

Addressing today's challenges

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With 2013 sales of EUR 11.2 billion, Bayer MaterialScience is among the world's largest polymer companies. Business activities are focused on the manufacture of high-tech polymer materials and the development of innovative solutions for products used in many areas of daily life. Transportation is one industry that benefits from Bayer MaterialScience's expertise in material engineering. The company has developed valuable plastics for use in mass transportation, for example. Stefan Mechnig, spokesperson for Bayer MaterialScience, says that they strive for solutions that address the big challenges of our times such as climate change, increasing resource scarcity, urbanisation and growing mobility. "Our materials help cope with these developments."

Bayer MaterialScience was established as a legally independent subgroup in 2004 following a comprehensive restructuring of parent company Bayer AG. The company's roots, however, date back to the early part of the 20th century. A notable milestone in its history was the discovery of polyurethane foam by the chemist Otto Bayer, in 1937. Polyurethane foam is now a common material and incorporated in a variety of products we use every day, from car seats to mattresses through to insulation material. Bayer is also credited with the invention of high-

performance plastic polycarbonate, in 1953. This material, too, is now used in a variety of industries such as automotive, construction and consumer electronics.

Most recently, Bayer MaterialScience and partners developed a new technology to make use of carbon dioxide. It can partly replace crude oil, the traditional raw material base for the chemical industry. The technology was developed jointly by experts at the CAT Catalytic Center of the RWTH Aachen University, Bayer Technology Services and Bayer MaterialScience. Following a

successful test phase, in 2013, Bayer is aiming to commercialise the use of the greenhouse gas carbon dioxide as a new raw material for plastics. The company has started the planning process for the construction of a production facility at its site in Dormagen, Germany, where CO₂ will be used to produce a precursor for high-quality foam. The objective is to initially make larger quantities of this precursor available to selected processors from 2015. The use of carbon dioxide benefits the environment. CO₂ replaces a portion of the fossil raw materials, such as petroleum, that would otherwise be used exclusively. At the same time, parent company Bayer expects the new process to provide economic advantages over the conventional production method.



Airborne adventure: the solar plane is scheduled to fly around the world without fuel. Bayer MaterialScience supports the "Solar Impulse" project with new material composites, helping to make the plane lighter and more stable.



State-of-the-art household refrigeration appliances demonstrate the potential that rigid polyurethane foams from Bayer MaterialScience offer when it comes to cutting CO₂ emissions.



Turning sunlight into electric power: solar panels with frames made of Bayer's polycarbonate Makrolon® plastic, convert the sun's rays directly into electric power.

Bayer MaterialScience by itself invests a good EUR 300 million year for year in research and development. Roughly 1,100 of the 14,300 total employees worldwide work in innovation centres, from Leverkusen to Shanghai and Pittsburgh. As many as 218 patent applications were filed in 2013 alone. Investment is also ongoing at Bayer MaterialScience's plants, all over the world. The focus in that regard is currently on China, with EUR 1 billion being invested there alone in additional production capacities. In addition, its tight global network of competence, technology and innovation centres is steadily being expanded.

This continued commitment to, and continued investment in innovation has contributed to a global leadership position for Bayer MaterialScience in a number of market segments. The company is the global market leader in polyurethanes for rigid and flexible foams as well as for solid materials, with applications ranging from mattresses and ski boots to insulating materials for refrigeration appliances and buildings. Bayer MaterialScience also enjoys global leadership in the development and production of polycarbonates with lightweight, tough and freely formable high-performance plastics. Last but not least, Bayer MaterialScience is among the world's leading suppliers of raw materials for coatings, adhesives and

sealants. These products protect and enhance the appearance of cars and furniture, for example, and are also used in the sports and leisure sector. In addition, Bayer MaterialScience supplies the chemical industry with numerous basic chemicals.

Mr. Mechnig emphasises that Bayer MaterialScience innovates not for innovation's sake, but to make a real difference and add value. For the automotive sector, for example, the company offers especially lightweight materials. This helps make vehicles more eco-friendly: the lighter a car, the lower is its fuel consumption. "One of our latest polyurethane systems for car components is even lighter than water. Our polycarbonates also contribute to making consumer electronic devices such as notebooks not only extremely light, but also safe and good looking. And our innovations in polyurethanes allow for better insulation of cooling devices. Most recently, our researchers developed a material with ten percent less thermal

conductivity – a contribution to safe electricity. Another example of our innovative strength I would like to mention is special glue used in glass fibre textile for houses. It can delay collapses when an earthquake occurs."

Bayer MaterialScience additionally strives to make a positive contribution to the advancement of mass transportation, with materials that reduce energy consumption while also being environmentally friendly and safe. Notable in that regard is that Bayer and China South Railway (CSR) Nanjing Puzhen joined forces earlier this year to create new interior designs for CSR's low-floor trams. The Chinese industry development zone Suzhou New District will be the first implementation site for the new designs. Bayer will supply the interior equipment for all low-floor trams of the new metro line number 1. This project was the first to be approved by the China National Development and Reform Commission through official tender. To achieve their goal of having



Production facilities in Leverkusen, Germany, where Bayer MaterialScience is headquartered

lightweight parts with greater energy efficiency, the railway manufacturer chose Bayer's Bayblend® and Makrolon® polycarbonate sheets for its train components. In particular, CSR Nanjing Puzheng was seeking a material offering leading-edge interior designs while at the same time maximising passenger safety through its flame retardance. Bayer's polycarbonate sheets offer all of these characteristics, and are also available in appealing designs, colours, and surface structures. The sheets are used for the interior wall panelling of the trams.

Bayer thermoplastic sheets are produced through processes that minimise emissions and environmental impact. This is thanks to the application of modern extrusion technologies that allow processes to create high-quality, lightweight, and yet still durable interior rail components in an environmentally conscious manner. The properties of Bayer's thermoplastic sheets provide excellent dimensional stability over a wide range of temperatures. At the same time, their production cycle times are shortened with new processes, allowing for

greater production volume of thermoformed components. Bayer thermoplastic sheets utilised by the rail industry have satisfied all flame and smoke safety requirements, making them an ideal choice for industrial applications.

"The mass transportation market is of great interest to our company and we have committed significant resources to improving mass transportation applications," emphasises Mr. Mechnig. "We have gained significant global experience regarding specific market support requirements involving an increasing number of mass transportation customers around the world. This global experience puts us in a position to provide tailored solutions for specific mass transit applications based on the needs of given countries." He continues: "Being a producer of high-performance materials for key industries we are not only active in a highly competitive environment but also particularly dependent on global macroeconomic developments. In addition, our business is very asset intensive. Given this, we do everything to make our production as efficient as possible in order to reduce our cost base. On the other hand we rely on constant innovation. Creating new and sustainable products that really help people, contribute to safeguarding our planet's limited resources and create value – this is our formula for success."



The BayArena, home of the German soccer team Bayer 04 Leverkusen. A polycarbonate roof is noted for its high break resistance, impact strength, temperature resistance and light weight.



In automobiles, plastics are replacing steel and other metals. This helps make cars as much as 30 percent lighter.



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