



Black Magic

Black Magic GmbH is the world's largest manufacturer of curved graphene and has its production facilities in Bitterfeld-Wolfen Chemical Park.

Curved graphene is used in ultracapacitors. The energy storage devices can be quickly discharged and recharged, making them particularly suited to the automotive, transport and space sectors. Last year, the Saxony-Anhalt-based company Black Magic received the Hugo Junkers Prize for its development of curved graphene.

When the company was founded in 2017, its choice of name was no coincidence. The black carbon powder that it produces here really does have properties similar to black magic! It enables up to three times as much energy to be stored in the ultracapacitors, which are manufactured by parent company Skeleton Technologies.

Black Magic GmbH produces special curved graphene. This material is used in the cells of ultracapacitors, which are energy storage devices that in comparison to conventional batteries can provide much greater current (up to 1,000 amps or more) in a very short period of time, and can be recharged just as quickly. This is possible because the electrode material in the ultracapacitors works differently than in batteries. In batteries, the lithium ions fully penetrate into particles, whereas in capacitors, they only use the surface of the particles. The surface area must therefore be large, and this is where the graphene comes in as it has a large, specially structured surface area. Unlike conventional two-dimensional graphene, the graphene produced by Black Magic GmbH is curved, which prevents the particles from bonding to each other. This would block the otherwise available surface area. "The material containing the carbon is modified until carbon is the only substance remaining. During this process, the surface, made of carbon atoms, becomes curved – a bit like a crumpled sheet of paper," explained Dr. Sebastian Pohlmann, the company's Vice President of Innovation, who was heavily involved in establishing the research center.

The technology behind the curved graphene originally came from Estonia, where Skeleton Technologies Group was founded in 2009. Business activities were set up in Germany soon after: Skeleton Technologies GmbH was founded in 2013 and Black Magic GmbH in 2017. The material is now being steadily developed in Bitterfeld, and the technology is being developed ready for the market.

Use in satellites

Many sectors are very interested in the use of these ultracapacitors and their curved graphene, such as the transport, logistics, automotive and space sectors. As part of a pilot project, the European Space Agency tested several of the high-performance storage devices for use in satellites. Dr. Pohlmann explained that this is a sensible choice if a certain application requires a lot of energy within a very short period of time, such as when producing radar pulses. The study was successful, and a potential follow-up project is currently being planned. "We expect ultracapacitors to become more widespread in the space sector over the next few years," Dr. Pohlmann said.

It's not just the rapid and incredibly large energy output that gives the ultracapacitors their advantage, but also the fact that they can be frequently recharged. Conventional batteries can be recharged only around 500 to 1,000 times, whereas it is possible to recharge the capacitors up to a million times. Dr. Pohlmann emphasized that the aim is not to replace batteries, however. "That wouldn't be feasible because the ultracapacitors do not have enough energy." Dr. Pohlmann went on to explain that a combination of both technologies is much more desirable; they might conceivably be used together in hybrid vehicles to absorb possible power peaks during fast braking or acceleration, for example. Ultracapacitors are also particularly promising for hydrogen vehicles because their fuel cells are not able to absorb energy. Concept cars already exist and, depending on the success of fuel cell technology in the automotive sector, could go into series production in a few years' time.

Collaborations across the whole of Europe

Skeleton Technologies and Black Magic GmbH are advancing research into combining both storage devices, particularly for use in hybrid vehicles. "These cars are playing an ever increasing role in the transition from conventional engines to electric vehicles," maintained Dr. Pohlmann. The company is working with research institutes from all over Europe, from institutes in the local region such as universities in Halle, Leipzig, Jena and Dresden, to foreign universities in Toulouse, Bologna, Tampere and Tallinn. "We are a very young company, which is why it is important to both maintain existing collaborations and set up new ones. For a long time now, large automotive companies have made too little progress toward new mobility. We cannot afford to make the same mistake."

This technology is seen as particularly promising in the automotive sector, not only because of the possibility to recover braking power, but also because of the reduction in emissions. And where better for such a specialized company to be based than in Saxony-Anhalt? Since the founding of the Association of German Engineers, this region has been the cradle of German engineering. Experts here have been working on the future of the automobile for a long time. And to top it all off, every car in the world is already fitted with at least one part from Saxony-Anhalt! When Black Magic GmbH decided to produce its material under one roof, its idea of locating to Bitterfeld-Wolfen Chemical Park was a sound one. It wanted to have a production facility in Germany, even though Skeleton Technologies Group is an Estonian company and the base material for their ultracapacitors was being developed in Estonia. Dr. Pohlmann explained that they deliberately decided in favor of Bitterfeld-Wolfen over numerous other locations. "Firstly, the support from the Chemical Park and the local administration is very good. Secondly, it has a lot going for it as an optimum location: not just the excellent transport links, but also the opportunity to recruit a high-quality workforce."

Black Magic GmbH will need more staff in the foreseeable future. It currently employs just under 10 employees – mostly chemists and engineers – and expects this will soon rise to 20, and possibly even 50 once production has been scaled up. This will see the production of several hundred metric tons of curved graphene each year. Current capacity remains under 10 metric tons each year. Although that makes Black Magic GmbH the world's largest manufacturer of this material, this volume still isn't enough to meet large customer orders. This should all change, however, once production has been scaled up over the next two to three years. Talks with investors are already underway. What's more, winning the 2019 Hugo Junkers Prize for Research and Innovation in Saxony-Anhalt shows that Black Magic GmbH is on the path to success.

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25/09/20

The eDLP, the world's largest development and test center for high-voltage batteries for passenger cars and commercial vehicles, is due to enter operation at the end of September 2020. This is yet another milestone reached by FEV, the world's leading independent service provider in vehicle and drive development. The center also represents another chapter in the success story of FEV's presence in the business location of Saxony-Anhalt – a story that began in 2007 with a groundbreaking ceremony for a continuous testing center for conventional, electric and hybrid drives.

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A "run-of-the-river" hydroelectric power station, photovoltaic installation, and battery storage system have been combined to provide facilities in the Patagonia National Park with electricity from renewable energy sources. The park is part of one of the most important nature conservation projects in the world. It was established by the founder of North Face, Douglas Tompkins, and his wife Kristine, previously CEO of the outdoor clothing company Patagonia. The aim of their foundation, Tompkins Conservation, is to rewind the region after decades of heavy overgrazing and desertification.

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