



**Their batteries are fully charged** Sila founders Yushin, Berdichevsky and Jacobs (from left) work on the best battery

General Electric, and also a prominent US manager, has been a member of the Supervisory Board.

When Sila boss Berdichevsky was born 35 years ago in Murmansk, north of the Arctic Circle, it would not have been possible to predict this path. Today he tells us that it was “dark and cold” in Russia. He moved to the USA with his parents when he was nine years old, and later, while studying mechanical engineering there at the elite Stanford University, he built his first innovative vehicle together with fellow students. This solar-powered car covered the 3,200 kilometer distance from Chicago to Los Angeles at speeds of up to 100 kilometers per hour.

“My passion for batteries was awakened,” says Berdichevsky. In June 2004, he was one of the first ever employees to join electric car manufacturer Tesla. Once there, he worked intensively on battery cells, which were initially still supplied by Japanese group Sony. Although their capacity was constantly improving, the Sila boss says that “Progress became less and less rapid, and melted from four to two percent or less per year.” So, in summer 2008, he returned to university “to learn everything we currently know about battery chemistry”.

## Progress through powder

US start-up **Sila Nanotechnologies** wants to make batteries of electric cars more powerful, and BMW and Daimler are also enthusiastic about the technology as it promises incredible vehicle ranges.

TEXT BY MATTHIAS HOHENSEE

**G**ene Berdichevsky puts a blue rubber glove on his right hand, opens a steel cabinet and takes out a corked ampule. In it shimmers black powder that looks like crushed pencil lead. The Sila Nanotechnologies boss has big plans for this silicon composite, which is intended to increase the storage capacity of lithium-ion batteries by up to 40%. If it works, electric cars could drive more than 1,000 kilometers on one battery charge.

This would be an important step in helping drive technology finally achieve a breakthrough, but there are constant setbacks along the way. Audi has just had to recall almost all models of the E-Tron electric off-roader delivered to date, due to water penetration posing a risk of fire. Companies worldwide are working to develop new batteries (see page 76) or improve 30-year-old lithium-ion technology, for example through experimentation with the materials used in the electrodes. Sila Nanotechnologies uses more silicon instead of the usual graphite for the anode, and some German companies also

appear to consider this approach to be promising: BMW has been collaborating with the start-up for over a year now, and Siemens invested last summer. What’s more, a few weeks ago Daimler acquired around 10% of the company – located at the edge of Silicon Valley – for around €100 million. Since this financing round, raising €170 million in total, Jeffrey Immelt, formerly head of the conglomerate

### Russian power

After two years of intensive study, Berdichevsky then signed up with venture capitalist firm Sutter Hill Ventures, where his work involved traveling through North America reviewing energy projects. During this time, he got to know Gleb Yushin, a Professor at the Georgia Institute of Technology who, like him, had immigrated from Russia – and was also enthusiastic about battery technology. He has been researching a way to replace graphite with silicon for some years – the idea itself is not new, but there are still major obstacles to application. “One serious challenge is that silicon expands significantly, whereas expansion is only moderate with graphite,” says Martin Winter, a Professor at the University of Münster and a renowned expert in electrochemistry, adding that the expansion of silicon could destroy battery cells and that this can only be solved by making the material more flexible. Winter compares this to the difference between a window pane and a fiber-optic cable.

**“We can do 20% more and are optimistic that we can expand that to 40%.”**

**GENE BERDICHEVSKY**  
Head of Sila Nanotechnologies

He goes on to explain that, while the former would break during bending, the latter could even be used to make a knot.

Yushin believes he's solved the problem with his composite. In Berdichevsky, he has found a business partner who both shares his passion and knows the ways of Silicon Valley. He and Alex Jacobs, also an early Tesla employee, set up their own company in summer 2011, in the name of which they immortalize their roots. "Sila" in Russian means power;

the many failures and sleepless nights mean that the founders need plenty of that. And when they finally manage to control the expansion of silicon not only in the laboratory but also in practice, it initially stores less rather than more energy than graphite – a problem that has now also been overcome. "We can do 20% more and are optimistic that we can expand that to 40%," says Berdichevsky.

Equipped with protective goggles, he walks through a narrow production hall with pride. It is currently being expanded with new ovens that will melt the silicon composite together. "This is our high-tech kitchen, where we are constantly refining the recipe," says the Sila boss. Tiny batteries hang in a cabinet stuffed to the brim with cables, which are charged and discharged hundreds of times. Sila also wants to use these to impress beyond the automotive industry. The plan is that next year they will be put to use in smartwatches and wireless headphones, followed by smartphones.

A manufacturer of battery cells will then need around 20 grams of Sila silicone for these devices, while an electric car needs around 20 kilograms. However, it will be a few years before this launches to market, and even then the silicon used will be considerably more expensive than the graphite currently deployed. Yet, Berdichevsky adds that the greater energy density and a more compact battery would more than compensate for the additional costs, and that there is significant interest in his product. "We're talking to everyone," says the Sila boss – and immediately praises BMW and Daimler as "strong, strategic partners." He's certainly got a lot to offer them, because in future the most attractive car will be the one with the best battery. It's clear to him that this will be a battery that uses his miracle powder. ■

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