

[NEWS](#) > [TO UNDERTAKE](#) > [COMMODITIES](#)

REPORTAGE

The first diamonds made in Belgium, straight from the microwave



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[JAN DE SCHAMPHELAERE](#) | Today at 06:10

De Tijd held the first 100 percent Belgian diamonds. They do not come from the ground, but from a kind of microwave oven. In time, Heyaru Engineering wants to make 200,000 kilos of lab diamond annually in Lommel. "This is exciting."

"Have you ever seen the third Superman movie?" Asks Vikram Shah, describing a 1983 scene. Superman stands in a coal mine with his red-blue suit, takes a block of black rock, clenches his fist around it for a few seconds, and opens his hand. The coal had been turned into a glittering diamond by his superhuman powers.

Requested? Actually not, because that is more or less how the precious material originated in nature. Diamond is the result of a process that took place 100 kilometers underground billions of years ago. Landslides compressed layers of carbon - abundant in Superman coal - at a very high temperature and high pressure. As a result, the molecular structure of carbon changed to that of diamond.

Scientists and companies have been trying to imitate that natural process in laboratories for decades. Not without success. Since the 1950s, lower quality diamonds have been made with HPHT (High Pressure High Temperature) technology. Diamond is the hardest material in the world and has become indispensable for drill bits and saw blades.



Vikram Shah starts his 'Project Superman'. © Debby Termonia

Buzzword

A newer technique, which Heyaru also focuses on, makes it possible to make extremely pure diamonds for jewelry and even for energy applications and quantum technology. CVD is the new buzzword in the sector. “Chemical Vapor Deposition,” says Shah, whose family has been trading diamonds for three generations, and in 2012 also began producing synthetic diamonds grown in the lab. First in India, now with better machines also in Belgium, where Shah started his Project Superman.

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"Actually, these are microwave ovens," says Shah, pointing to the equipment in which diamonds are "maturing." "We create a vacuum in this. Methane gas and hydrogen gas are then added and heated up. This creates a very hot gas ball of a few thousand degrees. "

1 million carats

A soft green glow escapes from the oven chamber. "Because of the methane gas. With pure hydrogen it would be purplish. Also beautiful.' As a bystander it is fun to watch, but the chemical reaction that takes place inside is even more fascinating. 'The carbon in the methane gas changes and acquires a crystal structure, typical of diamond. The carbon vapor precipitates on a plate. And so the diamond grows layer by layer. Actually, you can say that we 3D print diamonds', says Shah.

"Come and see," he says invitingly. We crawl on a ladder. Ten blocks of diamond are in their final growth spurt in the oven. These are the very first diamonds that were produced in Belgium. This is exciting. "

This is just a warm-up for the big work. Heyaru works on the abandoned site of the defunct Ducatt in Lommel in Limburg. No man's land, Shah calls it. But at the end of this year, the company will move to a new location further down the road. Heyaru will invest 262 million euros there in the next 5 to 10 years in additional diamond ovens and production capacity. In the first phase, 26 million euros will be invested, 2 million of which will be borne by Flanders. As soon as the factory runs at full speed, an estimated 150 people will work and 1 million carats - about 200,000 kilograms - of diamonds will roll off the production line every year.

On the new site, Heyaru will draw direct green energy from Kristal Solar Park, the largest solar panel park in the Benelux. That will be a lot of power. The diamonds are in the oven for 400 hours. So half a month, good for a consumption of 7,000 kilowatt hours. That amounts to the annual consumption of two families. "We use a lot of energy, but it is green," it says.



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Oven cure

Shah puts the result of the weeks-long oven cure on the table: forty cubes of diamond of about four carats each. "Pure diamond," he says. Of the class IIa. They have a very pure carbon structure, are transparent and do not contain any impurities that give the stone a yellowish appearance. "Only 2 percent of all naturally mined diamonds are of that quality. Here they are all because we are in control of the process."

However, with black, grainy edges and a dull shine, they do not look very clean. "This is a rough diamond. The edges are cut with a laser, and the stones are then sharpened and glistened. In the end, a 1 carat cut diamond remains, a quarter of the original weight. '

It is a process with many parameters such as temperature and gas supply. It's like making a pizza. If you sprinkle onions or mushrooms on it, there is more or less in one place.

After a more thorough analysis, it appears that some stones also have cracks, internal cracks, so that they cannot be cut as one stone. Shah acknowledges that the road to 100 percent perfection can be long. "This was our first test in Belgium. We still have to find the right recipe. It is a process with many parameters such as temperature and gas supply. It's like making a pizza. If you sprinkle onions or mushrooms on it, there is more or less in one place. This was our first pizza. The more production runs we do, the better we will be able to do it."

In the meantime, Shah has already completed three runs. About 30 of the 120 diamonds produced were completely successful. They are cut in India and used in jewelry. "We hope to hit American store shelves by Thanksgiving," says Shah.

He also has the ambition to make bigger stones. 10 carats? 20 carat? The longer you leave them in the oven, the bigger of course. The limit is somewhere. We want to break records and do things no one has done to push the boundaries of science. Now we have created classic white diamonds. But one day we will also make pink, even rarer ones.

The real thing

We ask whether he carries diamonds himself. He shows his watch and belt, the shimmer of which can be seen from afar. "They are natural diamonds," he admits. His wife and daughter do wear his self-made diamonds, in India, not in Belgium, in a ring and in a necklace. 'A present. I like that,' he says. "It is also useful. If people don't believe that lab and natural diamonds look the same, I just call my wife over there."

'Even for trained eyes, the lab diamond is indistinguishable from the real thing,' says Ken Haenen, diamond researcher at Hasselt University. "The chemical composition and optical characteristics are the same. You can only separate the two with sophisticated equipment."



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"The only difference is the price," says Shah. "Lab diamond is up to 30 percent cheaper. That also explains the appeal, especially with millennials and the Z generation. They would rather spend money on travel than on goods. And they are more sensitive to reports of blood diamonds and tigers being driven out of their territory for large mining projects. "

Leonardo DiCaprio and Lady Gaga

Synthetic diamonds have already taken over 2 percent of the jewelry market, accounting for 1.5 million carats annually. Experts expect 30 percent growth annually, now that even the biggest critics are slowing down. The mantra of the diamond giant De Beers was long that lab diamond was not worthy of the name diamond. But last year he launched his own lab range. It was that or missing the boat.

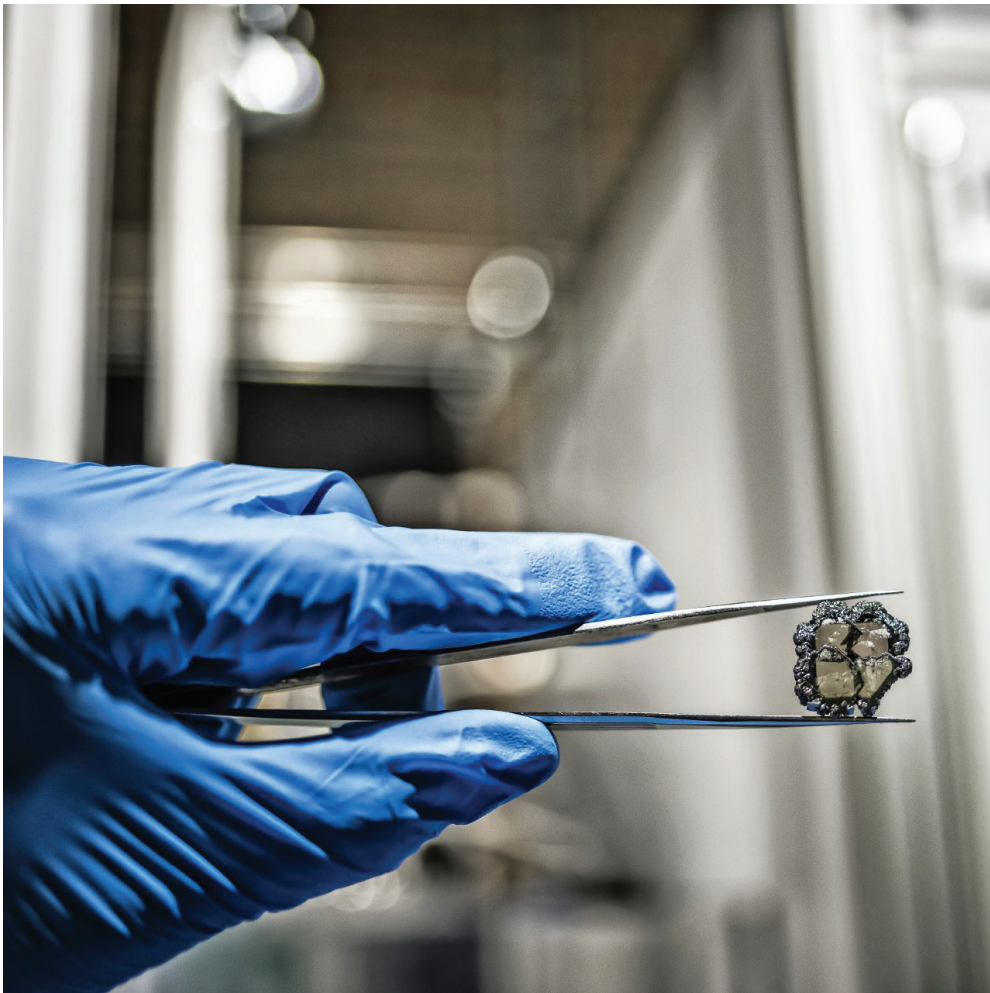
Jewelry brands like Swarovski have jumped on the cart. Meghan Markle, wife of British Prince Harry, has already been spotted with synthetic bling, as have stars like Lady Gaga, Penelope Cruz and Taylor Swift. Several start-ups worldwide are scaling up production. In the US, Diamond Foundry raised \$ 100 million, including from actor Leonardo DiCaprio.

Our diamond is very pure. Only 2 percent of all naturally mined diamonds are of that quality.

VIKRAM SHAH

MEMBER OF AN INDIAN DIAMOND FAMILY, RESPONSIBLE FOR HEYARU ENGINEERING IN BELGIUM

Won't many snap because of 'fake' and continue to choose the charm of a stone that took 3 billion years to be found by humans? Diamonds were once called tears of God, or seen as dinosaur eggs. I know those stories. But it is all a matter of perception. It's like ice outside on a pond and ice in your freezer. It is the same, only the location where it originated differs. " It is no coincidence that Heyaru settled in Belgium. With Antwerp, our country has one of the most important diamond hubs in the world. The proximity of Hasselt University also played a role. A team is conducting extensive research into new applications of lab diamonds, which is exactly where Shah's ambitions lie.



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'If you control the diamond production process, you can not only make perfectly pure ones. You can also purposefully build in impurities,' says researcher Haenen. "Instead of methane and hydrogen, you can put boron in the reactor, so that it evaporates in the diamond and the

diamond becomes electrically conductive."

In this way, diamond has potential in high-voltage switches to convert power from high-voltage lines to 220 volts in your home. 'Now they work on silicon. But diamonds can handle higher voltages and you need less of them,' says Haenen. 'I also see opportunities in quantum technology - for super-powerful computers or portable brain scanners.'

But that is still future music for the record. Also for Heyaru, although Shah is very optimistic. 'There's a lot going on. Maybe in 20 years it will not be Silicon Valley but Diamond Valley here', he says. "The sky is the limit. We have been working on this since 2012. We have gradually pushed the boundaries and plan to continue to do so."



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