amethyst	do.	Purple	do.	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.

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										
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, artificially colored green chalcedony	Do.
Citrine	do.	Yellow	do.	do.	7.0	2.65–2.66	do.	1.55	do.	Macrocrystalline, color, refractive index, transparent, hardness.
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.
Rock crystal	do.	Colorless	do.	do.	7.0	2.65–2.66	do.	1.55	Topaz, colorless sapphire	Do.
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, chatoyancy.
Rhodochrosite	Manganese carbonate	Rose-red to yellowish, stripped	do.	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.

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
Shell:—Continued										
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-ray of internal structure.
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.

Do., do. Ditto. 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.

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.	Do.
Cubic zirconia	Skull melt	Various producers	1970s.
Emerald	Flux	Chatham Created Gems	1930s.
Do.	do.	Gilson	1960s.
Do.	do.	Kyocera Corp.	1970s.
Do.	do.	Lennix	1980s.
Do.	do.	Russia	Do.
Do.	do.	Seiko Corp.	Do.
Do.	Hydrothermal	Biron Corp.	Do.
Do.	do.	Lechleitner	1960s.
Do.	do.	Regency	1980s.
Do.	do.	Russia	Do.
Ruby	Flux	Chatham Created Gems	1950s.
Do.	do.	Douras	1990s.
Do.	do.	J.O. Crystal Co., Inc.	1980s.
Do.	do.	Kashan Created Ruby	1960s.
Do.	Melt pulling	Kyocera Corp.	1970s.
Do.	Verneuil	Various producers	1900s.
Do.	Zone melt	Seiko Corp.	1980s.
Sapphire	Flux	Chatham Created Gems	1970s.
Do.	Melt pulling	Kyocera Corp.	1980s.
Do.	Verneuil	Various producers	1900s.
Do.	Zone melt	Seiko Corp.	1980s.
Star ruby	Melt pulling	Kyocera Corp.	Do.
Do.	do.	Nakazumi Earth Crystals Co.	Do.
Do.	Verneuil	Linde Air Products Co.	1940s.
Star sapphire	do.	do.	Do.

Do., do. Ditto.

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

(Thousand dollars)

Gem materials	2011	2012
Beryl	1,740	1,790
Coral, all types	150	150
Diamond	(2)	(2)
Garnet	110	98
Gem feldspar	756	757
Geode/nodules	110	89
Opal	71	74
Quartz:		
Macrocrystalline[3]	333	383
Cryptocrystalline[4]	248	261
Sapphire/ruby	343	360
Shell	832	810
Topaz	(2)	(2)
Tourmaline	73	99
Turquoise	1,330	1,320
Other	4,950	5,140
Total	11,000	11,300

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Less than ½ unit.
[3]Macrocrystalline quartz (crystals recognizable with the naked eye) includes amethyst, 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 quartz (microscopically small crystals) includes agate, carnelian, chalcedony, chrysoprase, fossilized wood, heliotrope, jasper, moss agate, onyx, and sard.

TABLE 4
PRICES PER CARAT OF U.S. CUT ROUND DIAMONDS, BY SIZE AND QUALITY IN 2012

Carat weight	Description, color[1]	Clarity[2] (GIA terms)	Representative prices		
			January[3]	June[4]	December[5]
0.25	G	VS1	$1,650	$1,650	$1,650
Do.	G	VS2	1,600	1,600	1,600
Do.	G	SI1	1,250	1,250	1,250
Do.	H	VS1	1,600	1,600	1,600
Do.	H	VS2	1,500	1,500	1,500
Do.	H	SI1	1,200	1,200	1,200
0.50	G	VS1	3,600	3,600	3,600
Do.	G	VS2	3,100	3,100	3,100
Do.	G	SI1	2,500	2,500	2,500
Do.	H	VS1	3,170	3,170	3,170
Do.	H	VS2	2,750	2,750	2,750
Do.	H	SI1	2,250	2,250	2,250
1.00	G	VS1	8,500	8,000	7,810
Do.	G	VS2	8,000	7,500	6,800
Do.	G	SI1	6,500	6,200	6,205
Do.	H	VS1	7,700	7,700	6,885
Do.	H	VS2	7,200	7,200	6,300
Do.	H	SI1	5,900	5,900	5,780
2.00	G	VS1	15,500	15,500	14,870
Do.	G	VS2	13,200	13,200	12,880
Do.	G	SI1	11,200	11,200	10,660
Do.	H	VS1	13,300	13,300	12,710
Do.	H	VS2	11,700	11,700	10,800
Do.	H	SI1	10,300	10,300	9,950

Do. Ditto.

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

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

[3]Source: The Gem Guide, v. 31, no. 1, January/February 2012, p. 20–22.

[4]Source: The Gem Guide, v. 31, no. 4, July/August 2012, p. 20–22.

[5]Source: The Gem Guide, v. 31, no. 6, November/December 2012, p. 20–22.

TABLE 5
PRICES PER CARAT OF U.S. CUT COLORED GEMSTONES IN 2012

Gemstone	Price range per carat	
	January[1]	December[2]
Amethyst	$10–25	$10–25
Blue sapphire	950–1,900	1,000–1,900
Blue topaz	5–10	5–10
Emerald	2,600–4,400	2,600–4,400
Green tourmaline	50–70	50–70
Cultured saltwater pearl[3]	5	5
Pink tourmaline	65–170	65–170
Rhodolite garnet	22–45	22–45
Ruby	2,200–2,600	2,200–2,600
Tanzanite	300–375	300–375

[1]Source: The Gem Guide, v. 31, no. 1, January/February 2012, p. 50, 53, 57, 61, 63, 65, and 68–71. These figures are approximate wholesale purchase prices paid by retail jewelers on a per stone basis for 1 to less than 1 carat, fine-quality stones.

[2]Source: The Gem Guide, v. 31, no. 6, November/December 2012, p. 50, 53, 57, 61, 63, 65, and 68–71. These figures are approximate wholesale purchase prices paid by retail jewelers on a per stone basis for 1 to less than 1 carat, fine-quality stones.

[3]Prices are per 4.5–5-millimeter pearl.

TABLE 6
U.S. EXPORTS AND REEXPORTS OF DIAMOND (EXCLUSIVE OF INDUSTRIAL DIAMOND), BY COUNTRY[1]

Country	2011 Quantity (carats)	2011 Value[2] (millions)	2012 Quantity (carats)	2012 Value[2] (millions)
Exports:				
Aruba	3,390	$11	851	$3
Australia	11,700	25	14,100	21
Austria	544	1	114	1
Bahamas, The	852	5	753	3
Belgium	269,000	370	393,000	210
Belize	142	1 r	140	(3)
Brazil	7,130	2	31,100	9
Canada	52,400	96	48,600	114
Cayman Islands	1,190	6	731	2
China	13,900	39	21,500	22
Costa Rica	7,760	1	4,800	2
Curacao	6,150	17	13,700	42
Denmark	190	(3)	271	1
Dominican Republic	44,300	11	34,500	14
France	1,200	34	869	32
Germany	22,500	4	838	3
Honduras	113	(3)	199	1
Hong Kong	2,320,000	522	2,390,000	411
India	768,000	579	526,000	262
Ireland	895	5	12,100	77
Israel	293,000	756	575,000	1,530
Italy	3,020	15	3,000	2
Jamaica	440	2	479	2
Japan	6,830	3	13,800	5
Lebanon	4,800	5	3,330	3
Malaysia	255	1 r	156	1
Mexico	604,000	97	469,000	88
Netherlands	474	1	233	1
Netherlands Antilles (former)	5,860	15	--	--
New Zealand	429	2	668	2
Panama	609	2	158	(3)
Qatar	--	--	117	7
Russia	639	3	--	--
Singapore	6,050	3	3,600	11
South Africa	510	4	36,800	22
Sweden	2,510	7	179	1
Switzerland	190,000	257	9,320	34
Taiwan	497	2	430	2
Thailand	168,000	22	116,000	39
United Arab Emirates	131,000	66	45,100	55
United Kingdom	492,000	76	8,680	67
Vietnam	564	1 r	6,990	10
Other	12,500	5	10,700	19
Total	5,450,000	3,070	4,790,000	3,130
Reexports:				
Armenia	11,000	5	1,980	1
Aruba	2,290	4	2,680	5
Australia	2,980	18	7,410	23
Austria	301	3	1,680	3
Belgium	956,000	2,240	816,000	2,330
Botswana	7	(3)	886	1
Canada	129,000	150	129,000	176
China	32,900	43	25,100	30
France	6,560	126	7,740	177
Germany	2,230	3	1,560	5

See footnotes at end of table.

TABLE 6—Continued
U.S. EXPORTS AND REEXPORTS OF DIAMOND (EXCLUSIVE OF INDUSTRIAL DIAMOND), BY COUNTRY[1]

Country	2011		2012	
	Quantity (carats)	Value[2] (millions)	Quantity (carats)	Value[2] (millions)
Guatemala	52,600	4	16,100	1
Hong Kong	2,830,000	2,470	2,820,000	2,480
India	3,510,000	2,940	3,320,000	2,340
Israel	2,000,000	5,140	1,350,000	3,780
Italy	7,270	3	8,960	15
Japan	47,200	34	32,100	40
Laos	4,850	3	9,700	5
Lebanon	3,040	5	4,450	3
Malaysia	376	4	368	5
Mexico	2,900	3	2,780	6
Namibia	4,450	11	3,660	9
Netherlands	108,000	365	116,000	288
Netherlands Antilles (former)	4,360	16	--	--
Saint Kitts and Nevis	333	(3)	--	--
Singapore	5,080	41	17,700	90
South Africa	8,040	76	10,900	41
Spain	207	1 r	89	1
Switzerland	83,500	604	117,000	957
Taiwan	18,000	15	1,330	60
Thailand	178,000	60	215,000	76
United Arab Emirates	511,000	322	492,000	441
United Kingdom	31,500	399	32,100	312
Other	17,300	24	8,560,000	13,701
Total	10,600,000	15,100	18,100,000	13,800
Grand total	16,000,000	18,200	22,900,000	16,900

[r]Revised. -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Customs value.
[3]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	2011 Quantity (carats)	2011 Value[2] (millions)	2012 Quantity (carats)	2012 Value[2] (millions)
Rough or uncut, natural:[3]				
Angola	26,700	$168	15,900	$84
Belgium	2,640	4	2,160	3
Botswana	84,100	159	56,800	108
Brazil	110	2	1,880	1
Canada	20,100	37	30,800	52
Central African Republic	394	1 r	98	1
Congo (Kinshasa)	6,460	8	5,250	15
India	170,000	2	339,000	2
Israel	1,030	2	7,110	12
Lesotho	932	40	418	9
Namibia	3,820	4	7,970	27
Russia	118,000	18	55,400	57
Sierra Leone	3,180	10	978	3
South Africa	199,000	173	248,000	171
Other	68,200	3	41,500	8
Total	704,000	631	813,000	553
Cut but unset, not more than 0.5 carat:				
Australia	4,110	4	8,150	4
Belgium	277,000	102	402,000	134
Botswana	6,890	18	5,420	19
Brazil	4,470	1	2,860	2
Canada	23,600	8	7,980	6
China	34,300	31	56,900	60
Dominican Republic	3,430	1	6,960	1
Hong Kong	197,000	30	273,000	49
India	6,990,000	1,850	5,860,000	2
Israel	414,000	236	394,000	209
Mauritius	6,220	17	4,700	16
Mexico	76,300	21	114,000	30
Namibia	2,060	5	3,920	11
Russia	585	1	171	(4)
South Africa	4,910	7	7,710	18
Sri Lanka	2,980	1	--	--
Switzerland	40,600	2	947	3
Thailand	93,000	13	72,300	9
United Arab Emirates	112,000	42	132,000	38
United Kingdom	24,700	4	45,000	6
Vietnam	30,400	29	46,700	66
Other	11,600	3	29,400	1,510
Total	8,360,000	2,430	7,470,000	2,190
Cut but unset, more than 0.5 carat:				
Armenia	3,170	3	272	1
Australia	4,710	41	5,790	37
Belgium	733,000	3,550	707,000	3,370
Botswana	11,200	63	9,410	54
Brazil	294	7	1,390	4
Canada	16,200	67	18,000	74
Central African Republic	35	2	--	--
China	35,000	102	64,100	306
Costa Rica	5	(4)	--	--
France	1,240	23	844	20
Germany	3,050	12	3,680	13
Hong Kong	48,500	107	58,400	144
India	1,970,000	4,410	1,680,000	3,900
Indonesia	41	1	52	1
Israel	1,970,000	8,950	1,830,000	7,990

See footnotes at end of table.

TABLE 7—Continued

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

	2011		2012	
Kind, range, and country of origin	Quantity (carats)	Value[2] (millions)	Quantity (carats)	Value[2] (millions)
Italy	3,320	11	3,520	11
Japan	1,380	2	666	8
Lebanon	1,470	3	173	1
Lesotho	136	28	--	--
Mauritius	2,720	16	1,910	11
Mexico	465	2	1,270	1
Namibia	16,800	89	14,200	79
Netherlands	284	5	146	2
Philippines	145	1	--	--
Russia	17,100	100	19,200	93
Singapore	245	1	26,800	15
South Africa	42,700	900	22,600	625
Sri Lanka	3,920	4	75	(4)
Switzerland	18,900	541	8,460	380
Thailand	11,200	26	12,100	33
United Arab Emirates	38,400	100	44,300	164
United Kingdom	3,880	85	4,740	84
Vietnam	1,920	2	2,230	3
Other	1,750	7	4,240	22
Total	4,970,000	19,300	4,550,000	17,400

[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 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]

Kind and country	2011 Quantity (carats)	2011 Value[2] (millions)	2012 Quantity (carats)	2012 Value[2] (millions)
Emerald:				
Belgium	737	$1	2,150	$4
Brazil	186,000	9	136,000	13
Canada	1,390	(3) r	3,340	(3)
China	34,100	(3) r	4,660	(3)
Colombia	365,000	161	201,000	172
France	152	2	163	1
Germany	9,940	3	9,190	3
Hong Kong	118,000	11	147,000	49
India	1,400,000	57	1,650,000	54
Israel	138,000	15	144,000	38
Italy	9,050	6	7,790	1
Switzerland	71,900	61	8,460	20
Thailand	374,000	11	334,000	17
United Kingdom	760	1	314	2
Other	43,400	10	252,000	34
Total	2,760,000	348	2,890,000	408
Ruby:				
Belgium	41	(3)	252	1
China	730	(3)	2,900	(3)
France	15	1	238	5
Germany	14,000	(3)	37,700	1
Hong Kong	137,000	4	64,400	16
India	2,020,000	4	2,600,000	4
Israel	4,570	(3)	4,580	7
Italy	9,910	1	15,200	(3)
Kenya	1,050	(3)	54	(3)
Sri Lanka	633	(3)	10,100	3
Switzerland	55,900	4	1,870	2
Thailand	1,640,000	23	1,420,000	44
United Arab Emirates	--	--	974	(3)
Other	45,100	7	110,000	31
Total	3,920,000	45	4,260,000	114
Sapphire:				
Belgium	1,720	2	1,780	4
China	163,000	5	41,100	1
France	2,460	2	6,480	2
Germany	32,200	11	146,000	3
Hong Kong	237,000	15	333,000	36
India	2,970,000	18	1,990,000	15
Israel	13,000	3	9,760	2
Italy	93,200	6	15,900	1
Madagascar	31,700	3	14,300	5
South Africa	3,680	1	14,400	(3)
Sri Lanka	256,000	77	332,000	87
Switzerland	91,800	26	16,600	31
Thailand	3,050,000	109	2,990,000	79
United Kingdom	1,040	3	769	1
Other	40,500	1	38,900	2
Total	6,980,000	282	5,940,000	269

See footnotes at end of table.

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

	2011		2012	
Kind and country	Quantity (carats)	Value[2] (millions)	Quantity (carats)	Value[2] (millions)
Other:				
Rough, uncut, all countries	NA	23	NA	25
Cut, set and unset, all countries	NA	37	NA	33

[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	2011	2012
Laboratory-created, cut but unset:		
Austria	2,340	2,640
Belgium	882	1,310
China	4,770	7,170
Germany	9,970	9,320
India	11,900	5,380
Malaysia	3,120	822
Other	3,710	6,570
Total	36,700	33,200
Imitation:[3]		
Austria	48,300	47,600
China	19,500	11,700
Czech Republic	5,540	3,890
Other	2,010	1,680
Total	75,400	64,800

[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)

	2011		2012	
Stones	Quantity	Value[2]	Quantity	Value[2]
Coral and similar materials, unworked	5,370	11,800	6,340	13,400
Diamonds:				
Cut but unset	13,300	21,700,000	12,000	19,600,000
Rough or uncut	704	630,000	813	551,000
Emeralds, cut but unset	2,760	348,000	2,900	408,000
Pearls:				
Cultured	NA	27,300	NA	31,800
Imitation	NA	5,930	NA	7,310
Natural	NA	18,600	NA	30,200
Rubies and sapphires, cut but unset	10,900	328,000	10,200	383,000
Other precious and semiprecious stones:				
Rough, uncut	1,670,000	15,000	2,160,000	15,300
Cut, set and unset	NA	301,000	--	--
Other	33,600	7,240	9,710	153,000
Laboratory-created:				
Cut but unset	6,230	36,700	9,160	33,200
Other	NA	22,800	NA	25,400
Imitation gemstone[3]	NA	69,400	NA	57,500
Total	1,740,000	23,500,000	2,200,000	21,300,000

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]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	2008	2009	2010	2011	2012
Gemstones:					
Angola[e]	8,020 r	8,310 r	7,530 r	7,500 r	7,500
Australia[e]	149 r	156 r	100	78 r	92
Botswana[e]	22,600 r	12,400 r	15,400 r	16,000 r	14,400
Brazil, unspecified[4, 5]	80 r	21	25	46 r	46
Canada, unspecified[4, 5]	14,803	10,946	11,804 r	10,795	10,451
Central African Republic[e]	302	249	241 r	259 r	293
China, unspecified[4, 5]	69 r	46 r	17 r	(6) r	2
Congo (Brazzaville)[4, 5]	22 r	14 r	76 r	15 r	10
Congo (Kinshasa)[e]	33,402	21,298	20,166	19,249	21,524
Ghana, unspecified[4, 5]	643 r	376 r	334 r	302 r	233
Guinea[e]	2,480 r	557	299 r	243 r	213
Guyana, unspecified[4, 5]	193 r	97 r	46 r	51 r	44
India[e]	--	2	5	3	7
Indonesia[e]	24	9	--	--	--
Lesotho, unspecified[4, 5]	253 r	92 r	109 r	224 r	479
Liberia, unspecified[4, 5]	47	28	27	42	42
Namibia, unspecified[4, 5]	2,435	1,192	1,693	1,256 r	1,629
Russia[e]	21,900 r	20,600 r	20,700 r	20,900 r	20,700
Sierra Leone[7]	223	241	263 r	214 r	406
South Africa[e]	5,160 r	2,460 r	3,550 r	2,820 r	2,830
Tanzania[e]	202	155	60 r	35 r	108
Togo, unspecified[4, 5]	9	(6)	(6)	(6)	(6)
Venezuela[e]	4 r	3 r	1 r	-- r	--
Zimbabwe[e]	725 r	876 r	7,670 r	7,730 r	11,000
Total, gem	114,000 r	80,200 r	90,100 r	87,800 r	92,000
Industrial:[e]					
Angola	891 r	924 r	836 r	833 r	833
Australia	14,800 r	15,400 r	9,880 r	7,750 r	9,090
Botswana	9,680 r	5,320 r	6,610 r	6,870 r	6,170
Central African Republic	75 r	62	60 r	65 r	73
Congo (Kinshasa)	88 r	54 r	305 r	61 r	41
Guinea	620 r	139	75 r	61 r	53
India	--	7	13	9	20
Indonesia	6	2	--	--	--
Russia	15,000	14,100 r	14,200 r	14,300 r	14,200
Sierra Leone[8]	149	160	175 r	143 r	135
South Africa	7,740 r	3,680 r	5,320 r	4,230 r	4,246
Tanzania	36	27	11 r	6 r	19
Venezuela	6	5	1	-- r	--
Zimbabwe	73 r	88 r	768 r	774 r	1,100
Total, industrial	49,100 r	40,000 r	38,200 r	35,100 r	36,000
Grand total[9]	163,000 r	120,000 r	128,000 r	123,000 r	128,000

[e]Estimated. [r]Revised. -- Zero.

[1]Estimated data and subtotals are rounded to no more than three significant digits; may not add to unrounded, reported grand totals shown. Source: Kimberley Process Certification Scheme.

[2]Subcategory estimates are based on reported country totals, in carats. Includes data available through June 19, 2014.

[3]In addition to the countries listed, Belarus, Germany, Ireland, Nigeria, the Republic of Korea, and Sweden produced 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]Less than ½ unit.

TABLE 11—Continued

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

(Thousand carats)

[7]From 2008 to 2011, production was estimated to be about 60% gem quality. In 2012, production is estimated to be about 75% gem quality.

[8]From 2008 to 2011, production was estimated to be about 40% industrial quality. In 2012, production is estimated to be about 25% industrial quality.

[9]Grand totals are reported and not rounded to three significant digits. Source: Kimberley Process Certification Scheme and United States Geological Survey.