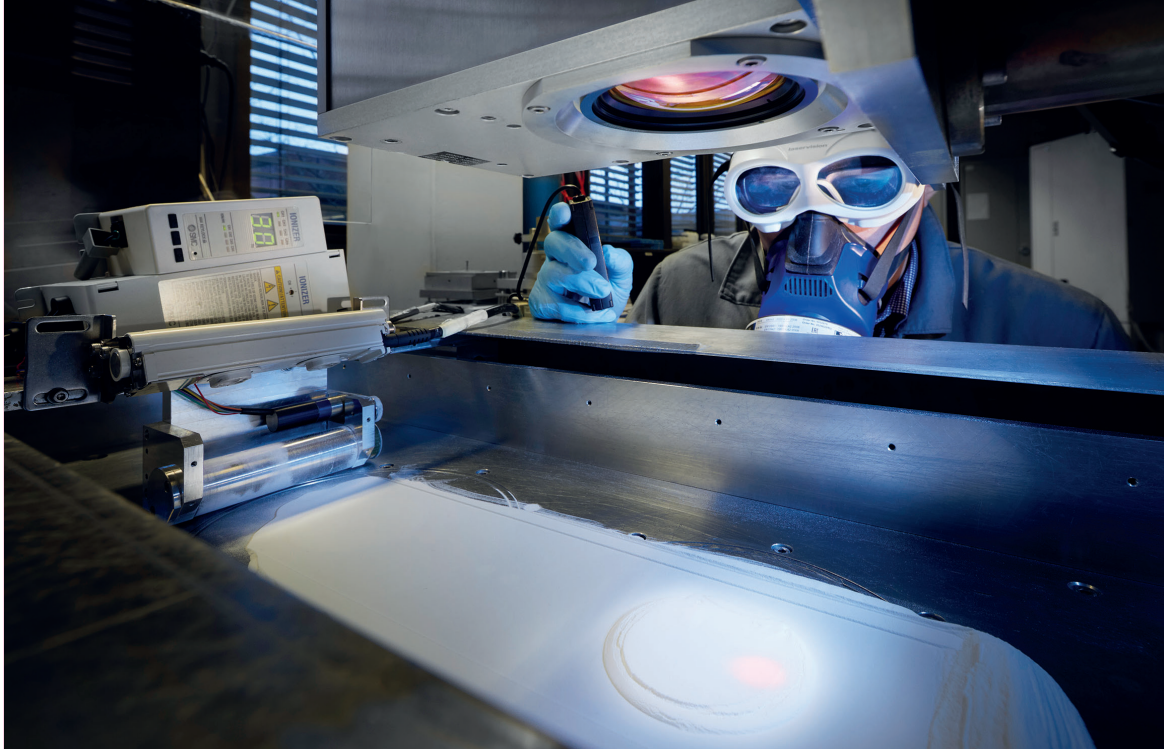

SLS laboratory system for processing novel materials.

Functionalization of novel polymer materials for SLS

While selective laser sintering (SLS) was initially used only for prototyping, it is increasingly being employed as a manufacturing process for series components. One disadvantage of SLS compared to injection molding, however, is that the choice of materials is currently limited. Among those are thermoplastic polyurethanes (TPU), which form one of the most important families of elastomers. They are suitable for various applications such as individual footwear or high-quality automotive components since they have such versatile mechanical properties (in particular large elongation at break > 700 percent). In the SLS Elasto research project, Fraunhofer ILT is advancing the process capability of novel TPU materials with small Shore A hardnesses of 50 to 60 so that parts with injection-molding properties can be printed with SLS.

Qualification of the TPU base material

The TPU base material researched in preliminary work is not yet suitable for industrial use in additive manufacturing. It will first be functionalized with trickling aids, additives and absorbers, and Fraunhofer ILT will investigate how the material properties influence processability. For a new powder material to be widely used, it must be qualified for the SLS machines established on the market. Therefore, an SLS process control specifically adapted to the material will be developed. Subsequently, the project partners will investigate various post-processing methods in order to improve the surface roughness. In parallel with the material qualification, a partner company is developing design guidelines for components with integrated functions made of extra-soft TPU.

Promising results

Initial material analyses and manufacturing trials show promising results. Particularly soft TPU materials can be used in medical technology, e.g. for individualized insoles and prostheses. Other fields of application include mechanical and plant engineering (e.g. gripper systems) as well as the production of prototypes, small series products and spare parts for various branches of industry.

The SLS Elasto R&D project underlying this report is being carried out on behalf of the German Federal Ministry of Education and Research (BMBF) under the grant number 03XP0466D.

Author: Daniel Flachsenberg M. Sc., daniel.flachsenberg@ilt.fraunhofer.de

Kontakt

Prof. Sebastian Bremen
Group Manager AM Polymers
Phone +49 241 8906-537
sebastian.bremen@ilt.fraunhofer.de