

News Release

P312/18e
September 19, 2018

BASF has developed the world's first particle foam based on polyethersulfone

- **Prototypes with unique combination of properties: lightweight, stiff and strong, highly temperature resistant, intrinsically flame retardant**
- **Suitable for complex-shaped components in cars, airplanes and trains**

After two years of intensive research, BASF is now able to present prototypes of the world's first particle foam based on polyethersulfone (PESU). The foam is characterized by its unique combination of properties: high-temperature resistance, inherent flame retardancy - and its extreme light weight coupled with great stiffness and strength. It is therefore particularly well suited for complex-shaped components in cars, airplanes and trains, which require excellent mechanical properties together with the ability to withstand high operating temperatures or to meet stringent flame-retardant requirements. The expandable PESU granulate is pre-foamed into beads with low densities between 40 and 120 g/L and can be processed into molded parts with complex 3D geometries using technologies available on the market.

Ultrason® E, the PESU of BASF, is an amorphous thermoplastic with an extraordinary temperature profile: It has a high glass transition temperature of 225°C and remains dimensionally stable up to this temperature. Its excellent mechanical and dielectric properties are only slightly dependent on the temperature, too. Foams made of Ultrason® E are approved for use in aircraft. The material, with its exceptionally high limiting oxygen index of 38 (according to ASTM D 2863),

distinguishes itself because it meets the requirements for commercial aircraft with regard to combustibility, low heat release and low smoke density (“fire, smoke, toxicity”) even without the addition of flame retardants, which means it is intrinsically flame retardant.

Particle foam for new lightweight components

Despite its low density the PESU particle foam thus enables extremely stiff and strong components with excellent dimensional stability at high temperatures. Expanded molded parts made from one single material offer numerous advantages compared to traditional honeycomb structures coated with phenolic resins: They offer considerable flexibility in terms of densities and shapes and therefore greater freedom in design. There are fewer processing steps and therefore lower system costs. Additional functional parts such as inserts and screw threads can be integrated in the complex geometries. And, last but not least, recycling of the parts can easily be carried out as the polymer is of one single origin. Thanks to such weight-optimized, thermoplastic foams for complex geometries it is possible to realize new lightweight components which, compared to traditional thermoplastic parts, have better properties and are an answer to trends such as e-mobility in automotive construction, the modernization of aircraft cabin interiors and increasing flame retardant requirements in public transport.

Ultrason® is the trade name for BASF’s product range of polyethersulfone (Ultrason® E), polysulfone (Ultrason® S) and polyphenylsulfone (Ultrason® P). The high-performance material is used to manufacture lightweight components in the electronics, automotive and aerospace industries, but also in water-filtration membranes and in parts that come into contact with hot water and food. Because of their extraordinary property profile the Ultrason® brands can substitute thermosets, metals and ceramics.

BASF: Extensive expertise in foams

BASF has an outstanding expertise in foams that are successfully used in numerous industries. In 1951, the company patented the first particle foam ever: the classic white foam made from expandable polystyrene (EPS) - Styropor®. Since then, it has set the standard for insulation and packaging applications and was further developed into the high-performance Neopor® for insulation materials in 1997. BASF was also a pioneer in block foam: Since 1964, BASF has produced the

insulation material Styrodur®, the expanded polystyrene (XPS) for use in construction. Since then, the company has brought other high-performance foams onto the market: Basotect®, a flexible, open-cell foam made from the thermoset melamine resin for acoustic, transportation and cleaning applications, as well as Neopolen®, a polypropylene foam (EPP) with high energy absorption and good resilience. The latest innovations are Infinergy®, the world's first expanded thermoplastic polyurethane (E-TPU), which has been causing a sensation in the sports shoes industry, and ecovio® EA, a certified compostable, expandable particle foam with a high biobased ratio for transport packaging, which contributes to circular economy.

Further Information: www.ultrason.basf.com/particlefoam

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About BASF

At BASF, we create chemistry for a sustainable future. We combine economic success with environmental protection and social responsibility. The more than 115,000 employees in the BASF Group work on contributing to the success of our customers in nearly all sectors and almost every country in the world. Our portfolio is organized into five segments: Chemicals, Performance Products, Functional Materials & Solutions, Agricultural Solutions and Oil & Gas. BASF generated sales of €64.5 billion in 2017. BASF shares are traded on the stock exchanges in Frankfurt (BAS), London (BFA) and Zurich (BAS). Further information at www.basf.com.