

### **Adiprene prepolymers from LANXESS offer new possibilities in 3D printing**

- **3D desktop printing in uncontrolled home, office and retail environments**
- **Lower hazard classifications**
- **Easier processing, tailored gel profiles, and increased productivity**

**Cologne** – Specialty chemicals company LANXESS is offering the next generation of Low Free (LF) isocyanate urethane prepolymers that can be formulated into resins for 3D printing (additive manufacturing). In order to create such resins LANXESS works together with 3D printing companies. Based on Adiprene LF pPDI (para-phenylene diisocyanate) prepolymers, these high performance resins are easy to process and safe for industrial manufacturers as well as for the casual home, office or retail user.

#### **High performance resins for the footwear industry**

The footwear industry is a key user of 3D printing technology for midsole, upper, and structural components such as heels and toes. Footwear components are designed to require both very soft and more rigid elastomers. The wide flexibility to formulate LF prepolymers into printable resins enables 3D printers to drive toward mass customization, enabling printing across a wide range of hardness from very soft elastomers for cushioning to the more structural shoe elements.

High flexural strength and a wide range of use-temperatures are important to the performance of these components. Adiprene LF pPDI prepolymers are designed to provide superior resistance to low and high temperatures, excellent toughness, and superior resistance to chemicals and abrasion. With excellent property retention up to 6 weeks at 150 °C, athletic shoes, for example, can be stored in a hot

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Page 1 of 5

car for long time periods without losses. In addition, footwear components benefit from higher flexural fatigue resistance and cold temperature flex performance down to - 20 °C.

LANXESS offers urethane prepolymers for 3D printing with other chemistries, including LF MDI and LF HDI. These elastomers provide unique performance, such as optical clarity, UV and hydrolytic stability for outdoor uses, and the elimination of surface imperfections.

### **Easy processing and higher productivity**

Casual users in desktop 3D printing want simple, easy to use resins that increase their manufacturing productivity. This means resins must be liquid at room temperature, or have a low melting point (< 40 °C), and they must have very low viscosity (< 3000 cP). One-component (1K) resins can be plugged directly into the machine without the need for blending or mixing.

High performance LF pPDI prepolymers can be designed with lower viscosity for easier processing and higher productivity. LF technology enables the chemist to control the reactivity of the ink, enabling the 3D printer the flexibility to custom design the PU systems (1K, 2K or 3K). The gel time can be tailored to increase productivity by enabling users to keep resins stable for days without curing, while allowing cure to happen within seconds of application.

Adiprene LF pPDI prepolymers can be cured at room temperature, or formulated into dual curing systems that use both UV and heat. Printable resins made with LF prepolymers are more stable, providing a better surface finish, and can be designed to require minimal post curing, which further improves productivity.

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Page 2 of 5

### **Superior user safety**

Companies are looking for the safest materials for their customers who are not familiar with handling chemicals, especially in uncontrolled home, office, and retail environments. LF technology enables 3D desktop printing where low hazard classifications are critical. Adiprene LF pPDI prepolymers contain less than 0.1% residual isocyanate, reducing the hazard classifications and protecting users from potential exposure.

### **LF technology offers significant advantages**

LANXESS Urethane Systems is leading in the development of low free (LF) isocyanate urethane prepolymers, which have free isocyanate levels < 0.1%. LF technology creates polymer morphology that can be precisely controlled, resulting in highly structured phase separation between the crystalline hard and amorphous soft segments. This tailored chemical structure provides better physical properties, easier processing and reduces the hazard classifications for formulated urethane systems.

LANXESS is the only manufacturer to offer Low Free (LF) isocyanate prepolymer systems based on pPDI, with global production capacity, and fast, customized development of new products for specific customer needs.

LANXESS is a leading specialty chemicals company with sales of EUR 7.2 billion in 2018. The company currently has about 15,400 employees in 33 countries and is represented at 60 production sites worldwide. The core business of LANXESS is the development, manufacturing and marketing of chemical intermediates, additives, specialty chemicals and plastics. LANXESS is listed in the leading sustainability indices Dow Jones Sustainability Index (DJSI World and Europe) and FTSE4Good.

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Page 3 of 5

### **Forward-Looking Statements**

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You can find further information concerning LANXESS chemistry in our WebMagazine at <http://webmagazine.lanxess.com>.

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Page 4 of 5

### Image



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Page 5 of 5

The footwear industry is a key user of 3D printing technology for midsole, upper, and structural components. The wide flexibility to formulate LF prepolymers into printable resins enables 3D printers to drive toward mass customization. Photo: LANXESS AG