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GEMSTONES [ADVANCE RELEASE]

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GEMSTONES

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In 2013, the estimated value of natural gemstones produced in the United States was $9.57 million (table 3), and the estimated value of U.S. synthetic gemstone production was $56.9 million. The total estimated value of U.S. gemstone production was $66.5 million. The value of U.S. gemstone imports was $24.7 billion (table 10), and the value of combined U.S. gemstone exports and reexports was estimated to be $19.4 billion. In 2013, world production of natural diamond totaled 130 million carats, of which an estimated 70.6 million carats were gem quality (table 11). During 2013, worldwide average diamond values decreased by 4% to $95.00 per carat (SNL Metals Economics Group, 2014).

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 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. 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 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 $9.57 million during 2013 (table 3). This production value was a 16% decrease from that of 2012.

Natural gemstone materials indigenous to the United States are collected or produced in every State. During 2013, each of the 50 States produced at least $1,440 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, North Carolina, 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 2013, 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. In 2013, 455 diamond stones with an average weight of 0.213 carat were recovered at the Crater of Diamonds State Park. Of the 455 diamond stones recovered, 17 weighed more than 1 carat. Since the diamond-bearing pipe and the adjoining area became a State park in 1972 through yearend 2013, 30,891 diamond stones with a total weight of 6,173.18 carats have been recovered (James Howell, Park Superintendent, Crater of Diamonds State Park, written commun., January 14, 2014). 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, synthetic gemstones and gemstone simulants were produced in the United States in 2013. 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 2013, 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 $56.9 million during 2013, which was an 82% increase compared with that of 2012. This increase was the result of increased moissanite production by Charles & Colvard, Ltd. and increased diamond production by Scio Diamond Technology Corp. 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 (Park, 2007).

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 Diamond Co. (Lakewood Ranch, FL) reported production of gem-quality synthetic diamond in 2013. 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 is a less expensive process than the HPHT process (Lord, 2013). Gemesis began marketing its synthetic diamonds over its own Web site in March 2012. The prices of the Gemesis synthetic diamonds are 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 synthetic diamond with an International Gemological Institute report for $4,434, about 35% less than a similar Gemological-Institute-of-America-certified natural stone listed for $6,916 (Bates, 2012). In April 2013, Gemesis offered what the company referred to as the world's largest, whitest synthetic diamond, a 1.29-carat, E color, VVS2 clarity, emerald-cut synthetic diamond. The stone was listed on Gemesis.com, and the diamond's retail value was reported as $7,633.64 (Diamonds.Net, 2013).

During 2013, 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 and Gemesis prefer to call their diamonds "cultured" rather than synthetic, referring to the fact that the diamonds are grown much like a cultured pearl is grown. Scio Diamond Technology reported that for the fiscal year ending March 31, 2014, the company had manufactured more than 23,000 carats of rough diamond. This production was a 49% increase over the previous fiscal year's production (Scio Diamond Technology Corp., 2014).

Charles & Colvard, Ltd. in North Carolina was the only U.S. manufacturer of moissanite. The manufacturing process uses 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., 2010). Charles & Colvard reported that moissanite sales increased by 27% to $28.5 million in 2013 compared with $22.4 million in 2012 (Charles & Colvard, Ltd., 2014).

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 by 14% in 2013 compared with that of 2012 (table 3) 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, diamonds and nondiamond gemstones have usually held their value despite wars or economic depressions, but this did not hold true during the recent worldwide economic recession. Diamond and nondiamond gemstones value and sales in the United States decreased during the economic downturn in the second half of 2008 and continued decreasing into 2009, dropping 35%. Values and sales returned to near pre-recession levels during 2010, and have generally increased by 10% to 20% in all years since with the exception of 2012 when values decreased by an estimated 9%.

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 2013. The U.S. market for unset gem-quality diamond during the year was estimated to be $23.3 billion, an increase of 16% compared with that of 2012. Domestic markets for natural, unset nondiamond gemstones totaled $1.40 billion in 2013, which was a 10% increase from that of 2012.

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 94% of the total value of the U.S. gemstone market. Colored natural gemstones, colored synthetic gemstones, and "fancy" colored diamonds were popular in 2013, as was demonstrated by the values of domestic consumption for almost all types of colored, natural, unset nondiamond gemstones increasing from 2012 values.

U.S. fine jewelry and watch retail sales, most of which included gemstones, were a record $80.1 billion in 2013, an increase of 12.4% from sales of $71.3 billion in 2012. Of this $80.1 billion, fine jewelry retail sales were a record $70.7 billion in 2013, an increase of 6.7% from sales of $66.2 billion in 2012. During 2013, each U.S. household spent a record average $434 on fine jewelry alone. Total U.S. jewelry and watch sales for December holiday shopping during the 2013 increased by 6.6% to nearly $17 billion from sales during December 2012. Of these total sales, jewelry store sales in December increased slightly to $6.54 billion from $6.44 billion the previous year (Golan, 2015; Munn, 2014).

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 2013 because the companies mine a significant portion of the world's gem-quality diamond produced each year. In 2013, De Beers production from its independently owned and joint-venture operations in Botswana, Canada, Namibia, and South Africa increased by 12% to 31.2 million carats, compared with 27.9 million carats in 2012 (Taylor, 2014).

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. During 2013, new rough diamond sales methods were used in addition to diamonds being sold through a limited number of sightholder sales, the method used for years by De Beers. In 2013, rough diamonds were also sold by term contracts, placed sales, auctions, and tender sales (De Beers Group Inc., 2014, p. 39).

Foreign Trade

During 2013, total U.S. gemstone trade with all countries and territories was valued at about $44.1 billion, which was an increase of 15% from that of 2012. Diamond accounted for about 95% of the 2013 gemstone trade total value. In 2013, U.S. exports and reexports of diamond were shipped to 90 countries and territories, and imports of all gemstones were received from 115 countries and territories (tables 6–10). In 2013, U.S. import quantities of cut diamond increased by 3% compared with those of 2012, and the value increased by 16%. U.S. import quantities of rough and unworked diamond decreased by 15%, and the value decreased by 4% (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 2013, U.S. export and reexport quantities of gem-grade diamond increased by 3% compared with those of 2012, but the value increased by 15%. The large volume of reexports revealed the significance of the United States in the world's diamond supply network (table 6).

Import values of synthetic gemstone increased by 6% in value for the United States in 2013 compared with those of 2012 (tables 9, 10). Synthetic gemstone imports from Austria, Belgium, China, Germany, Hong Kong, and India, with more than $32.4 million in imports, accounted for about 92% (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 2013. 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.

De Beers' gradual loss and giving up of its control of world production and sale of rough diamonds began during 2000 when De Beers started restructuring its operations and strategic role in the diamond market, and the company closed its African buying offices. In 2002, De Beers made an agreement with the European Monopolies and Mergers Commission to phase out its marketing of Russia's diamond production over a 7-year period. De Beers sold its diamond stockpile and curtailed its market custodianship by declining to limit sales during periods of lower demand. De Beers contributed to the rough diamond market's fragmentation by transferring many of its aging South African mines to smaller companies. The company sold the Premier Mine (now known as the Cullinan Mine), the Finsch Mine, its Kimberley operations, and several smaller prospects to Petra Diamonds Ltd., and its Namaqualand properties went to Trans Hex Group. These changes reduced De Beers' market share and diminished De Beers' ability to control rough diamond prices. In 2003, De Beers' mines, which it owned outright or in partnership with the Governments of Botswana and Namibia, produced about 43.9 million carats, and De Beers controlled a 65% market share by value and 55% by volume. By 2012, De Beers' production had declined to 27.9 million carats; with no contract sales; the company's share of the rough diamond market was approximately 40% by value and 29% by volume. Consequently, within a decade, the production and sale of rough diamonds passed from the control of De Beers Group of Companies, with a stated priority of maintaining price stability to a multichannel environment, with major companies such as Rio Tinto plc, BHP Billiton Ltd., and Petra Diamonds Ltd. (Shor, 2014). In 2013, the new rough diamond sales methods used were term contracts, placed sales, auctions, and tender, in addition to diamond sales through a limited number of sightholder sales, as had been the method used for years by De Beers (De Beers Group Inc., 2014, p. 39).

In 2013, world natural rough diamond production totaled 130 million carats—70.6 million carats gem quality and 59.9 million carats industrial grade (table 11). Most production was concentrated in a few regions—Africa [Angola, Botswana, Congo (Kinshasa), Namibia, and South Africa], Asia (northeastern Siberia and Yakutia in Russia), Australia, North America (Northwest Territories in Canada), and South America (Brazil). In 2013, Russia led the world in total natural rough diamond output quantity (combined gemstone and industrial) with 29% of the estimated world production. Russia also was the world's leading gemstone diamond producer with 30%; followed by Botswana, 23%; Canada, 15%; Angola, 12%; South Africa, 9%; Congo (Kinshasa), 4%; Namibia, 2%; and Zimbabwe, 1.5%. These eight countries produced 97% (by quantity) of the world's gemstone diamond output in 2013.

During 2013, De Beers and OJSC ALROSA continued to be the two leading diamond-producing groups by quantity and value. De Beers' production was 21% of total global quantity and 33% of total global value; ALROSA's production was 25% of total global quantity and 26% of total global value. The third-leading company was Rio Tinto, which produced 11% of total global production quantity and approximately 5% of global production value. Another leading producer was Angola's Catoca Mine, generating approximately 5% of both total global production quantity and value. The companies that operated the alluvial fields of Chiadzwa in Zimbabwe contributed an estimated 8% of total global production quantity and 4% of value (De Beers Group Inc., 2014).

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 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. South Africa assumed the chair of KPCS for a second term from January 1 through

December 31, 2013. As of August 2, 2013, the 54 participants represented 81 nations (including the 28 member nations of the European Community) plus the rough-diamond-trading entity of Taipei (Taiwan). During 2013, the Central African Republic was under a temporary suspension of exports and imports of rough diamonds, 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 2013. 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 2013.

Worldwide diamond exploration spending decreased by 6% in 2013 with 47 companies allocating $489 million compared with 65 companies allocating $520 million during 2012. The diamond share of overall worldwide mineral exploration spending was 3.4%. Africa was the leading diamond exploration location (SNL Metals Economics Group, 2013).

Worldwide in 2013, average diamond values decreased by 4% to $95.00 per carat from the 2012 average value of $98.81 per carat. The major reasons for this decrease was lower demand in China and India in 2013 compared with 2012. During the first half of the year, price decreases were moderated by steady demand in the United States (SNL Metals Economics Group, 2014).

Four new diamond projects started production in 2013. The Grib Pipe Mine in Russia, and three other much smaller mines—the Merlin Mine in Australia, the Mobilong Diamond Mine in Cameroon, and the Saxendrift Mine in South Africa (SNL Metals Economics Group, 2014).

Australia.—Diamond production in Australia was 11.7 million carats during 2013, a 27.8% increase compared with that of 2012, accounting for 9.0% of total global production.

The Merlin Mine, in the Northern Territory, was a redevelopment project. The Merlin Mine, originally owned by Rio Tinto Group, closed after exhausting its reserves in 2003. Merlin Diamonds Ltd. acquired the mine in 2004 and subsequently determined that the deposit contained 2.9 million carats in proven reserves and an additional 4.6 million carats in inferred resources. Merlin Diamonds expected to produce 250,000 carats per year (SNL Metals Economics Group, 2014).

In April 2013, Rio Tinto announced the official opening of the new Argyle underground diamond mine, in the region of Western Australia east of Kimberley. The Argyle Mine had been operating as an open pit mine since 1983 and had produced more than 800 million carats of rough diamonds. It has been one of the world's leading suppliers of diamonds and the world's largest supplier of natural colored diamonds. Rio Tinto projected that the move from open pit mining to an underground operation would extend the life of the Argyle Mine until at least 2020. The $2.2 billion underground mine used the most up-to-date block caving technology and was the first of its kind in Western Australia. Rio Tinto estimated that the average annual production over the life of the underground mine was likely to be 20 million carats per year (Rio Tinto Group, 2013).

Canada.—Diamond production in Canada was 10.6 million carats during 2013, a slight increase compared with that of 2012, accounting for 8.1% 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, the Northwest Territories, the Nunavut Territory, Ontario, and Quebec.

The Ekati Diamond Mine, Canada's first operating commercial diamond mine, completed its 15th full year of production in 2013 under new ownership. On April 10, 2013, Dominion Diamond Corp., formerly Harry Winston Diamond Corp., finalized its acquisition of an 80% controlling interest in the Ekati Diamond Mine and its diamond sorting and sales facilities from BHP Billiton Canada Inc. for $553 million (Dominion Diamond Corp., 2014b). Ekati produced 1.17 million carats of diamond from 2.44 Mt of ore during the period from April 10, 2013, through December 31, 2013 (Dominion Diamond Corp., 2014a).

Cameroon.—Diamond production in Cameroon was about 3,000 carats during 2013. In mid-2013, C and K Mining, Inc. began production at the Mobilong Diamond Mine. C and K Mining, which is a joint venture between the Governments of Cameroon and the Republic of Korea, intended to increase production from an initial 50,000 carats per year to 800,000 carats per year (SNL Metals Economics Group, 2014).

Russia.—Diamond production in Russia was 37.9 million carats during 2013, an 8.5% increase compared with that of 2012, accounting for 29.0% of total global production.

In October 2013, the Government of Russia privatized 16% of its stake in ALROSA, by way of an initial public offering, for $1.3 billion (De Beers Group Inc., 2014).

OAO LUKOIL brought its wholly owned Grib Pipe Mine in the Arkhangelsk Region of Russia into production at the end of 2013. The mine started production as an open pit that was expected to produce about 58 million carats during its projected 16-year mine life and then transition to an underground mine to produce a further 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. Grib Pipe has unclassified reserves containing 98.5 million carats (SNL Metals Economics Group, 2014).

South Africa.—Diamond production in South Africa was 8.1 million carats during 2013, a 15.1% increase compared with that of 2012, accounting for 6.2% of total global production.

Rockwell Diamonds Inc. began production at the Saxendrift Mine with estimated output of 10,000 carats per year. The Saxendrift is an alluvial mine, 74% owned by Rockwell Diamonds and 26% owned by BEE Group. The mine was adjacent to the Middle Orange River approximately 160 kilometers southwest of Kimberley. The plant was commissioned with a capacity of 115,000 cubic meters per month and was expected to increase to full capacity of 200,000 cubic meters per month. The alluvial deposit hosted 11.9 million cubic meters grading 0.005 carat per cubic meter (SNL Metals Economics Group, 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.

Diamond production is expected to decline gradually, and operating costs will continue increasing. Global diamond production is expected to increase over 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 much of the 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 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, 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, 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)

Gem materials	2012	2013
Beryl	1,790	191
Coral, all types	150	138
Diamond	(2)	(2)
Garnet	98	92
Gem feldspar	757	698
Geode/nodules	89	89
Opal	74	93
Quartz:		
Macrocrystalline[3]	383	384
Cryptocrystalline[4]	261	199
Sapphire/ruby	360	266
Shell	810	695
Topaz	(2)	(2)
Tourmaline	99	94
Turquoise	1,320	1,310
Other[5]	5,140	5,330
Total	11,300	9,570

[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.

[5]Includes jade, pearl, and many other gemstone types.

TABLE 4
PRICES PER CARAT OF U.S. CUT ROUND DIAMONDS, BY SIZE AND QUALITY IN 2013

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	1,580
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	2,400	2,400
Do.	G	VS2	2,100	2,100	2,100
Do.	G	SI1	1,850	1,850	1,850
Do.	H	VS1	2,200	2,200	2,200
Do.	H	VS2	1,850	1,850	1,850
Do.	H	SI1	1,700	1,700	1,700
1.00	G	VS1	7,810	7,650	7,650
Do.	G	VS2	6,800	6,900	6,900
Do.	G	SI1	5,840	5,920	5,920
Do.	H	VS1	6,890	6,700	6,700
Do.	H	VS2	6,300	6,150	6,150
Do.	H	SI1	5,470	5,750	5,750
2.00	G	VS1	14,900	14,900	14,900
Do.	G	VS2	12,900	12,900	12,900
Do.	G	SI1	10,700	10,700	10,700
Do.	H	VS1	12,700	12,700	12,700
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: 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. 32, no. 1, January/February 2013, p. 20–22.

[4]Source: The Gem Guide, v. 32, no. 4, July/August 2013, p. 20–22.

[5]Source: The Gem Guide, v. 32, no. 6, November/December 2013, p. 20–22.

TABLE 5
PRICES PER CARAT OF U.S. CUT COLORED GEMSTONES IN 2013

Gemstone	Price range per carat	
	January[1]	December[2]
Amethyst	$10–25	$17–25
Aquamarine	80–300	205–300
Citrine	7–20	13–20
Emerald	2,600–4,400	2,600–4,400
Opal, fire	110–250	180–250
Opal, white (also jelly opal)	55–80	65–80
Pearl, cultured saltwater[3]	5	5
Peridot	60–95	120–150
Rhodolite garnet	22–45	32–45
Ruby	2,200–2,600	2,400–2,600
Sapphire, blue	1,000–1,900	1,450–1,900
Tanzanite	300–375	335–375
Topaz, blue	5–10	7–10
Topaz, golden-yellow	75–225	150–225
Tourmaline, green	50–70	60–70
Tourmaline, pink	65–170	155–200

[1]Source: The Gem Guide, v. 32, no. 1, January/February 2013, p. 49, 50, 53, 57, 61, 63–65, 68–71, and 78. 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. 32, no. 6, November/December 2013, p. 49, 50, 53, 57, 61, 63–65, 68–71, and 78. 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	2012 Quantity (carats)	2012 Value[2] (millions)	2013 Quantity (carats)	2013 Value[2] (millions)
Exports:[3]				
Aruba	851	$3	110,000	$3
Australia	14,100	21	10,600	32
Austria	114	(4) r	120	1
Bahamas, The	753	3	582	2
Belgium	393,000	210	90,900	142
Belize	140	(4)	176	(4)
Brazil	31,100	9	32,800	11
Canada	48,200 r	114	54,200	100
Cayman Islands	731	2	664	1
China	21,500	22	8,980	33
Costa Rica	4,800	2	4,420	1
Curacao	13,700	42	15,700	42
Denmark	271	(4) r	861	1
Dominican Republic	34,500	14	37,300	15
France	869	32	10,800	5
Germany	838	3	2,410	4
Honduras	199	1	155	1
Hong Kong	2,390,000	411	2,140,000	458
India	525,000 r	261 r	489,000	163
Ireland	12,100	78 r	13,100	77
Israel	576,000 r	1,540 r	346,000	491
Italy	3,000	2	2,860	2
Jamaica	479	2	474	2
Japan	13,800	4 r	3,110	5
Lebanon	3,330	2 r	1,670	(4)
Malaysia	156	1	2,500	1
Mexico	473,000 r	88	420,000	75
Netherlands	233	1	405	2
New Zealand	668	2	1,320	3
Panama	158	(4)	12	(4)
Qatar	117	7	--	--
Russia	--	--	62	4
Singapore	3,600	11	1,910	12
South Africa	36,800	22	6,320	9
Sweden	179	1	253	1
Switzerland	9,320	34	10,800	68
Taiwan	430	2	211	1
Thailand	116,000	39	154,000	21
United Arab Emirates	45,100	55	49,100	54
United Kingdom	8,680	67	19,700	38
Vietnam	6,990	10	4,600	9
Other	10,700	11 r	13,200	27
Total	4,800,000 r	3,130	4,060,000	1,920
Reexports:[3]				
Armenia	1,980	1	3,350	2
Aruba	2,680	5	4,480	7
Australia	7,410	23	3,790	24
Austria	1,680	4 r	208	1
Belgium	816,000	2,330	1,050,000	2,620
Botswana	886	1	--	--
Canada	130,000 r	175 r	142,000	181
China	25,100	30	43,500	28
France	7,740	177	7,580	136
Germany	1,560	4 r	4,700	7

See footnotes at end of table.

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

Country	2012 Quantity (carats)	2012 Value[2] (millions)	2013 Quantity (carats)	2013 Value[2] (millions)
Reexports:[3]—Continued				
Guatemala	16,100	1	2,210	(4)
Hong Kong	2,820,000	2,480	3,760,000	2,560
India	3,310,000 r	2,330 r	3,270,000	3,700
Israel	1,350,000	3,780	1,370,000	5,200
Italy	8,960	15	13,700	13
Japan	32,100	40	68,300	73
Laos	10,100 r	5	5,640	3
Lebanon	4,450	4 r	8,660	3
Malaysia	368	5	172	2
Mexico	2,780	5 r	8,330	7
Namibia	3,660	9	4,110	8
Netherlands	116,000	289 r	66,300	266
Singapore	17,700	90	8,260	102
South Africa	10,900	41	21,300	125
Spain	89	1	869	(4)
Switzerland	117,000	956 r	117,000	1,430
Taiwan	1,330	60	1,850	8
Thailand	215,000	77 r	113,000	113
United Arab Emirates	492,000	440 r	549,000	466
United Kingdom	32,100	313 r	43,400	291
Other	65,500 r	120 r	88,200	116
Total	9,630,000 r	13,800	10,800,000	17,500
Grand total	14,400,000 r	16,900	14,800,000	19,400

rRevised. -- 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 7102.31.000, 7102.39.0010, 7102.39.0050.

[4]Less than ½ unit.

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

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

Kind, range, and country of origin	2012 Quantity (carats)	2012 Value[2] (millions)	2013 Quantity (carats)	2013 Value[2] (millions)
Rough or uncut, natural:[3, 4]				
Angola	15,900	$84	4,820	$16
Australia	1,050	1	105,000	1
Belgium	2,160	3	3,250	13
Botswana	56,800	112 r	109,000	133
Brazil	1,880	1	12,500	4
Canada	30,800	52	18,100	35
Central African Republic	98	1	77	2
Congo (Kinshasa)	5,250	15	2,610	1
India	304,000 r	2	86,300	2
Israel	7,110	12	1,600	5
Lesotho	418	9	907	28
Namibia	7,970	27	4,220	6
Russia	55,400	57	40,100	56
Sierra Leone	978	3	11,800	6
South Africa	252,000 r	171	234,000	221
Other	5,550 r	4 r	3,800	5
Total	748,000 r	556 r	638,000	534
Cut but unset, not more than 0.5 carat:[5]				
Australia	8,150	4	4,850	2
Belgium	402,000	134	186,000	111
Botswana	5,420	19	20,500	17
Brazil	2,860	2	1,440	1
Canada	7,980	6	7,240	6
China	56,900	60	45,000	52
Dominican Republic	6,960	1	3,100	1
Hong Kong	273,000	49	112,000	33
India	5,860,000	1,500 r	5,730,000	1,760
Israel	394,000	209	539,000	242
Mauritius	4,530 r	16	10,200	37
Mexico	114,000	30	83,500	18
Namibia	3,920	11	5,080	16
Russia	171	(6)	131	(6)
South Africa	7,710	18	9,370	12
Sri Lanka	--	--	1,440	1
Switzerland	947	3	3,020	13
Thailand	72,300	9	90,600	15
United Arab Emirates	132,000	38	81,700	22
United Kingdom	45,000	6	31,200	8
Vietnam	46,700	66	22,900	29
Other	29,400	8 r	31,500	10
Total	7,470,000	2,190	7,020,000	2,410
Cut but unset, more than 0.5 carat:[7]				
Armenia	272	1	683	1
Australia	5,790	37	6,630	42
Belgium	707,000	3,380 r	691,000	3,930
Botswana	9,410	54	13,600	103
Brazil	1,380 r	4	472	3
Canada	18,000	74	28,900	125
China	64,100	306	43,300	235
France	1,120 r	20	2,010	19
Germany	3,680	13	3,390	9
Hong Kong	42,800 r	144	62,700	253
India	1,680,000	3,900	2,320,000	5,640
Indonesia	52	1	253	6
Israel	1,830,000	7,990	1,950,000	8,540

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	2012 Quantity (carats)	2012 Value[2] (millions)	2013 Quantity (carats)	2013 Value[2] (millions)
Cut but unset, more than 0.5 carat:[7]—Continued				
Italy	3,520	11	4,000	15
Japan	666	8	1,290	7
Lebanon	173	1	540	4
Lesotho	--	--	11	1
Mauritius	1,890 r	11	4,340	31
Mexico	1,270	1	7,390	7
Namibia	14,200	79	15,700	81
Netherlands	146	2	362	2
Russia	19,200	93	19,400	114
Singapore	26,800	15	11,900	7
South Africa	22,600	625	43,000	649
Sri Lanka	75	(6)	438	3
Switzerland	8,460	380	11,400	350
Thailand	12,100	33	16,800	27
United Arab Emirates	44,300	164	17,000	87
United Kingdom	4,740	84	13,400	89
Vietnam	2,230	3	3,090	2
Other	4,240	23 r	3,470	12
Total	4,530,000 r	17,400	5,300,000	20,400

rRevised. -- 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]Cut but unset, not more than 0.5 carat data are for Harmonized Tariff Schedule of the United States code 7102.39.0010.
[6]Less than ½ unit.
[7]Cut but unset, more than 0.5 carat data are for Harmonized Tariff Schedule of the United States code 7102.39.0050.

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

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

Kind and country	2012 Quantity (carats)	2012 Value[2] (millions)	2013 Quantity (carats)	2013 Value[2] (millions)
Emerald:[3]				
Belgium	2,150	$4	3,630	$5
Brazil	136,000	13	140,000	20
Canada	3,340	(4)	3,000	(4)
China	4,660	(4)	28,700	(4)
Colombia	201,000	172	275,000	176
France	163	1	1,590	3
Germany	9,190	3	15,400	2
Hong Kong	147,000	49	145,000	16
India	1,650,000	54	1,630,000	85
Israel	144,000	38	151,000	49
Italy	7,790	1	3,070	1
South Africa	81,100	4	99,300	14
Switzerland	8,470 r	22 r	3,330	13
Thailand	334,000	17	436,000	22
United Kingdom	314	2	696	3
Zambia	95,800	27	87,800	15
Other	75,000 r	4 r	12,300	6
Total	2,890,000	410 r	3,040,000	431
Ruby:[5]				
Belgium	252	1	1,150	1
China	2,900	(4)	13,200	(4)
France	238	5	432	4
Germany	37,700	1	3,920	(4)
Hong Kong	64,400	16	21,500	6
India	2,600,000	4	2,170,000	11
Israel	4,580	7	2,080	3
Italy	15,200	(4)	3,920	(4)
Madagascar	7,750	(4)	2,280	(4)
Mozambique	37,500	3	20,900	16
South Africa	18,700	2	39,800	2
Sri Lanka	10,100	3	6,340	1
Switzerland	1,870	2	2,180	6
Thailand	1,420,000	44	1,460,000	88
Other	47,500 r	26 r	12,400	9
Total	4,260,000	114	3,760,000	146
Sapphire:[6]				
Belgium	1,780	4	5,060	3
China	41,100	1	41,900	2
France	6,480	2	1,100	6
Germany	146,000	3	28,600	3
Hong Kong	333,000	36	138,000	34
India	1,990,000	15	2,400,000	24
Israel	9,760	2	18,900	5
Italy	15,900	1	7,380	1
Madagascar	14,300	5	7,990	2
South Africa	14,400	(4)	17,700	8
Sri Lanka	331,000 r	87	358,000	91
Switzerland	16,600	31	20,300	37
Thailand	2,990,000	79	3,710,000	102
United Kingdom	769	1	11,900	4
Other	38,900	2	44,500	6
Total	5,940,000	269	6,810,000	330

See footnotes at end of table.

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

Kind and country	2012 Quantity (carats)	2012 Value[2] (millions)	2013 Quantity (carats)	2013 Value[2] (millions)
Other:				
Rough, uncut, all countries[7]	2,180,000 r	15 r	2,540,000	14
Cut, set and unset, all countries[8]	NA	310 r	NA	340

rRevised. 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.

Source: 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	2012	2013
Synthetic, cut but unset:[3]		
Austria	2,610 r	1,910
Belgium	1,310	1,110
China	7,190 r	9,060
Germany	9,320	9,180
Hong Kong	321	6,440
India	5,390 r	4,740
Malaysia	822	--
Other	6,250 r	2,750
Total	33,200	35,200
Imitation:[4, 5]		
Austria	3,010 r	2,460
China	23,000 r	22,600
Czech Republic	41 r	94
Other	4,350 r	3,560
Total	30,400 r	28,700

rRevised. -- 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.
[5]Includes pearls data that are for Harmonized Tariff Schedule of the United States code 7018.10.1000.

Source: 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	2012		2013	
	Quantity	Value[2]	Quantity	Value[2]
Coral and similar materials, unworked[3]	6,340	$13,400	5,960	$13,700
Diamonds:				
Cut but unset[4]	12,000	19,600,000	12,300	22,800,000
Rough or uncut[5]	748 r	556,000 r	638	534,000
Emeralds, cut but unset[6]	2,890 r	410,000 r	3,040	431,000
Pearls:				
Cultured[7]	NA	31,800	NA	18,500
Imitation[8]	NA	7,290 r	NA	5,520
Natural	NA	30,200	NA	29,100
Rubies, cut but unset[9]	4,260	114,000	3,760	146,000
Sapphires, cut but unset[10]	5,940	269,000	6,810	330,000
Other precious and semiprecious stones:				
Rough, uncut[11]	2,180,000 r	14,800 r	2,540,000	13,800
Cut, set and unset[12]	NA r	310,000 r	NA	340,000
Other[13]	NA r	8,040 r	NA	9,060
Synthetic:				
Cut but unset	9,170 r	33,200	16,700	35,200
Other	NA r	4,110 r	NA	4,670
Imitation gemstone[14]	NA r	23,100 r	NA	23,200
Total	2,220,000 r	21,500,000 r	2,590,000	24,700,000

rRevised. 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 of the United States code 0508.00.0000.

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

[5]Rough or uncut data are for Harmonized Tariff 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]Does not include pearls.

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

TABLE 11
DIAMOND (NATURAL): ESTIMATED WORLD PRODUCTION, BY COUNTRY AND TYPE[1, 2]

(Thousand carats)

Country and type[3]	2009	2010	2011	2012	2013
Gemstones:					
Angola[4]	8,310	7,530	7,500	7,500	8,420
Australia[5]	312 r	200 r	157 r	184 r	235
Botswana[6]	12,400	15,400	16,000	14,400	16,200
Brazil, unspecified[7]	21	25	46	46	49
Cameroon, unspecified	--	--	--	--	3 [8]
Canada, unspecified	10,900 r	11,800 r	10,800 r	10,500 r	10,600
Central African Republic[9, 10]	249	241	259	293	--
China, unspecified	46	17	(11)	2	1
Congo (Brazzaville), unspecified	68 r	381 r	77 r	52 r	56
Congo (Kinshasa)[12]	4,260 r	4,030 r	3,850 r	4,300 r	3,140
Ghana, unspecified	376	334	302	233	169
Guinea[10]	557	299	243	213	162
Guyana	97	46	51	44	60
India[13]	3 r	5	3	7	10
Indonesia[14]	2 r	--	--	--	--
Lesotho, unspecified	92	109	224	479	414
Liberia[15]	17 r	16 r	25 r	25 r	32
Namibia, unspecified	1,190	1,690	1,260	1,630	1,690
Russia[16]	19,500 r	19,500 r	19,700 r	19,600 r	21,200
Sierra Leone[17]	241	263	214	406	457
South Africa[10]	4,910 r	7,090 r	5,640 r	5,660 r	6,510
Tanzania[18]	155	60	35	108	153
Togo, unspecified	(11)	(11)	(11)	(11)	(11)
Venezuela[19]	3	1	--	--	--
Zimbabwe[20]	96 r	844 r	850 r	1,210 r	1,040
Total	63,800 r	69,900 r	67,200 r	66,800 r	70,600
Industrial:					
Angola[4]	924	836	833	833	936
Australia[5]	15,300 r	9,800 r	7,700 r	9,000 r	11,500
Botswana[6]	5,320	6,610	6,870	6,170	6,960
Central African Republic[10]	62	60	65	73	--
Congo (Kinshasa)[12]	17,000 r	16,100 r	15,400 r	17,200 r	12,500
Guinea[10]	139	75	61	53	40
India[13]	7	13	9	20	27
Indonesia[14]	9 r	--	--	--	--
Liberia[15]	11	11	17	17	21
Russia[16]	15,300 r	15,300 r	15,500 r	15,400 r	16,700
Sierra Leone[17]	160	175	143	135	152
South Africa[10]	1,230 r	1,770 r	1,410 r	1,420 r	1,630
Tanzania[18]	27	11	6	19	27
Venezuela[19]	5	1	--	--	--
Zimbabwe[20]	867 r	7,590 r	7,650 r	10,900 r	9,370
Total	56,400 r	58,400 r	55,600 r	61,200 r	59,900
Grand total, unrounded	120,224	128,317	122,829	127,962	130,482

rRevised. -- Zero.

[1]Estimated data are rounded to no more than three significant digits; may not add to totals shown. Includes data available through August 15, 2014.

[2]Grand totals reported by Kimberley Process Certification Scheme. Country divisions into gemstones and industrial categories estimate with input from U.S. Geological Survey country specialists.

[3]In addition to 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]About 90% gem quality and 10% industrial quality.

TABLE 11—Continued

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

[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 Mobilong Diamond Mine and artisanal mining.

[9]Includes artisanal mining.

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

[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 17% gem quality and 83% industrial quality.

[15]About 60% gem quality.

[16]About 56% gem quality.

[17]From 2009 to 2011, production was estimated to be about 60% gem quality and 40% industrial quality. In 2012 and 2013, production is estimated to be about 75% gem quality and 25% industrial quality.

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

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

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