2014 Minerals Yearbook

GEMSTONES [ADVANCE RELEASE]

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

January 2018

Gemstones

By Donald W. Olson

Domestic survey data and tables were prepared by Connie Lopez and Chanda C. Williams, statistical assistants, and the author. The world production table was prepared by Glenn J. Wallace, international data coordinator.

In 2014, the estimated value of natural gemstones produced in the United States was $9.49 million (table 3), and the estimated value of U.S. synthetic gemstone production was $51.0 million. The total estimated value of U.S. gemstone production was $60.5 million. The value of U.S. gemstone imports was $26.4 billion (table 10), and the value of combined U.S. gemstone exports and reexports was estimated to be $23.0 billion. In 2014, world production of natural diamond totaled 125 million carats, of which an estimated 72.0 million carats were gem quality (table 11). During 2014, worldwide average diamond values increased by 5% to $135.77 per carat from the 2013 average value of $128.82 per carat (Diamond Shades, 2017).

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, synthetic 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 calculated 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. 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 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 commercial operations.

The commercial gemstone industry in the United States consists of individuals and companies that mine gemstones or harvest shell and pearl, firms that manufacture synthetic gemstones, and individuals and companies that cut and polish natural and synthetic 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 may 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 $9.49 million during 2014 (table 3). This production value was a slight decrease from that of 2013.

Natural gemstone materials indigenous to the United States are collected or produced in every State. During 2014, each of the 50 States produced at least $1,470 worth of gemstone materials. The leading 11 States accounted for 90% of the total value, as reported by survey respondents. These States were, in descending order of production value, Arizona, California, Oregon, Utah, Montana, Tennessee, Colorado, Arkansas, Idaho, Maine, and North Carolina. 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 were found and produced in California, Idaho, Montana, and North Carolina.

In 2014, 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 for collecting diamonds. The diamonds occur in a lamproite breccia tuff associated with a volcanic pipe and in the soil developed from the lamproite breccia tuff. During 2014, 585 diamond stones with an average weight of 0.207 carat were recovered at the Crater of Diamonds State Park. Of the 585 diamond stones recovered, 17 weighed more than 1 carat. The largest diamond found during the year was a 6.19-carat white diamond. Since the diamond-bearing pipe and the adjoining area became a State park in 1972 through yearend 2014, 31,476 diamond stones with a total weight of 6,294.20 carats have been recovered (James Howell, Park Superintendent, Crater of Diamonds State Park, written commun., January 14, 2015). Exploration has demonstrated that this diamond deposit contained about 78.5 million metric tons (Mt) of diamond-bearing rock (Howard, 1999, p. 62). An Arkansas law prohibits commercial diamond mining in the park.

In addition to natural gemstones, synthetic gemstones and gemstone simulants (or imitation gemstones) were produced in the United States in 2014. Cultured or laboratory-created also are terms used to refer to synthetic gemstones. Synthetic gemstones have the same chemical, optical, and physical properties as their natural gemstone counterparts. Simulants have an appearance similar to that of a natural gemstone material, but they have different chemical, optical, and physical properties. Synthetic gemstones that have been produced in the United States include alexandrite, cubic zirconia, diamond, emerald, garnet, moissanite, ruby, sapphire, spinel, and turquoise. However, during 2014, 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 synthetic sapphire and spinel, used to represent other gemstones, are classified as simulants.

Synthetic gemstone production in the United States was valued at $51.0 million in 2014, which was a 5% decrease compared with that of 2013. Five companies in five States, representing virtually the entire U.S. synthetic gemstone industry, reported production to the USGS. The States with reported synthetic gemstone production were, in descending order of production value, North Carolina, Florida, New York, South Carolina, and Arizona. The value of U.S. simulant gemstone output was estimated to be more than $100 million.

Since the 1950s, when scientists manufactured the first synthetic 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 synthetic diamonds, so much so that thousands of small plants throughout China were using the HPHT method and producing synthetic 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 synthetic diamond companies were able to produce relatively large high-quality diamonds that equaled those produced from mines.

In the early 2000s, technology was developed for 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, synthetic diamond producers discovered the temperature, gas composition, and pressure combination that resulted in the growth of a single diamond crystal and were able to produce synthetic stones that ranged from 1 to 2 carats.

Gemesis Inc. (Lakewood Ranch, FL) reported production of gem-quality synthetic diamond in 2014. The weight of the majority of synthetic diamond stones ranged from 0.4 to 2 carats, and most of the stones were brownish yellow, colorless, green, or yellow. Gemesis used diamond-growing machines capable of growing up to 3-carat rough diamonds by generating HPHT conditions that recreate the conditions in the Earth's mantle where natural diamonds form. Beginning in 2012, Gemesis manufactured some of its synthetic diamonds using a CVD process, which was a less expensive process than the HPHT process (Lord, 2013). Gemesis began marketing its synthetic diamonds through its Web site in March 2012. The prices of these synthetic diamonds were lower than those of comparable natural diamond but above the prices of simulated diamond. For example, Gemesis listed a 1.04-carat, J color, VS1 clarity, very good round cut with an International Gemological Institute report for $4,434, about 36% less than a similar Gemological-Institute-of-America-certified natural stone listed for $6,916 (Bates, 2012). In June 2014, Gemesis announced that the company was rebranding itself as Pure Grown Diamonds Inc., which would be a privately held company based in New York, NY, with its diamond growing facility located in Lakewood Ranch, FL (Pure Grown Diamonds Inc., 2014).

During 2014, Scio Diamond Technology Corp. (Greenville, SC) used CVD technology to produce synthetic single crystal diamond stones that ranged from 1 to 2 carats for gemstone and industrial use. Scio Diamond Technology reported that for the fiscal year ending March 31, 2015, the company had manufactured more than 39,300 carats of rough diamond. This production was a 71% increase over the previous fiscal year's production. During the year, the average size of synthetic diamond crystals more than doubled (Scio Diamond Technology Corp., 2015).

Charles & Colvard, Ltd. in North Carolina was the only U.S. manufacturer of moissanite and used proprietary patented technology. Moissanite is gem-quality synthetic silicon carbide and 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 that of corundum (ruby and sapphire) and that of diamond, which gives it durability (Charles & Colvard, Ltd., 2016). Charles & Colvard reported that moissanite sales decreased by 10% to $25.6 million in 2014 compared with $28.5 million in 2013 (Charles & Colvard, Ltd., 2015).

U.S. mussel shells are used as a source of mother-of-pearl and as seed material for culturing pearls. United States shell production decreased slightly in 2014 compared with that of

2013 (table 3) owing to decreased demand for United States shell materials that was caused by the use of seed materials from China, manmade seed materials, 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

Although the United States accounted for only a small portion of total global gemstone production, it was the world's leading diamond and nondiamond gemstone market, accounting for more than 35% of world gemstone demand in 2014. The U.S. market for unset gem-quality diamond during the year was estimated to be $24.6 billion, an increase of 6% compared with $23.3 billion in 2013. Domestic markets for natural, unset nondiamond gemstones totaled $1.80 billion in 2014, which was a 26% increase from $1.43 billion in 2013.

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 93% of the total value of the U.S. gemstone market. Colored natural gemstones, colored synthetic gemstones, and "fancy" colored diamonds were popular in 2014, as was demonstrated by the values of domestic consumption for almost all types of colored, natural, unset nondiamond gemstones increasing from 2013 values.

U.S. fine jewelry and watch retail sales, most of which included gemstones, were $78.1 billion in 2014, a slight increase from sales of 2013. Of this $78.1 billion, fine jewelry retail sales were a record $68.8 billion in 2014, a slight increase from sales of 2013. During 2014, an average $434 per household was spent on fine jewelry alone. Total U.S. jewelry and watch sales during the 2014 November-December holiday shopping season decreased slightly to $21.7 billion from holiday sales during 2013. One reason for this decline may have been a shift in purchasing habits—more jewelry was purchased throughout the year, which de-emphasized the importance of the holiday season for jewelry sales for jewelry retailers (Golan, 2015).

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 2014 because the companies mine a significant portion of the world's gem-quality diamond produced each year. In 2014, De Beers production from its independently owned and joint-venture operations in Botswana, Canada, Namibia, and South Africa increased by 5% to 32.6 million carats, compared with 31.2 million carats in 2013 (Krawitz, 2015).

Since 2000, De Beers gradually has been losing and giving up its control of world diamond pricing. Instead, flexible pricing mechanisms have been created that set the stage for new methods of rough-diamond sales in addition to rough diamonds being sold through a limited number of sightholder sales, the method used for years by De Beers. Rough diamonds were also sold by term contracts, placed sales, auctions, and tender sales (De Beers Group Inc., 2014, p. 39).

Foreign Trade

During 2014, total U.S. gemstone trade with all countries and territories was valued at about $48.0 billion, which was an increase of 9% from that of 2013. Diamond accounted for about 96% of the 2014 gemstone trade total value. In 2014, U.S. exports and reexports of diamond were shipped to 92 countries and territories, and imports of all gemstones were received from 112 countries and territories (tables 6–10). In 2014, U.S. import quantities of cut diamond decreased by 4% compared with those of 2013, and the value increased by 5%. U.S. import quantities of rough and unworked diamond decreased by 33%, but the value increased by 3% (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 2014, U.S. export and reexport quantities of gem-grade diamond decreased slightly compared with those of 2013, but the value increased by 10%. The large quantity of reexports illustrated the significance of the United States in the world's diamond supply network (table 6).

Imports of synthetic gemstone decreased by 34% in value for the United States in 2014 compared with those of 2013 (tables 9, 10). This decrease was due to large decreases in synthetic gemstone imports from China, Hong Kong, and India. Synthetic gemstone imports from Austria, Belgium, China, Germany, Hong Kong, and India, totaling more than $19.0 million in imports, accounted for about 82% (by value) of total domestic imports of synthetic gemstones during the year (table 9). The marketing of imported synthetic gemstones and enhanced gemstones as natural gemstones and the mixing of synthetic materials with natural stones in imported parcels continued to be an issue for some domestic producers in 2014. In addition, some simulants were marketed as natural or synthetic gemstones during the year as in previous years.

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 influenced by consumer demand and supply availability and, to a lesser extent, by managing the quality and quantity of the gemstones relative to demand, a function that has been performed by De Beers Group sightholder sales. Unlike diamond, colored gemstones are primarily produced at relatively small, low-cost operations with few dominant producers; prices are influenced only by consumer demand and supply availability.

In 2014, world natural rough-diamond production decreased by 4% in 2014 to 125 million carats from 130 million carats in 2013 and consisted of 72.0 million carats of gem-quality and 52.8 million carats of industrial-grade diamonds (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). In 2014, Russia led the world in total quantity of natural rough-diamond output (combined gemstone and industrial) with 31% of the estimated world production. Russia also was the world's leading gemstone diamond producer with 30%; followed by Botswana, 24%; Canada, 17%; Angola, 11%; South Africa, 8%; Congo (Kinshasa), 4%; and Namibia, 3%. These seven countries produced 97% (by quantity) of the world's gemstone diamond output in 2014. Rough-diamond production was valued at more than $19 billion, an increase of almost 6% compared with that of 2013 (De Beers Group Inc., 2015, p. 18).

During 2014, ALROSA Group and De Beers Group Inc. remained the two leading diamond producers by quantity and value. ALROSA's production was 29% of total global quantity and 29% of total global value; De Beers' production was 26% of total global quantity and 38% of total global value. The third-ranked company was Rio Tinto Ltd., which produced 13% of total global production quantity and approximately 5% of global production value (Diamond Shades, 2017).

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 objectives of the UN Security Council. The KPCS monitors rough-diamond trade in both gemstone and industrial diamond. 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. China assumed the chair of KPCS from January 1 through December 31, 2014. As of December 31, 2014, the 54 participants represented 81 nations (including the 28 member nations of the European Union counted as a single participant) plus the rough-diamond-trading entity of Taipei (Taiwan). During 2014, the Central African Republic was under a temporary suspension of exports and imports of 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, 2014).

Globally, the value of production of natural gemstones other than diamond was estimated to be more than $2.5 billion in 2014. 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 2014.

Worldwide diamond exploration spending decreased by 9% in 2014 with 48 companies allocating $447 million, compared with 47 companies allocating $489 million during 2013. The diamond share of overall worldwide mineral exploration spending was 4.2% (SNL Metals Economics Group, 2014a, p. 20).

In 2014, the worldwide average unit value of diamond increased by 5% to $135.77 per carat from the 2013 average value of $128.82 per carat (Diamond Shades, 2017).

Three new diamond mines started production in 2014: the Grib Mine and the Karpinskogo-1 Mine in western Russia and the Ghaghoo Mine in Botswana (De Beers Group Inc., 2015, p. 20).

Botswana.—Diamond production in Botswana was 24.7 million carats during 2014, a 6% increase compared with that of 2013, accounting for 20% of the world's combined natural gemstone and industrial diamond output.

The Ghaghoo Mine began production during the second half of 2014. The mine was operated by Gem Diamonds Ltd. and was the first underground diamond mine in Botswana. At full production, Ghaghoo was expected to produce 750,000 carats per year (De Beers Group Inc., 2015, p. 20; Zimnisky, 2014).

Canada.—Diamond production in Canada was 12.0 million carats in 2014, a 14% increase compared with that of 2013, accounting for 10% of the world's combined natural gemstone and industrial diamond output. Diamond exploration continued in Canada, with several commercial diamond projects and additional discoveries in Alberta, British Columbia, Northwest Territories, Nunavut, Ontario, and Quebec.

One of the world's most anticipated diamond development projects was the Gahcho Kué diamond mine, 280 kilometers northeast of Yellowknife, Northwest Territories. Gahcho Kué continued moving forward with permitting approval in the second half of 2014, and mechanical completion of the processing plant and cold commissioning was expected to start in 2015. At full production, Gahcho Kué was expected to produce 5 million carats of diamonds per year, with an estimated 15-year mine life. Ownership of the Gahcho Kué Mine was De Beers Canada, 51%, and Mountain Province Diamonds, 49% (Zimnisky, 2014).

Russia.—Diamond production in Russia was 38.3 million carats during 2014, a slight increase compared with that of 2013, accounting for 31% of total global production.

The Grib Mine in the Arkhangelsk Region of western Russia was wholly owned by OAO LUKOIL and had its first full year of production in 2014. The mine started production as an open pit that was expected to produce about 58 million carats during its projected 19-year mine life and, after transition to an underground mine, was expected to produce an additional 40 million carats. Production was expected to be 3 to 4 million carats per year. Initial development of the open pit mine was projected to cost $850 million; no capital cost estimate for the underground mine was available. The Grib Mine had reserves containing 98.5 million carats (SNL Metals Economics Group, 2014b, p. 8; Zimnisky, 2014).

The Karpinskogo-1 Mine, also located in the Arkhangelsk Region of western Russia, was wholly owned and operated by ALROSA. It was estimated that the mine would have a 16-year mine life with production expected to be 2 million carats per year (De Beers Group Inc., 2015, p. 20; Zimnisky, 2014).

Outlook

As the domestic and global economies improve, internet sales of diamonds, gemstones, and jewelry are expected to continue to expand and increase in popularity, as are other forms of e-commerce that emerge to serve the diamond and gemstone industry. Internet sales are expected to add to and partially replace store sales.

Global diamond production is expected to increase during the next few years, as a result of new projects coming onstream. A number of projects are underway to increase diamond production. By 2020, about 25% of diamond production will come from projects that are currently being developed, but additional increase in output will come from expected expansions at currently operating mines, such as Rio Tinto's Argyle Mine in Australia. The largest newly developed mines are ALROSA's Botuobinskaya, LUKOIL's Grib, and De Beers' and Mountain Province Diamonds' Gahcho Kué projects (De Beers Group Inc., 2014).

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

References Cited

Bates, Rob, 2012, Colorless synthetic diamonds are being sold on the Internet (finally): JCK Magazine, March 13. (Accessed September 22, 2014, at http://www.jckonline.com/blogs/cutting-remarks/2012/03/13/colorless-synthetic-diamonds-are-being-sold-on-internet-finally.)

Charles & Colvard, Ltd., 2015, Charles & Colvard 2014 annual report: Morrisville, NC, Charles & Colvard, Ltd., March 12, 71 p. (Accessed December 15, 2016, via http://ir.charlesandcolvard.com/reports/.)

Charles & Colvard, Ltd., 2016, Our moissanite: Morrisville, NC, Charles & Colvard, Ltd. (Accessed December 15, 2016, at https://www.charlesandcolvard.com/our-moissanite/.)

De Beers Group Inc., 2014, The diamond insight report—2014: London, United Kingdom, De Beers UK Ltd., October 7, 86 p. (Accessed May 5, 2015, at http://insightreport.debeersgroup.com/_downloads/pdfs/de-beers-insight-report-2014.pdf.)

De Beers Group Inc., 2015, The diamond insight report—In brief—2015: London, United Kingdom, De Beers UK Ltd., March, 40 p. (Accessed May 10, 2016, at https://www.debeersgroup.com/content/dam/de-beers/corporate/images/insight-report/pdf/DeBeers_Insight_Report_2015.pdf.downloadasset.pdf.)

Diamond Shades, 2017, Diamond supply and production—The definitive guide: Docklands, Victoria, Australia, Equity Communications Private Ltd. (Accessed April 14, 2017, via http://www.diamondshades.com/diamond-supply-and-production/.)

Golan, Edahn, 2015, The 2014 US jewelry state of the market report: Edahn Golan Diamond Research & Data, March. (Accessed April 15, 2015, at http://edahngolan.com/Docs/Edahn_Golan-2015_US_State_of_the_Jewelry_Market.pdf.)

Howard, J.M., 1999, Summary of the 1990's exploration and testing of the Prairie Creek diamond-bearing lamproite complex, Pike County, Arkansas, with a field guide, *in* Howard, J.M., ed., Contributions to the geology of Arkansas: Little Rock, AR, Arkansas Geological Commission Miscellaneous Publication 18D, v. IV, p. 57–73.

Kimberley Process, 2014, What is the Kimberley Process?: New York, NY, Kimberley Process. (Accessed May 18, 2015, via http://www.kimberleyprocess.com/.)

Krawitz, Avi, 2015, De Beers 4Q production -8%: New York, NY, The Rapaport Group, Diamonds.Net, January 28. (Accessed December 15, 2015, at http://www.diamonds.net/News/NewsItem.aspx?ArticleID=50210&ArticleTitle=De+Beers+4Q+Production+-8%25.)

Lord, Nick, 2013, Lab-created diamond debate heats up: Jeweller Magazine, April 1. (Accessed September 22, 2014, at http://www.jewellermagazine.com/Article.aspx?id=3124.)

Pure Grown Diamonds Inc., 2014, Gemesis Inc. rebrands itself as Pure Grown Diamonds: New York, NY, Pure Grown Diamonds Inc. news release, June 26, 2 p. (Accessed December 18, 2014, at https://www.puregrowndiamonds.com/blog/gemesis-inc-rebrands-pure-grown-diamonds/.)

Scio Diamond Technology Corp., 2015, Scio Diamond completes first year under new management: Greenville, SC, Scio Diamond Technology Corp. news release, June 29. (Accessed December 15, 2015, at http://investors.sciodiamond.com/investors/news-archive/press-release-details/2015/Scio-Diamond-Completes-First-Year-under-New-Management/default.aspx.)

SNL Metals Economics Group, 2014a, Corporate exploration strategies 2014—Exploration budgets by target, 2014: SNL Metals Economics Group Corporate Exploration Strategies Report, November, p. 20–21.

SNL Metals Economics Group, 2014b, Diamond pipeline, 2014: SNL Metals Economics Group Strategic Report, v. 27, no. 3B, March, 15 p.

Zimnisky, Paul, 2014, The state of global rough diamond supply 2014: Vancouver, British Columbia, Canada, Mining.com, March 13. (Accessed January 12, 2016, at http://www.mining.com/web/the-state-of-global-rough-diamond-supply-2014/.)

GENERAL SOURCES OF INFORMATION

U.S. Geological Survey Publications

Diamond, Industrial. Ch. in Minerals Yearbook, annual.
Garnet, Industrial. Ch. in Minerals Yearbook, annual.

Gem Stones. Ch. in United States Mineral Resources, Professional Paper 820, 1973.
Gemstones. Ch. in Mineral Commodity Summaries, annual.
Historical Statistics for Mineral and Material Commodities in the United States. Data Series 140.

Other

An Overview of Production of Specific U.S. Gemstones. U.S. Bureau of Mines Special Publication 95–14, 1995.
Antwerp Confidential.
Colored Stone Magazine.
De Beers Consolidated Mines Ltd. annual reports, 1998–2001.
Directory of Principal U.S. Gemstone Producers in 1995. U.S. Bureau of Mines Mineral Industry Surveys, 1995.
Gems & Gemology.
Gemstone Forecaster.
Gem Stones. Ch. in Mineral Facts and Problems, U.S. Bureau of Mines Bulletin 675, 1985.
Lapidary Journal.

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.
Cairngorm	do.	Smoky orange or yellow	do.	do.	7.0	2.65–2.66	do.	1.55	do.	Macrocrystalline, color, refractive index, transparent, 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:										
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.
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.

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
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, Inc.	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, Inc.	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, Inc.	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)

Gemstone	2013	2014
Beryl	191	128
Coral, all types	138	135
Diamond	49 r	61
Garnet	92	81
Gem feldspar	698	684
Geode/nodules	89	82
Opal	93	88
Quartz:		
Macrocrystalline[2]	384	287
Cryptocrystalline[3]	199	226
Sapphire/ruby	266	262
Shell	695	693
Topaz	8 r	7
Tourmaline	94	74
Turquoise	1,310	1,300
Other	5,270	5,380
Total	9,570	9,490

[r]Revised.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]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.
[3]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 2014

Carat weight	Description, color[1]	Clarity[2] (GIA terms)	Representative prices January[3]	Representative prices June[4]	Representative prices December[5]
0.25	G	VS1	$1,650	$1,650	$1,650
Do.	G	VS2	1,575	1,575	1,575
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	2,400	2,600	2,600
Do.	G	VS2	2,100	2,400	2,400
Do.	G	SI1	1,850	2,080	2,080
Do.	H	VS1	2,200	2,390	2,390
Do.	H	VS2	1,850	2,320	2,320
Do.	H	SI1	1,700	1,910	1,910
1.00	G	VS1	7,650	7,280	7,280
Do.	G	VS2	6,900	7,100	7,100
Do.	G	SI1	5,920	6,400	6,400
Do.	H	VS1	6,700	6,500	6,500
Do.	H	VS2	6,150	6,300	6,300
Do.	H	SI1	5,750	5,750	5,750
2.00	G	VS1	14,870	14,870	14,870
Do.	G	VS2	12,880	12,880	12,880
Do.	G	SI1	10,660	10,660	10,660
Do.	H	VS1	12,710	12,710	12,710
Do.	H	VS2	10,800	10,800	10,800
Do.	H	SI1	9,950	9,950	9,950

Do. Ditto.

[1]Gemological Institute of America (GIA) color grades: G, H—traces of color.

[2]Clarity: VS1—very slightly included; VS2—very slightly included, but not visible; SI1—slightly included.

[3]Source: The Gem Guide, v. 33, no. 1, January/February 2014, p. 24–26.

[4]Source: The Gem Guide, v. 33, no. 4, July/August 2014, p. 24–26.

[5]Source: The Gem Guide, v. 33, no. 6, November/December 2014, p. 24–26.

TABLE 5
PRICES PER CARAT OF U.S. CUT COLORED GEMSTONES IN 2014

Gemstone	Price range per carat	
	January[1]	December[2]
Amethyst	$17–25	$30–35
Aquamarine	205–300	275–365
Citrine	13–22	13–22
Emerald	2,800–4,750	3,000–4,000
Opal, fire	180–250	180–250
Opal, white (also jelly opal)	65–80	65–80
Pearl, cultured saltwater[3]	5	5
Peridot	120–150	150–200
Rhodolite garnet	35–65	50–75
Ruby	2,400–2,600	2,200–3,000
Sapphire, blue	1,450–1,900	1,450–1,900
Tanzanite	335–375	400–425
Topaz, blue	7–10	7–10
Topaz, yellow	150–235	150–235
Tourmaline, green	60–70	125–175
Tourmaline, pink	155–200	175–215

[1]Source: The Gem Guide, v. 33, no. 1, January/February 2014, p. 53–54, 57–58, 61, 65, 67–69, 72–75, and 82. 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. 33, no. 6, November/December 2014, p. 53–54, 57, 61, 66–68, 70, 72–75, and 82. 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	2013 Quantity (carats)	2013 Value[2] (millions)	2014 Quantity (carats)	2014 Value[2] (millions)
Exports:[3]				
Aruba	110,000	$3	954	$2
Australia	10,600	32	30,500	32
Austria	120	1	122	1
Bahamas, The	582	2	480	1
Belgium	90,900	142	55,600	79
Belize	176	(4)	190	(4)
Brazil	32,800	11	30,700	6
Canada	54,200	100	50,200	91
Cayman Islands	664	1	547	1
China	8,980	33	6,740	26
Costa Rica	4,420	1	1,770	(4)
Curacao	15,300 r	41 r	12,900	41
Denmark	861	1	3,420	1
Dominican Republic	37,300	15	32,300	12
France	10,800	5	3,250	5
Germany	2,410	4	21,200	12
Honduras	155	1	152	1
Hong Kong	2,140,000	458	1,980,000	531
India	489,000	163	381,000	120
Ireland	13,100	77	12,800	83
Israel	346,000	491	78,500	234
Italy	2,860	2	6,930	1
Jamaica	474	2	477	2
Japan	3,110	5	3,090	8
Lebanon	1,670	(4)	28,000	2
Malaysia	2,500	1	202	2
Mexico	420,000	75	416,000	67
Netherlands	405	2	212	1
New Zealand	1,320	3	578	2
Panama	12	(4)	262	1
Qatar	--	--	2	(4)
Russia	62	4	179	3
Singapore	1,910	12	3,910	28
South Africa	6,320	9	16,800	3
Sweden	253	1	183	1
Switzerland	10,800	68	2,150	37
Taiwan	211	1	1,610	3
Thailand	154,000	21	153,000	21
United Arab Emirates	49,100	54	88,700	67
United Kingdom	19,700	38	26,300	85
Vietnam	4,600	9	4,190	6
Other	13,200	28	12,100	9
Total	4,060,000	1,920	3,470,000	1,630
Reexports:[3]				
Armenia	3,350	2	4,940	2
Aruba	4,480	7	3,290	5
Australia	3,790	24	12,600	43
Austria	208	1	285	(4)
Belgium	1,050,000	2,620	927,000	3,600
Canada	142,000	181	103,000	156
China	43,500	28	30,300	22
France	7,580	136	10,000	159
Germany	4,700	7	10,600	4
Guatemala	2,210	(4)	--	--
Hong Kong	3,760,000	2,560	2,850,000	2,920

See footnotes at end of table.

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

	2013		2014	
Country	Quantity (carats)	Value[2] (millions)	Quantity (carats)	Value[2] (millions)
Reexports—Continued:[3]				
India	3,270,000	3,700	3,560,000	3,630
Israel	1,370,000	5,200	1,850,000	6,480
Italy	13,700	13	14,400	41
Japan	68,300	73	48,300	78
Laos	5,640	3	5,740	3
Lebanon	8,660	3	1,200	3
Malaysia	172	2	8,230	6
Mexico	8,330	7	4,700	8
Namibia	4,110	8	6,290	5
Netherlands	66,300	266	53	(4)
Singapore	8,260	102	13,000	83
South Africa	21,300	125	56,300	170
Spain	869	(4)	1,050	2
Switzerland	117,000	1,430	88,700	1,250
Taiwan	1,850	8	34,800	16
Thailand	113,000	113	194,000	76
United Arab Emirates	549,000	466	1,030,000	389
United Kingdom	43,400	291	53,900	381
Other	88,200	116	121,000	149
Total	10,800,000	17,500	11,000,000	19,700
Grand total	14,800,000	19,400	14,500,000	21,300

[r]Revised. -- Zero.

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

[2]Customs value.

[3]Export and reexport data are for Harmonized Tariff Schedule of the United States codes 7102.31.0000, 7102.39.0010, and 7102.39.0050.

[4]Less than ½ unit.

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

Kind, range, and country of origin	2013 Quantity (carats)	2013 Value[2] (millions)	2014 Quantity (carats)	2014 Value[2] (millions)
Rough or uncut, natural:[3, 4]				
Angola	4,820	$16	415	$6
Australia	105,000	1	36,100	3
Belgium	3,250	13	--	--
Botswana	109,000	133	69,300	127
Brazil	12,500	4	5,150	3
Canada	18,100	35	11,700	17
Central African Republic	77	2	3	1
Congo (Kinshasa)	2,610	1	2,430	1
India	86,300	2	35,300	(5)
Israel	1,600	5	41	1
Lesotho	907	28	1,080	69
Namibia	4,220	6	4,830	7
Russia	40,100	56	51,700	52
Sierra Leone	11,800	6	1,150	5
South Africa	234,000	221	204,000	251
Other	3,800	5	2,210	4
Total	638,000	534	425,000	547
Cut but unset, not more than 0.5 carat:[6]				
Australia	4,850	2	35,000	4
Belgium	186,000	111	169,000	107
Botswana	20,500	17	7,780	23
Brazil	1,440	1	208	(5)
Canada	7,240	6	9,410	10
China	45,000	52	60,700	93
Dominican Republic	3,100	1	2,370	(5)
Hong Kong	112,000	33	182,000	43
India	5,730,000	1,760	5,320,000	1,810
Israel	539,000	242	633,000	253
Mauritius	10,200	37	18,000	49
Mexico	83,500	18	74,400	16
Namibia	5,080	16	10,200	35
Russia	131	(5)	379	1
South Africa	9,370	12	25,400	26
Sri Lanka	1,440	1	9,660	10
Switzerland	3,020	13	1,960	3
Thailand	90,600	15	58,600	12
United Arab Emirates	81,700	22	23,300	7
United Kingdom	31,200	8	29,100	5
Vietnam	22,900	29	52,400	64
Other	31,500	10	52,800	9
Total	7,020,000	2,410	6,770,000	2,580
Cut but unset, more than 0.5 carat:[7]				
Armenia	683	1	1,480	1
Australia	6,630	42	3,330	65
Belgium	691,000	3,930	588,000	3,810
Botswana	13,600	103	24,000	139
Brazil	472	3	760	5
Canada	28,900	125	61,100	219
China	43,300	235	66,400	296
France	2,010	19	2,200	27
Germany	3,390	9	2,510	7
Hong Kong	62,700	253	40,500	294
India	2,320,000	5,640	2,300,000	5,810
Indonesia	253	6	58	1
Israel	1,950,000	8,540	1,800,000	9,000
Italy	4,000	15	1,180	15

See footnotes at end of table.

TABLE 7—Continued

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

Kind, range, and country of origin	2013 Quantity (carats)	2013 Value[2] (millions)	2014 Quantity (carats)	2014 Value[2] (millions)
Cut but unset, more than 0.5 carat—Continued:[7]				
Japan	1,290	7	1,670	8
Lebanon	540	4	313	1
Lesotho	11	1	14	1
Mauritius	4,340	31	6,910	47
Mexico	7,390	7	19,300	5
Namibia	15,700	81	11,400	60
Netherlands	362	2	94	1
Russia	19,400	114	16,000	109
Singapore	11,900	7	2,200	5
South Africa	43,000	649	38,600	864
Sri Lanka	438	3	1,790	16
Switzerland	11,400	350	7,520	440
Thailand	16,800	27	13,200	10
United Arab Emirates	17,000	87	9,210	64
United Kingdom	13,400	89	9,140	100
Vietnam	3,090	2	307	(5)
Other	3,470	12	5,260	13
Total	5,300,000	20,400	5,040,000	21,400

-- 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]Rough or uncut, natural data are for Harmonized Tariff Schedule of the United States code 7102.31.0000.

[5]Less than ½ unit.

[6]Cut but unset, not more than 0.5 carat data are for Harmonized Tariff Schedule of the United States code 7102.39.0010.

[7]Cut but unset, more than 0.5 carat data are for Harmonized Tariff Schedule of the United States code 7102.39.0050.

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

	2013		2014	
Kind and country	Quantity (carats)	Value[2] (millions)	Quantity (carats)	Value[2] (millions)
Emerald:[3]				
Belgium	3,630	$5	2,120	$5
Brazil	140,000	20	148,000	15
Canada	3,000	(4)	2,710	(4)
China	28,700	(4)	10,000	(4)
Colombia	275,000	176	339,000	286
France	1,590	3	731	3
Germany	15,400	2	38,100	4
Hong Kong	145,000	16	90,500	30
India	1,630,000	85	1,580,000	122
Israel	151,000	49	183,000	54
Italy	3,070	1	5,790	2
South Africa	99,300	14	16,300	4
Switzerland	3,330	13	5,320	49
Thailand	436,000	22	418,000	18
United Kingdom	696	3	3,960	15
Zambia	87,800	15	311,000	29
Other	12,300	6	31,900	8
Total	3,040,000	431	3,180,000	644
Ruby:[5]				
Belgium	1,150	1	138	5
China	13,200	(4)	1,410	(4)
France	432	4	690	(4)
Germany	3,920	(4)	15,700	1
Hong Kong	21,500	6	24,800	5
India	2,170,000	11	1,830,000	12
Israel	2,080	3	7,470	6
Italy	3,920	(4)	5,750	(4)
Madagascar	2,280	(4)	40,400	2
Mozambique	20,900	16	45,500	28
South Africa	39,800	2	37,000	3
Sri Lanka	6,340	1	74,200	4
Switzerland	2,180	6	1,210	3
Thailand	1,460,000	88	1,550,000	59
Other	12,400	9	35,300	4
Total	3,760,000	146	3,660,000	129
Sapphire:[6]				
Belgium	5,060	3	487	4
China	41,900	2	21,300	1
France	1,100	6	246	4
Germany	28,600	3	45,700	2
Hong Kong	138,000	34	72,500	39
India	2,400,000	24	2,110,000	40
Israel	18,900	5	21,500	7
Italy	7,380	1	8,700	6
Madagascar	7,990	2	13,300	3
South Africa	17,700	8	207,000	3
Sri Lanka	358,000	91	478,000	117
Switzerland	20,300	37	13,000	55
Thailand	3,710,000	102	2,960,000	108
United Kingdom	11,900	4	674	2
Other	44,500	6	91,800	26
Total	6,810,000	330	6,050,000	418
Other:				
Rough, uncut, all countries[7]	2,540,000	14	53,400,000	474
Cut, set and unset, all countries[8]	NA	340	NA	435

See footnotes at end of table.

NA Not available.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Customs value.
[3]Emerald data are for Harmonized Tariff Schedule of the United States code 7103.91.0030.
[4]Less than ½ unit.
[5]Ruby data are for Harmonized Tariff Schedule of the United States code 7103.91.0010.
[6]Sapphire data are for Harmonized Tariff Schedule of the United States code 7103.91.0020.
[7]Rough, uncut data are for Harmonized Tariff Schedule of the United States code 7103.10.4080.
[8]Cut, set and unset data are for Harmonized Tariff Schedule of the United States code 7103.99.1080.

Sources: U.S. Census Bureau and the U.S. International Trade Commission.

TABLE 9

VALUE OF U.S. IMPORTS OF SYNTHETIC AND IMITATION GEMSTONES, BY COUNTRY[1, 2]

(Thousand dollars)

Country	2013	2014
Synthetic, cut but unset:[3]		
Austria	1,910	1,420
Belgium	1,110	735
China	9,060	5,210
Germany	9,180	9,190
Hong Kong	6,440	189
India	4,740	2,280
Malaysia	--	3
Other	2,750	4,200
Total	35,200	23,200
Imitation:[4]		
Austria	46,100	36,800
China	8,370	8,910
Czech Republic	1,120	1,550
Other	1,520	1,460
Total	57,100	48,700

-- Zero.

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

[2]Customs value.

[3]Synthetic, cut but unset data are for Harmonized Tariff Schedule of the United States code 7104.90.1000.

[4]Imitation data are for Harmonized Tariff Schedule of the United States code 7018.10.2000.

Sources: U.S. Census Bureau and the U.S. International Trade Commission.

TABLE 10

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

(Thousand carats and thousand dollars)

Stones	2013		2014	
	Quantity	Value[2]	Quantity	Value[2]
Coral and similar materials, unworked[3]	5,960	$13,700	7,780	$16,000
Diamonds:				
Cut but unset[4]	12,300	22,800,000	11,800	24,000,000
Rough or uncut[5]	638	534,000	425	547,000
Emeralds, cut but unset[6]	3,040	431,000	3,180	644,000
Pearls:				
Cultured[7]	NA	18,500	NA	24,400
Imitation[8]	NA	5,520	NA	4,680
Natural	NA	29,100	NA	20,600
Rubies, cut but unset[9]	3,760	146,000	3,670	132,000
Sapphires, cut but unset[10]	6,810	330,000	6,050	415,000
Other precious and semiprecious stones:				
Rough, uncut[11]	2,540,000	13,800	3,170,000	24,100
Cut, set and unset[12]	NA	340,000	NA	435,000
Other[13]	NA	9,060	NA	8,160
Synthetic:				
Cut but unset	16,700	35,200	55,400	23,200
Other	NA	4,670	NA	8,710
Imitation gemstone[14]	NA	57,100	NA	48,700
Total	2,590,000	24,800,000	3,250,000	26,400,000

NA Not available.

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

[2]Customs value.

[3]Coral and similar materials, unworked data are for Harmonized Tariff Schedule of the United States code 0508.00.0000.

[4]Cut but unset data are for Harmonized Tariff Schedule of the United States codes 7102.39.0010, 7102.39.0050.

[5]Rough or uncut data are for Harmonized Tariff Schedule of the United States code 7102.31.0000.

[6]Emeralds, cut but unset data are for Harmonized Tariff Schedule of the United States code 7103.91.0030.

[7]Cultured data are for Harmonized Tariff Schedule of the United States code 7101.21.0000.

[8]Imitation data are for Harmonized Tariff Schedule of the United States code 7018.10.1000.

[9]Rubies, cut but unset data are for Harmonized Tariff Schedule of the United States code 7103.91.0010.

[10]Sapphires, cut but unset data are for Harmonized Tariff Schedule of the United States code 7103.91.0020.

[11]Rough, uncut data are for Harmonized Tariff Schedule of the United States codes 7103.10.2020 and 7103.10.2080.

[12]Cut, set and unset data are for Harmonized Tariff Schedule of the United States code 7103.99.1080.

[13]Other data are for Harmonized Tariff Schedule of the United States code 7103.99.5080.

[14]Imitation data are for Harmonized Tariff Schedule of the United States code 7018.10.2000.

Sources: U.S. Census Bureau and the U.S. International Trade Commission.

TABLE 11

DIAMONDS (NATURAL): WORLD PRODUCTION, BY COUNTRY AND TYPE[1, 2]

(Thousand carats)

Country and type[3]	2010	2011	2012	2013	2014
Gemstones:					
Angola[4]	7,526 r	7,496 r	7,498 r	8,424 r	7,912
Australia[5]	200	157	184	235	186
Botswana[6]	15,413 r	16,033 r	14,388 r	16,231 r	17,268
Brazil, unspecified[7]	25	46	46	49	57
Cameroon, unspecified	--	--	--	3 [8]	4 [8]
Canada, unspecified	11,804 r	10,795 r	10,451 r	10,562 r	12,012
Central African Republic[9, 10]	241	259	293	--	--
China, unspecified	17	(11)	2	1	--
Congo (Brazzaville), unspecified	381	77	52	56	53
Congo (Kinshasa)[12]	4,033 r	3,850 r	4,305 r	3,136 r	3,130
Côte d'Ivoire, unspecified	--	--	--	--	1
Ghana, unspecified	334	302	233	169	242
Guinea[10]	299	243	213	162	131
Guyana	46	51	44	60	100
India[13]	5	3	7	10	10
Lesotho, unspecified	109	224	479	414	346
Liberia[14]	16	25	25	32	39
Namibia, unspecified	1,693 r	1,256 r	1,629 r	1,689 r	1,918
Russia[15]	19,520 r	19,678 r	19,559 r	21,215 r	21,450
Sierra Leone[16]	263	214	433 r	487 r	496
South Africa[10]	7,090 r	5,636 r	5,662 r	6,515 r	5,945
Tanzania[17]	53 r	31 r	95 r	135 r	190
Togo, unspecified	(11)	(11)	(11)	(11)	(11)
Venezuela[18]	1	--	--	--	--
Zimbabwe[19]	844	850	1,206 r	1,041 r	477
Total, gemstones	69,900	67,200	66,800	70,600	72,000
Industrial:					
Angola[4]	836	833	833	936	879
Australia[5]	9,777 r	7,673 r	8,997 r	11,494 r	9,102
Botswana[6]	6,605 r	6,871 r	6,166 r	6,956 r	7,400
Central African Republic[10]	60	65	73	--	--
Congo (Kinshasa)[12]	16,133 r	15,399 r	17,219 r	12,546 r	12,522
Guinea[10]	75	61	53	40	33
India[13]	13	9	20	27	27
Liberia[14]	11	17	17	21	26
Russia[15]	15,337 r	15,462 r	15,368 r	16,669 r	16,854
Sierra Leone[16]	175	143	108 r	122 r	124
South Africa[10]	1,773 r	1,409 r	1,415 r	1,629 r	1,486
Tanzania[17]	18 r	10 r	32 r	45 r	63
Venezuela[18]	1	--	--	--	--
Zimbabwe[19]	7,592 r	7,652 r	10,854 r	9,371 r	4,294
Total, industrial[5]	58,400	55,600	61,200	59,900	52,800
Grand total, unrounded	128,317	122,829	127,962	130,482	124,778

[r]Revised. -- Zero.

[1]Gem and industrial quantities are estimated from reported country totals; may not add to totals shown.

[2]Includes data available through October 2, 2015.

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

[4]About 90% gem quality and 10% industrial quality.

[5]About 2% gem quality and 98% industrial quality.

[6]About 70% gem and near gem quality and 30% industrial quality.

[7]Figures represent officially reported diamond output plus official Brazilian estimates of output by nonreporting miners.

[8]From artisanal mining.

[9]Includes artisanal mining.

[10]About 80% gem quality and 20% industrial quality.

TABLE 11—Continued

DIAMONDS (NATURAL): WORLD PRODUCTION, BY COUNTRY AND TYPE[1, 2]

[11]Less than ½ unit.

[12]About 20% gem quality and 80% industrial quality.

[13]About 27% gem quality and 73% industrial quality.

[14]About 60% gem quality and 40% industrial quality.

[15]About 56% gem quality and 44% industrial quality.

[16]In 2010 and 2011, production was estimated to be about 60% gem quality; and in 2012–14, production is estimated to be about 80% gem quality.

[17]About 85% gem quality and 15% industrial quality.

[18]About 40% gem quality and 60% industrial quality.

[19]About 10% gem quality and 90% industrial quality.

Source: Kimberley Process Certification Scheme.