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Zentrum für Sonnenenergie- und Wasserstoff-Forschung Baden-Württemberg (ZSW)

Standort Ulm:
Helmholtzstr. 8, 89081 Ulm

Batteries for Electric Cars: Industrial Production in Germany Is Nearing

ZSW manufactures automotive lithium-ion cells with a new research platform under factory-like conditions

Manufacturers may soon be able to produce automotive lithium-ion batteries on an industrial scale in Germany. The Centre for Solar Energy and Hydrogen Research Baden-Württemberg (ZSW) recently made a major stride in this direction. With the benefit of a new research production line completed in December in Ulm, the institute was able to manufacture lithium-ion cells for plug-in hybrid cars, a first for Germany. The cells' capacity of 23 ampere-hours (Ah) matches that of Asia-made commercial cells, and offer considerable potential for improvement on top of that. Funded by federal and state governments, the research platform at ZSW is available to industrial companies and research partners, facilitating their efforts to develop advanced cell technologies.

"This is a great success for researchers, the industry and policymakers who want Germany to become the leading supplier in electric mobility," says Prof. Werner Tillmetz, a member of ZSW's board of directors and head of the Electrochemical Energy Technologies division. "It will be possible to manufacture competitive batteries for electric cars in our country."

The cells have a terminal voltage of 4.1 volts, weigh 650 grams, and comply with the PHEV-1 standard for plug-in hybrids. What's more, they will be optimized. "This is not the end of the road," says Tillmetz. "With improved processes, we will be able to significantly increase capacity, quality and yield in the months ahead."

The battery business is lucrative: According to the most recent report published by the National Electric Mobility Platform, up to 40 percent of a vehicle's value-added is attributable to its battery. Germany, the land of automotive engineering, aims to plant a footprint in this market and develop and manufacture the most competitive cells for electric cars.

ZSW and leading industry companies joined forces to this end, ramping up a research platform for manufacturing large lithium-ion cells for automobiles at the end of 2014 as planned. It encompasses the entire manufacturing process, from slurries production to cell formation. This platform serves to develop tomorrow's products without impairing manufacturers' ongoing production, and its success has brought cell and battery manufacturing a good deal closer in this country.

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ZSW and its partners have since launched the first project to optimize the manufacturing process for PHEV-1 cells using this equipment. BASF, BMW, Daimler, Elring Klinger, Manz, Robert Bosch, Rockwood Lithium, SGL Carbon and Siemens are all taking part.

A research plant geared towards commercial production

The research facilities at ZSW are open to all industrial enterprises such as manufacturers of battery materials, mechanical engineering firms and research institutions. Several hundred high-quality cells can be made per day in a reproducible way with this new equipment. The plant's modular layout enables companies and research organizations to assess new processes and system components all along the value chain in a robust testing environment. Manufacturers of battery materials can demonstrate new cell chemistries in standard cells, while machine engineering companies are able to optimize their manufacturing technologies in a networked system.

The Federal Ministry for Education and Research (BMBF) provided €25.7 million in funding for equipment. The state of Baden-Württemberg's Ministry of Finance and Economy (MFW) contributed €6 million in subsidies to build the extension necessary to house the hardware.

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A research platform for manufacturing lithium-ion cells under factory-like conditions in the Laboratory for Battery Technology (eLab), Ulm

- Automated powder materials weighing and loading
- Thermostat-driven mixing stations for preparing electrode slurries in 60 liter batches
- Two-storey machine for applying electrode coating to both sides in a 500 mm width track at a belt speed of 30 m/min. and equipped with various application systems
- Fully automated system for winding, installing and filling prismatic (PHEV-1) cells with a cycle time of 1 cell / min.
- 200 m² dry room with -60°C dew point for testing new assembly technologies
- 70 m² low-oxygen room for fully automated formation with 240 tempered cycle stations and 2.016 storage stations

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The Centre for Solar Energy and Hydrogen Research Baden-Württemberg (ZSW) is one of the leading institutes for applied research in the fields of photovoltaic energy, renewable fuels, battery technology, fuel cells and energy systems analysis. The three ZSW sites at Stuttgart, Ulm and Widderstall are currently staffed with around 230 scientists, engineers and technicians supported by 120 research and student assistants.

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ZSW scientist with PHEV1-Cell
Foto: ZSW/ Photodesign Buhl

ZSW high precision calender for compacting of electrodes
Foto: ZSW/M. Duckek

For copies of the images shown here, more topic-related pictures, and a factsheet on ZSW, contact Solar Consulting GmbH.