Media Release

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No electric car without plastic

BASF with materials and construction know-how in the BMW i3:

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- **New seat structure made of Ultramid® (PA)**
- **Multifunctional body reinforcement made of Ultradur® (PBT)**
- **Self-supporting rear seat shell made of Elastolit® (PU)**
- **Structural reinforcement for the roof frame made of Elastolit® D (PU)**

For several innovative components in the BMW i3, the electric vehicle from the BMW Group, the chemical company BASF supplies versatile plastics and supported part development with extensive construction know-how. These include the backrests of the front seats, key reinforcement parts in the carbon fiber body, and the rear seat shell.

“By bringing together all our plastics expertise in the division Performance Materials, we can offer customized solutions to innovative customers such as the BMW Group and their suppliers worldwide as well as support them during component construction”, says Raimar Jahn, Head of BASF’s Performance Materials division. “With the BMW i3, the BMW Group has taken a ground-breaking step into the future of the automotive industry, and BASF’s intelligent solutions are making a key contribution here.”

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Seat backrest made of polyamide

The seat backrest in the driver's and passenger seats is the first injection molded and uncoated structural component made from polyamide to have a visible surface and to be used in the vehicle interior. This lightweight hybrid component, weighing only 2 kg, embodies all the know-how of BASF's Global Seat Competence Team. The backrest, which integrates multiple functions, is made from a highly UV-stable polyamide 6 compound developed by BASF especially for such applications (Ultramid® B3ZG8 UV). As well as providing sufficient rigidity, this material also ensures adequate elongation and toughness to meet the mechanical requirements of the BMW Group, and this within a temperature range of -30°C to +80°C.

The seat backrest owes its final, complex and above all very slim shape to the early use of BASF's universal simulation tool Ultrasim®. Thanks to the precise numerical simulation of the materials used for the backrest, release lever and belt guide, the calculated behavior in the crash simulation matched the subsequent tests very accurately. Optimization could thus take place on the computer in the early stages, avoiding modifications later on in component development. The BASF simulation method Ultrasim® effectively accompanied all the certificates required by law at different seat positions, temperatures and loads.

Furthermore, the particular Ultramid® grade is especially low-emission. It is very high scratch resistance and remarkable surface quality allow a visible use of the seat structure, which thus becomes an important element. Regarding the seat release lever, its material must not fail in a crash. Therefore, a special long glass

fibre reinforced Ultramid® grade is employed in this application: Ultramid® Structure B3WG8 LF.

Multifunctional structural body parts made of PBT

The BMW i3's carbon body contains PBT (polybutylene terephthalate) structural parts between the inner and outer shell. The largest component and the first of its kind is a so-called integral component located in the rear side area between the carbon fiber body shells. Apart from its load-bearing function in the event of a crash, it also serves to keep the two body shells apart and forms the rear opening for the side window. The PBT Ultradur® B4040 G6 from BASF is ideal for this since it is dimensionally stable irrespective of surrounding climate conditions and offers the necessary buckling resistance. The simulation provided by BASF's engineers has made a major contribution here to low-warpage production and the glass fiber orientation suitable for the occurring loads. The injection-molded component comprises several smaller components planned in the past thus reducing complexity and costs. More than two dozen smaller Ultradur® components with a combined weight of around nine kilograms are integrated in other areas of the vehicle's body where they provide reinforcement and achieve the desired acoustics.

Rear seat shell made of carbon fibers and a PU matrix

The self-supporting rear seat shell is made from BASF's Elastolit® polyurethane system. For the first time in a serial production vehicle, carbon fibers are combined with a polyurethane matrix. The component integrates a variety of functions such as the cupholder attachment and storage tray, saving on both assembly work and weight. A key feature of BASF's Elastolit® is its wide process window together with its high fatigue strength and damage tolerance. Because of the material's special properties the crash-

relevant part meets the stringent safety requirements by the BMW Group despite its wall thickness of just 1.4 millimetres.

Structural foam for reinforcing the roof frame

The PU structural foam Elastolit® D is used as a reinforcing material in the whole roof frame, including the A-pillar. The highly pressure-resistant foam is manufactured to a carbon sandwich composite, thus supporting the structural rigidity of the vehicle.

Other components made of BASF plastics in the vehicle interior and exterior

The BMW i3 incorporates many other parts made of BASF plastics which have already been established in a number of vehicles:

- These include different electrical and electronic applications made of Ultramid®, Ultradur® or polyurethane; e.g. the fuse box made of Ultramid® B3ZG3, which meets the stringent demands on rigidity and tensile strength, as well as a high-voltage connector made of Ultramid® A3EG6; apart from that also cable sheathings and cable glands made of the polyurethanes Elastollan® and Elastoflex®.

- In the vehicle interior, the PU semi-rigid foam Elastoflex® E is utilized for back foaming the instrument panel, while the C-pillar cover is made of Ultramid® B3ZG3.

- Two different Elastoflex® E polyurethane foams are employed in the roof construction for improved interior acoustics: in the roof liner, forming the core material of a sandwich composite which has excellent thermoformability and high rigidity; an extremely low-density, open-cell

Elastoflex® E foam is used as the basis for acoustically effective parts.

- In the module production of the optional sliding roof, the UV- and weather-resistant glass encapsulation system Elastolit® R 8919 is applied. The frame of the sliding roof is made of Ultradur® B 4040 G6, a low-warpage PBT/PET-blend.

- Lightweight spring aids made of Cellasto®, the micro-cellular special elastomer, can be found in the front and back axle suspension of the BMW i3 as well.

Finally, BASF's Coatings operating division contributes to the extraordinary design of the BMW i3. It supplies the new production line for the BMW i3 at the Leipzig factory with basecoats in four colors which meet the requirements of the coating of add-on components and of the painting processes involved.

More information on the products:
www.plasticsportal.eu
www.polyurethanes.basf.de
www.basf-coatings.com

Note for editors:
A press photo can be found at www.basf.com/pressphoto-database, under the heading "Plastics" or by entering the search term "BMW i3". Text and photo will shortly be available in the BASF press archive for plastics: www.basf.de/plastics/pressreleases.

About BASF, South Africa
BASF has been doing business in South Africa over 45 years. Headquartered in Midrand, Johannesburg, the BASF Group in South Africa consists of eight companies with locations in Johannesburg, Port Elizabeth and Cape Town. Apart from a world-class automotive emission catalysts production site in Port Elizabeth BASF also recently invested in a dispersions production plant in Durban which is

producing acrylic dispersions since third quarter of 2012. The local groups' employee complement is around 1000 people.

Other local group portfolio includes chemicals, plastics, dispersions, agricultural products and nutrition. BASF products are used for industrial applications in various sectors e.g. paper, packaging, and leather, detergents, cosmetics, construction, mining, agriculture and automotive industries. For further local information visit the Website: **www.basf.co.za**.

About BASF Globally

BASF is the world's leading chemical company: The Chemical Company. Its portfolio ranges from chemicals, plastics, performance products and crop protection products to oil and gas. We combine economic success with environmental protection and social responsibility. Through science and innovation, we enable our customers in nearly every industry to meet the current and future needs of society. Our products and solutions contribute to conserving resources, ensuring nutrition and improving quality of life. We have summed up this contribution in our corporate purpose: We create chemistry for a sustainable future. BASF had sales of about €74 billion in 2013 and over 112,000 employees as of the end of the year. BASF shares are traded on the stock exchanges in Frankfurt (BAS), London (BFA) and Zurich (AN). Further information on BASF is available on the Internet at www.basf.com.