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FRAUNHOFER INSTITUTE FOR APPLIED POLYMER RESEARCH IAP

Universally processable materials for 3D printing

Build-up material
Elastic polymers as scaffold material in bio engineering

Support material
Water soluble and non toxic

Biocompatible and celladhesive materials for soft and hard tissues

PHOTOCURABLE MATERIALS FOR 3D PRINTING

3D printing method such as

- 3D-inkjet printing
- stereolithography
- multiphoton polymerization

are high-capacity, modern generative methods being able to build up most complex 3D prototypes in all kind of areas. Even in medical application nowadays 3D printing gets more and more important to personalize the medical implants to the individual needs of the patients. New materials for rapid prototyping processes are needed that fulfil the variety of requirements on the processing side on the one hand and the multifold demands on a medical implant device as well.

We offer you photocurable materials adapted to your printing machine. Materials are specified on nondegradable, biocompatible and medical characteristics.

We adapt the prepolymer materials to the needs of the chosen rapid prototyping process regarding:

- viscosity
- wavelength of light source
- surface tension
- curing speed

Cured polymers are tunable concerning:

- mechanical elasticity
- tensile strength (1–1000 MPa)
- swelling grade
- surface functionality
- tear resistance

1 Stereolithography processed blood vein from new photopolymeric materials. Inner diameter <2 mm. (photo: Fraunhofer ILT)

2 Epithelial cells growth on new polymeric materials.

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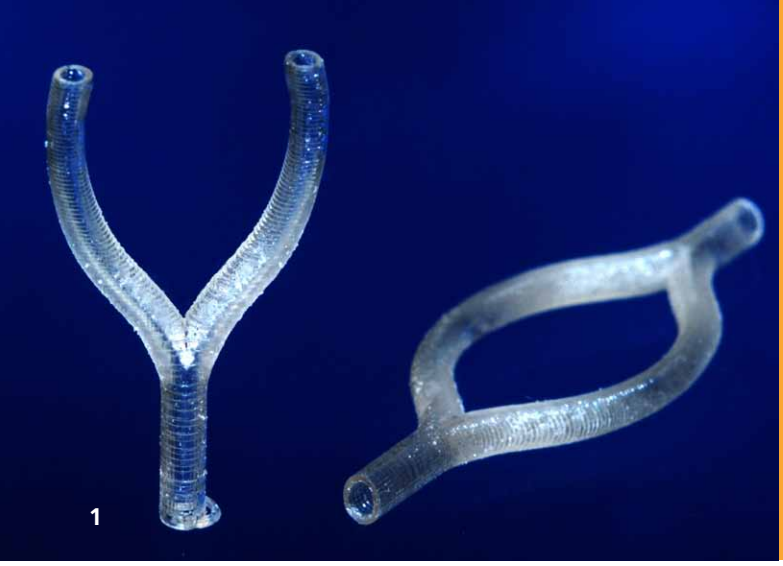
pioneers in polymers



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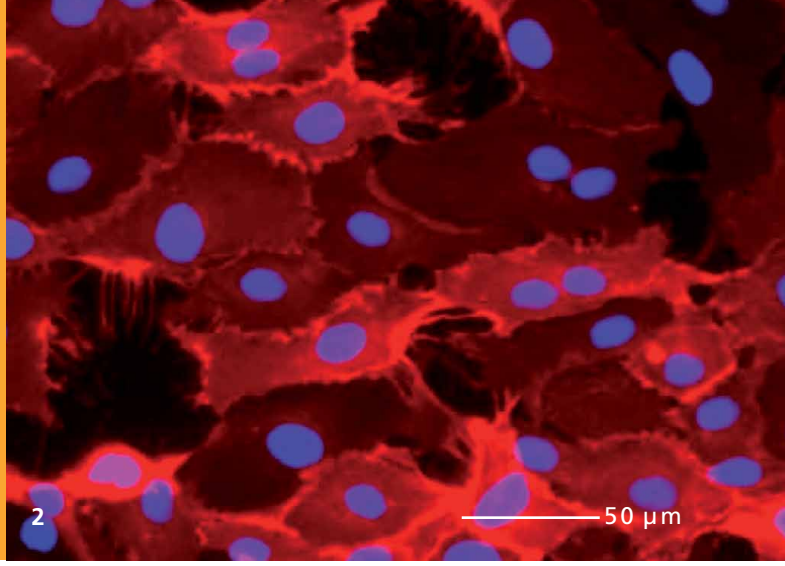

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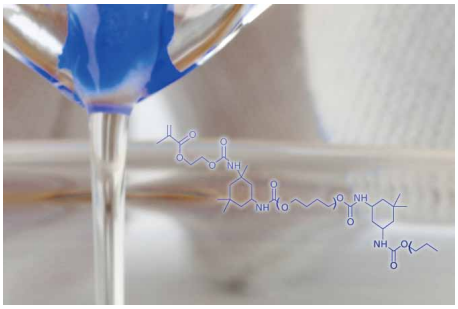
Adapted Prepolymer Synthesis

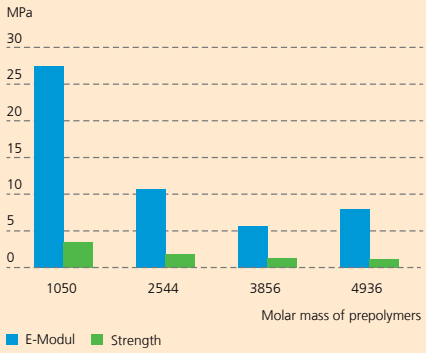
Linear macromolecules or oligomers are functionalized in an one step synthesis procedure with photoreactive endgroups. The spacer molecule is chosen of the wanted abilities of the cured polymers attributes as:

- elasticity
- elongation strength
- wettability
- surface attributes



Polymer Attributes

The dependency of the molar mass of the deployed prepolymer and the resulting photo-cured polymers E-module enables to tune polymers from elastic (~ 100 MPa) to very elastic materials (‹ 1 MPa).



Elasticity of soft photopolymers for medical use.

Surface functionality

The polymers surface may be functionalized with chemical groups such as –OH, -CO_2H, NH_2, catechol etc. to adapt the surface with tunable wetting abilities, contact angles or to enable post curing coating (e.g. with biomolecules).

Structuring with SL

Smallest structuring via stereolithography (SL) or multiphoton polymerisation (MPP) allows 3D prototype processing with complex structures down to mm and µm dimension. [2]

Biocompatibility

Postcured materials are biocompatible and even cell adherent to endothelia cells. [4]

Services

- synthesis of photoactive resins
- synthesis and selection of photoinitiators
- formulation of printable inks
- process-related adjustment of the photoactive materials
- chemical and physical analysis of prepolymers and polymers