Lab Grown Diamonds…

Separating facts from fiction.

How will science's latest miracle change the diamond industry?

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Man-made diamonds are not new. Scientists at General Electric knew in the 1950's that a diamond had some very interesting properties. They were very hard, easily dissipated heat and could be either a fantastic electrical insulator or conductor depending on variations in their atomic structure. These combinations of properties could dramatically advance electronics, communications and many other industrial applications. It's important to note that their original goal was not to make a high-grade diamond for use in jewelry.

If GE scientists could duplicate a diamond in the lab and at a low cost, it would be a real break-through. They accomplished this in 1954 using the same process as mother nature: high pressure and high temperature.

General Electric Scientists using a high pressure press to make the first synthetic diamond in 1955.

As amazing a feat as this was, there was still a big problem to solve: the mass production of high quality, low cost man-made diamonds. Over time the cost to produce an industrial grade synthetic diamond continued to drop, but there was still no real interest in producing gem grade diamonds for use in jewelry.

The jewelry trade was not concerned as gem grade diamonds just weren't economical to produce. It will take science another 50 years

before a gem grade diamond could be made for less than the cost of a mined diamond of the same size and quality formed in the earth.

But that day has arrived. The traditional diamond mining and jewelry industry is now very concerned how the availability of low cost and high quality lab grown diamonds are going to effect the traditional earth mined diamond market.

Let's take a look at what a lab grown diamond really is, and what is it not. According to a recent Federal Trade Commission ruling (2018) it no longer defines a "diamond" by using the term "natural mineral". It now states: "a diamond is a mineral consisting essentially of pure carbon crystallized in the isometric system…" ss 23.25.

Essentially this means regardless of the origin, if it has the same chemical, physical and optical properties it is a diamond. The FTC further adds that the term "diamond" used alone can only refer to a natural diamond, whereas a lab created diamond must use a clearly identifying descriptive term such as "lab grown, created, synthetic, etc." immediately proceeding the word "diamond.

Unlike other diamond look-a-likes such as cubic zirconia and moissanite, there are no appreciable differences between mined diamonds and lab grown diamonds other than cost and origin.

STONE COMPARISON CHART BY SISHU INTERNATIONAL :




PROPERTIES	NATURAL EARTH MINED DIAMONDS	LAB-GROWN DIAMONDS	CUBIC ZIRCONIA	MOISSANITE
% of Diamond Bonds	100% solid	100% solid	0%	0%
MOHS Hardness Scale	10	10	8.0 to 8.5	9.25
Cut	Varies on cost	Varies on cost	Varies on cost	Cut to correct its doubly refractive index
Color	D to F (colorless) to S to Z (yellow)	Anywhere from D to F (colorless) to S to Z (yellow)	D - shows yellows and greens under UV light	I to J - Tinges of yellow, grays and greens
Clarity	Variable - Nearly always a birth mark	VS to SI	I to F	VS to SI

Let's take a look at the two very different methods used to create lab grown diamonds. The first mimics the natural process where graphite carbon is placed under high temperature and high pressure (HPHT) causing the carbon to crystalize.

A small diamond seed crystal is placed in a vessel packed with graphite carbon.

The vessel is placed in a pressure chamber where pressures 50,000 times greater than our atmosphere are created and temperatures exceed 2,300 degrees Fahrenheit.

The graphite carbon melts and re-crystalizes over a period of several weeks, forming the man-made diamond crystal. As in nature the quality can vary and only high grade crystals are selected for analysis to determine the best cutting strategy to yield the heaviest weight, best clarity and highest brightness.

The original General Electric HPHT process has been fine-tuned and now large factories with hundreds of pressure chambers produce thousands of carats each week.

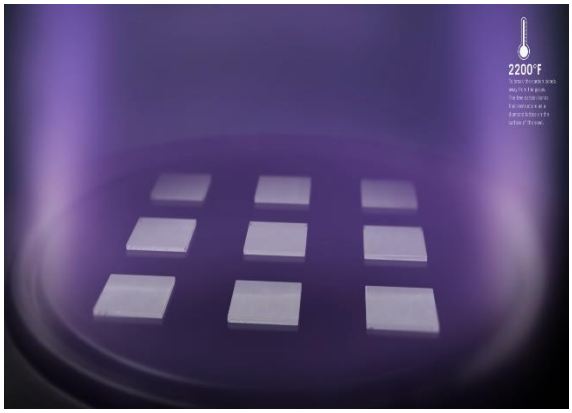
Large HPHT factories in China, Russia, India and Singapore can produce thousands of HPHT man-made diamonds every week.

Although the majority of HPHT diamond production is for industrial use, gem grade lab diamonds can be manufactured in quantity to meet the rising demand.

Closer to home there are several HPHT factories in the United States have recently began producing lab grown diamonds. The majority being for use in technology and industrial applications.

Following on the success of the HPHT process, science has also developed a new approach to producing mam-made diamonds. The "Chemical Vapor Deposit" or CVD produces multiple crystals that are much larger and can do it quicker with better control of the results.

Using a vacuum instead of high pressure, and methane gas as a carbon source the CVD process represents the latest lab grown diamond technology.



Slices of synthetic diamond are used as the starter "seed" and placed in a high output microwave chamber. Methane and Hydrogen gasses are added, and a plasma field is created.

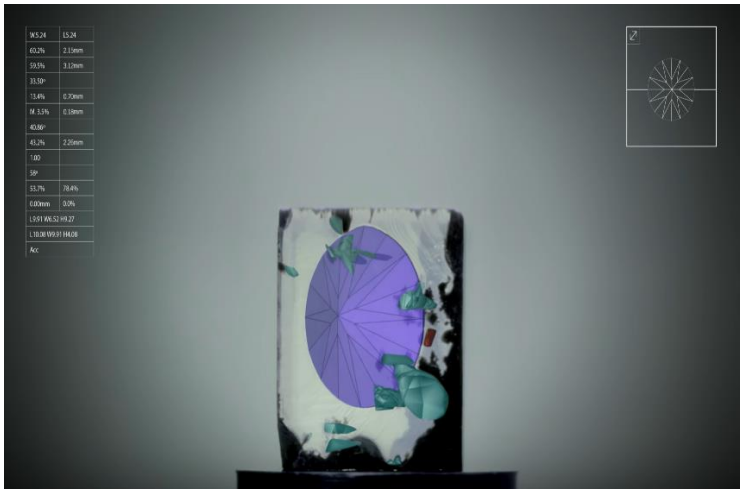
At similar temperatures to the HPHT process, atoms of carbon contained in the methane gas separate, and build up on the seed plates.

The CVD process requires a period of several weeks for the buildup of carbon to accumulate, with finished crystals as large as 10 carats being produced.

Like mined diamonds, finished crystal quality varies. The majority are used for industrial applications and a small portion of the finest quality are reserved for cutting into jewelry quality stones.

Both the HPHT and CVD process use large amounts of electricity to operate their equipment and offer no evidence of how large their actual carbon footprint is. The claims of Lab Grown Diamonds being "more eco-friendly" than traditional mined diamonds are questionable.

One major advantage to lab produced diamonds is that production can be quickly adapted to meet demand. The majority of crystal cutting and polishing is automated resulting in a faster response to current market choices of shapes and size needs.



The use of highly efficient Cad Cam technology and automated cutting and polishing machines results in a higher weight yield and at a lower cost than traditional methods.

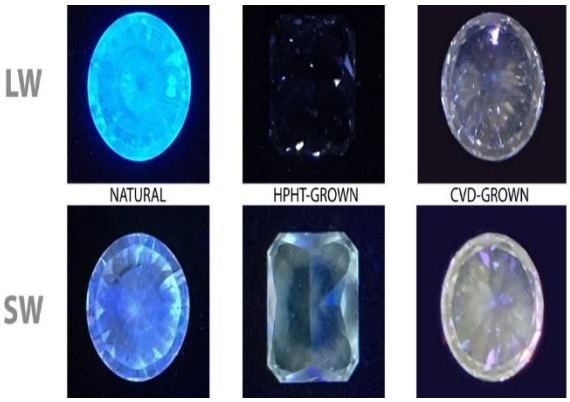
Traditional mining is slow to respond to market changes and lags behind in the implementation of automated processes. Most mined diamonds are still cut and polished by hand.

The key to successfully marketing both lab grown and Earth mined diamonds is the ability to tell them apart. As consumer preferences become more established and the price gap widens, the need to differentiate between them becomes even more critical.

Since natural diamonds and lab grown diamonds have identical physical, optical and chemical properties, they are nearly impossible to tell apart. Both consumers and jewelers relying on outdated testing equipment and methods will fail in identifying one from the other.

Gemological laboratories utilize expensive spectral analysis to make the separation, but this equipment is not practical or affordable for traditional jewelry stores or jewelry appraisers to use.

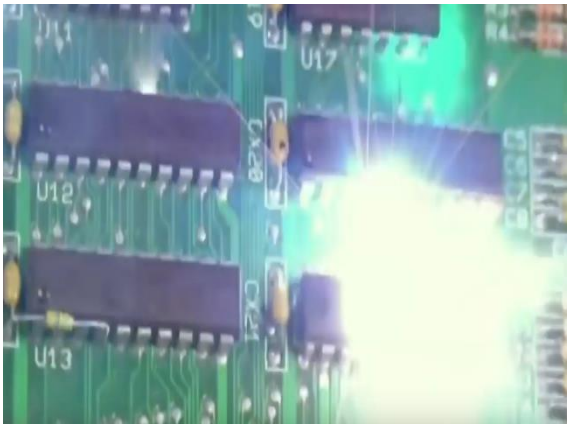
Fortunately using ultra-violet light separating natural from man-made diamonds is possible. By comparing the reaction of long wave and short wave ultra-violet light on the stone, natural diamonds can be separated with a high degree of accuracy.



This method requires a dangerously high output ultra-violet lamp and specialized training but is the preferred method for separation outside of a gemological laboratory. A Graduate Gemologist with the proper equipment and training can make the separation.

The major driving force in lab grown diamond production is still for industrial use and advanced technology applications. Our current use of silicone-based computer parts will soon be replaced by synthetic diamond coated components.

Silicone computer components burn out if too much power is applied. This is a significant problem and restricts the advancement of electronic technology.



By replacing silicone-based components with diamond-based technology, dramatic increases of power are attainable as well as a reduction in the size.

Diamond-based computer chips are still in the development phase. They hold tremendous potential to exponentially advance technology by replacing silicone based electronic components.

Prices of gem quality lab grown diamonds have fallen by 50% in the last few years as increased production and greater competition among manufacturers occurs. Even with increased consumer awareness and demand, prices are predicted to continue their slide until some level of market stability occurs.

Gem quality lab grown diamonds currently sell for 25%-50% less than a comparable mined diamond. Currently gem quality lab diamonds are also using the same grading system as traditional mined diamonds. Color, clarity, cut quality and carat weight are described on reports and certificates similar to mined diamond reports making it easy for consumers to compare them.

Authentic gemological laboratory reports are a useful means to make that separation, but they are also expensive to produce. As the cost of lab diamonds continues to fall, at some point it will not be economically feasible to include an expensive report with every gem grade lab diamond being sold.

The FTC requires all sales and documentation for lab created diamonds to clearly indicate their man-made origin, with the term

"Natural" or "Diamond" being only used for a mined diamond. But the potential for intentional or un-intentional misrepresentation and fraud still exists.

When buying and appraising diamonds, consumers should seek out a qualified Graduate Gemologists who has the proper equipment and training to separate natural from lab grown diamonds.

As existing diamonds mines continue to become depleted and economic and environmental issues restrict new development, the rarity of traditional earth mined diamonds seems likely to remain.

In the near future gem quality lab diamonds will find their place alongside other man-made gems like synthetic sapphire, ruby and emerald. They offer consumers a high quality, low cost alternative to traditional mined diamonds.

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