‘Diamonds Are Forever,’ And Made By Machine

Top, left, a tray of synthetic fashion diamonds. Until recently, De Beers scientists were focused on making diamonds for industrial and other uses. Top, middle, a laser machine. The De Beers scientists at Element Six have pivoted to the production of synthetic jewelry stones, as the company sets its sights on a lucrative market it had shunned. Top, right, a transparent sheet of polished diamond used in high-powered lasers. The market for synthetic diamonds has been growing in recent years as costs have fallen and quality has improved. Middle, right, a model of a diamond atomic lattice structure with a nitrogen defect. The structural unit consists of eight atoms, fundamentally arranged in a cube.
OXFORDSHIRE, England — In a white industrial building in the rolling hills of the English countryside 16 miles from Oxford, silver machines shaped like spaceships hum inside vast laboratories. They are replicating the extreme pressure and temperatures found deep in the earth’s crust and producing, in mere weeks, what historically nature managed only over billions of years: flawless diamonds.

This is the Element Six Innovation Center, the industrial arm of De Beers, the diamond behemoth that has operated mines from the Arctic to South Africa, that created (and for most of the 20th century controlled) the global diamond market, that convinced the world “a diamond is forever” and that made diamonds synonymous with engagement rings.

Focused for decades on things as diverse as tools for oil and gas drillers, high-powered lasers and state-of-the-art speaker systems, the De Beers scientists at Element Six have moved into new territory in recent months as the company sets its sights on a lucrative market it traditionally shunned: the production of synthetic jewelry stones.

On Tuesday, De Beers will introduce Lightbox, a fashion jewelry label selling (relatively) low-budget gems with mass-market appeal. (Think a sweet 16 gift, not an engagement ring.) Pastel pink, white and baby-blue lab-grown studs and pendants, priced from $200 for a quarter carat to $800 for one carat, will be presented in candy-colored cardboard gift boxes and initially sold directly to consumers via e-commerce.

Although diamonds made by companies like Diamond Foundry in the United States and New Diamond Technology of Russia usually cost 30 to 40 percent less than their natural counterparts, they are nowhere near as cheap as the ones from Lightbox, which will undercut its competitors by roughly 25 percent.

Through its aggressive pricing and pointed marketing, De Beers clearly aims to be a dominant player in this growing market, while simultaneously protecting its core business. "The big miners have held concerns about the growth of the synthetic diamond jewelry market for some time, particularly over the last decade, as the quality of stones has improved and manu-
facturing costs have started to fall,” said Paul Zimnisky, an independent diamond industry analyst and consultant.

De Beers, which controls about 30 percent of the world’s supply of mined stones (down from two-thirds in 1998) and owns the fine jewelry brands De Beers and Forevermark, said it was just responding to consumer demand.

“Having done our research, we see a massive opportunity to enter into the fashion jewelry market now by doing something that consumers tell us that they want but that no one else has done yet: synthetic stones in new and fun colors, with lots of sparkle and at a far more accessible price point than existing lab-grown diamond offerings,” Bruce Cleaver, the chief executive, said during a phone interview.

The idea would have been unthinkable even two years ago, when De Beers started its “Real Is Rare” campaign to combat the promotion of synthetic stones as alternatives to mined diamonds. Though man-made stones account for only about 2 percent of the diamond industry’s supply,

How to Make a Synthetic Diamond

Diamonds, among the hardest materials in the world, are formed from millions of years of geological pressure and must be extracted from mines deep in the earth. But stones with the same chemical properties as diamonds can now be made in laboratories. There are two methods of growing synthetic diamonds, and the process can be completed in as little as two weeks. Both options require a diamond seed — a single crystal diamond — from which a larger stone can form.

High Pressure, High Temperature (H.P.H.T.)

Scientists have been synthesizing diamonds for decades, producing the first gem-quality stones in the 1950s. The original method was known as high pressure, high temperature, or H.P.H.T., which simulates the crushing force of the earth by applying high temperature and high pressure alongside a metal catalyst to dissolve carbon into a diamond seed. Temperatures can go as high as 3,000 degrees Celsius, or more than 5,000 degrees Fahrenheit.

Chemical Vapor Deposition

Chemical vapor deposition, a newer process, uses low pressure and smaller machines, an approach that is easier for scientists to control and monitor. As a result, C.V.D. is increasingly favored over H.P.H.T., particularly for the jewelry market. It uses a vacuum chamber that is filled with hydrogen and methane to provide the source of carbon. The gas is turned into a plasma at extremely high temperatures, releasing carbon pieces, which are then layered onto a diamond seed in the vacuum chamber. The process is not dissimilar to 3-D printing.

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analysts at Citibank have forecast a possible rise to 10 percent by 2030.

“Consumers are clearly curious about synthetic stones,” Mr. Zimnisky said. “This isn’t a market that is about to go away.”

Chemically identical to mined diamonds (unlike past diamond substitutes such as cubic zirconia, moissanite or Swarovski crystals), synthetic diamonds have long been used for industrial purposes. De Beers itself has been “growing” diamonds at Element Six for 50 years, gradually producing stones from a hydrocarbon gas mixture in a high-pressure, high-temperature reactor.

But as Silicon Valley competitors began to market their synthetics as acceptable, greener choices and price them accordingly, De Beers, whose mining peers include Rio Tinto and Russia’s Alrosa, has decided to take the fight for market share to the laboratory turf. Alongside its high-pressure, high-temperature operations, Element Six is using a newer process known as C.V.D., or chemical vapor deposition, which uses low pressure in a vacuum filled with gases that react to create layers of carbon that gradually consolidate into a single stone. The new method is cheaper and easier to monitor than the older one and hence capable of being scalable as a jewelry business.

“Synthetics will never be as big as our natural business, and our investments into the space are dwarfed by those elsewhere,” Mr. Cleaver said. “But we have a massive advantage over everyone else, given the know-how and infrastructure provided by Element Six. So it’s something we have decided to be very serious about.” (A $91 million plant that De Beers is building in Gresham, Ore., is expected to generate half a million rough carats a year after its completion in 2020.)

At issue is an almost metaphysical question of what defines a diamond. Is it its chemical structure, which is the argument of the synthetic manufacturers? Or is it its provenance: created deep in the ground by Mother Earth, rather than cooked up in a machine?

Consumers are understandably confused. In a poll of 2,011 adults conducted this month for the Diamond Producers Association by Harris Insights & Analytics, 68 percent said they did not consider synthetics to be real diamonds, 16 percent said they thought they were, and 16 percent said they weren’t sure. But an acceptance of these new products has the potential to transform the diamond market, because lab-grown diamonds are endlessly replicable.

Sally Morrison, the head of marketing for Lightbox, said the brand’s products were meant to be viewed by consumers as playful accessories.

“Everyone who is in this space is focusing their marketing on the bridal category,” Ms. Morrison said. “And we believe they are missing an incredibly interesting opportunity: the self-purchasing professional and younger woman, the older woman who already has a jewelry collection,” and any woman “who doesn’t want the weight and seriousness
of a real diamond for everyday life.”

The message is conveyed through packaging that is clearly labeled “laboratory-grown diamonds” and intended to be the opposite of a velvet box. An inaugural ad campaign was styled by Micaela Erlanger, who became famous for dressing the actress Lupita Nyong’o for the red carpet. Featuring a diverse cast of young models romping in denim shirts and holding sparklers and laughing, the ads come with taglines like “Live, Laugh, Sparkle.”

“We see a massive opportunity to enter into the fashion jewelry market now by doing something that consumers tell us that they want but that no one else has done yet,” Bruce Cleaver, the De Beers chief executive, said.

“Man-made diamonds should not cost the same as natural stones — they really are totally separate businesses,” Steve Coe, the general manager of Lightbox, said as he stood by a glass box the size of a bowling ball at Element Six. Inside was a diamond seed, from which a stone was growing roughly 0.0002 inch an hour.

A former scientist and head of innovation at Element Six, Mr. Coe moved to De Beers 18 months ago to study approaches to the synthetic jewelry market. “I am not that concerned by the other guys,” he said. “We are simply positioning the product at a price it should be, and where it will be in five or six years’ time, thus making sure our customers today are not unhappy customers tomorrow.”

In addition, Mr. Coe was also at pains to debunk what he called many of the “misleading and bogus claims” around synthetic diamonds: that they are more sustainable alternatives to mined stones, with shorter supply chains and smaller carbon footprints.

“Given the pressure required to create lab-grown diamonds, it’s akin to the Eiffel Tower being stacked on a can of Coke,” he said. “If you look at the detailed numbers, the energy consumption levels between natural and man-made diamonds are in the same ballpark.”

This is not the first time De Beers has created brands and advertising strategies in response to disruption in the diamond market since it gave up its monopoly in 2000, abandoning its 60-year policy of controlling supply and demand to concentrate on mining and marketing instead.

In 2008, partly in response to consumer appetite for conflict-free diamonds.

Lightbox is fully in line with this strategy. “Synthetics are fun and fashionable, but they are not real diamonds in my book,” Mr. Cleaver said. “They aren’t rare or given at life’s great moments. Nor should they be.”