

# Crash-safe battery protection for electric cars

September 1 2011

---



The battery housing made of lightweight component materials weighs only 35 kilograms (77.16 lbs) - 25 percent less than traditional solutions made of steel. (© Fraunhofer ICT)

Everyone is talking about electric drives, and the scientists from Fraunhofer are also working on them. Engineers have replaced a battery box for lithium-ion batteries with a lightweight component. Not only does the housing save weight and sustain no damage in an accident – for the first time ever, it can also be mass-produced.

If an electric car wants to be environmentally friendly it must weigh as little as possible, because when the light turns green every additional pound/kilogram must be accelerated with considerable energy expenditure. And the lighter the electric vehicle, the longer it can be on the road without having to be plugged back into a power outlet. To advance the symbiosis between electromobility and lightweight

construction, engineers from the Fraunhofer Institute for Chemical Technology ICT in Pfinztal, Germany, are developing manufacturing concepts that have one goal – they want to gradually replace individual components in the vehicle with lightweight ones. “However, this cannot affect the stability or the safety of the passenger,” said Manfred Reif, project manager in the joint project ”Fraunhofer System Research for Electromobility.”

The fact that this is possible is proven by the researchers with the Artega GT, a sports car that was modified into a prototype with an electric drive, where the electric motor is located in the rear. The experts, along with colleagues from the Fraunhofer Institutes for Mechanics of Materials IWM, for Structural Durability and System Reliability LBF and for High-Speed Dynamics, Ernst-Mach Institut EMI, have developed a mass-production-ready, crash-safe battery housing that meets strict requirements. The battery housing that surrounds the battery that weighs 340 kilograms (749.57 lbs.) only weighs 35 kilograms (77.16 lbs.). “Traditional solutions made of steel weigh up to 25 percent more,” said Reif. “The battery housing can withstand a crash, assuming a ten-fold gravitational acceleration.” And even if a sharp object collides with the housing at 60 km/h (45mph), the highly sensitive battery on the inside remains intact. In addition, the 16 lithium-ion modules are protected from humidity, and a semi-permeable membrane to equalize pressure also guarantees that the batteries are able to “breathe.”

What make the new battery protection so special are the new fiber-reinforced composite materials. Currently, steel components are welded together to make these boxes. “However, it must be possible to mass-produce the lightweight components,” explained Reif. “Up to now, this has not been possible in this form.” Fiber composites have been used for a long time in the manufacturing of airplanes; however, only a few hundred are built every year. But as far as cars are concerned, this number could be several thousand daily, and mass production involves

completely different requirements as far as materials are concerned. For this reason, the scientists have developed a special process chain with cycle times that make the production of high unit counts possible. “The process chain is designed so that many steps can be run simultaneously,” said Reif. For example, the plastic is heated up parallel to the production step, and elements are prepared that ensure load and tensile strength or the attachment to the storage in the rear of the Artega. This includes, for example, directionally oriented fiberglass structures or custom-made metal inserts. All the individual components are then assembled and pressed together in a “one-shot process.”

The scientists will be presenting the housing at the 2011 Composites Europe Fair in Stuttgart (Hall 4, Booth D03). Currently, the [battery](#) box must still be secured with transverse attachments in the rear of the Artega; however, the experts working with Prof. Dr.-Ing. Frank Henning are already looking at a lightweight replacement for that.

Provided by Fraunhofer-Gesellschaft

Citation: Crash-safe battery protection for electric cars (2011, September 1) retrieved 27 April 2024 from <https://phys.org/news/2011-09-crash-safe-battery-electric-cars.html>

<p>This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.</p>
--