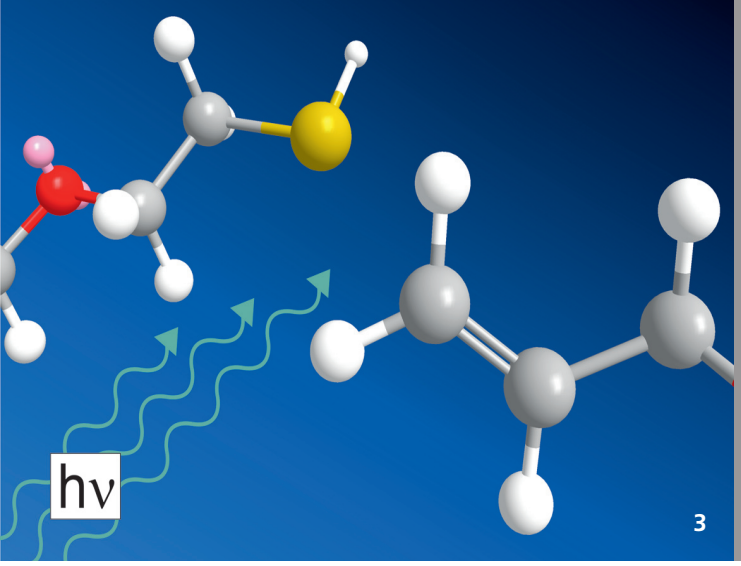

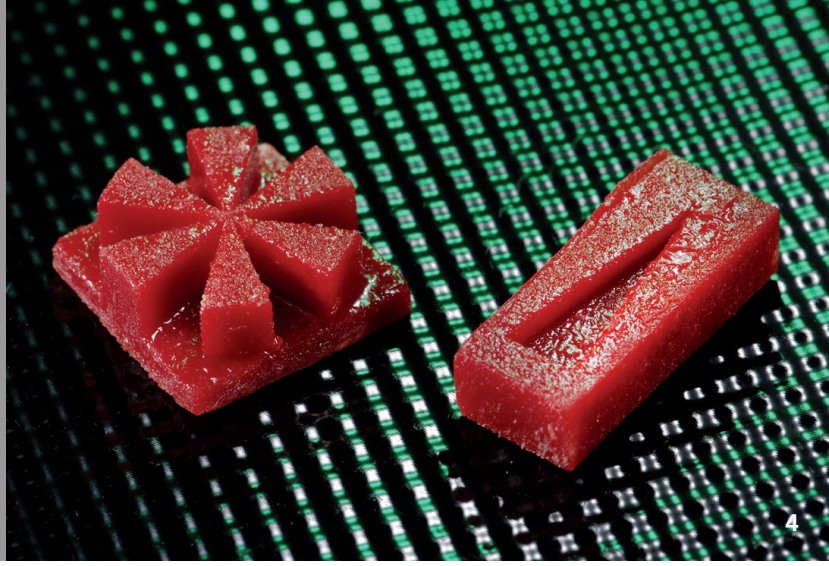

ADVANCED PHOTO-POLYMERS FOR 3D PRINTING

Task

The technology of 3D printing is conquering the world and awakens the interest of many users in the most varying of applications. These reach from building prototypes, producing polymer parts in small lot sizes all the way to personalized manufacture of implants in medical engineering. New applications require new, adapted materials. Biocompatibility, process speed, dimensional accuracy and adjustable product properties, such as high fracture strength and adjustable elasticity, are some of the requirements made during development of new light-curing polymer systems. The correlation between the materials and the 3D printing processes, such as stereolithography, projection-based printing processes and multi-photon polymerization, all present special challenges.

Method

Thiol-ene reactions have high efficiency in its reaction sequence and can be controlled via local initiation through light exposition both temporally and spatially. In combination with the high precision of 3D printing processes, this reaction type is a very promising approach for innovative photocurable resins. The selection of materials covers biocompatible, synthetic, natural or hybrid materials or composites with adjustable mechanical properties. In addition to the classic UV curing resins, such as acrylates or epoxides, the thiol-ene click reaction opens up a new class of photopolymers for 3D printing.

Result

Within the scope of the research activities in Life Sciences, biocompatible material systems could be developed on the basis of thiol-ene chemistry, which were processed into high resolution 3D objects though stereolithographic processes. By the printing of standard geometries, the high spatial and depth resolution of the material systems used and their suitability could be proven for highly precise components from stereolithographic printers (Figure 4).

Applications

In addition to biological and medical applications as well as those in the dental sector, the material systems based on thiol-ene are open to technical fields. The quick and controllable curing of the polymer systems enables an application-based composition of the photo resins. Next to formulating the photo-activated resins, Fraunhofer ILT is developing corresponding plants such that customers can be provided with optimized solutions from process and material.

Contact

Dipl.-Chem. Holger Leonards
Telephone +49 241 8906-601
holger.leonards@ilt.fraunhofer.de

Dr. Martin Wehner
Telephone +49 241 8906-202
martin.wehner@ilt.fraunhofer.de

3 Photochemical thiol-ene reaction.

4 3D structures from thiol-ene photopolymers.