

### New photopolymers with excellent mechanical properties

A new group of photocatalysts allows the curing of odourless monomers achieving excellent mechanical properties, such as high toughness and adjustable glass transition temperature in combination with good storage stability. The new substances are beneficial for wide range of applications in photopolymerization of coatings, composites and 3D printing.

#### REFERENCE:

M012/23

#### APPLICATIONS:

- Coatings
- Composites
- 3D Printing

#### DEVELOPMENT STATUS:

TRL 5

#### KEYWORDS:

Step Growth  
Photopolymerization,  
Tough Photopolymers

#### IPR:

Patent application filed

#### OPTIONS:

R&D co-operation  
License agreement

#### INVENTORS:

Klaus Ableidinger  
Robert Liska  
Jürgen Stampfl

#### CONTACT:

##### Karin Hofmann

TU Wien  
Research and Transfer  
Support  
T: +43.1.58801.415241  
[karin.hofmann@tuwien.ac.at](mailto:karin.hofmann@tuwien.ac.at)  
[www.rt.tuwien.ac.at](http://www.rt.tuwien.ac.at)

#### BACKGROUND

Photopolymerization is a technique to cure liquid polymerizable formulations within the fraction of a second to give decorative and protective coatings. Nowadays also more advanced applications have been included such as photoresists or bulk polymers such as dental fillings or light-based 3D printing.

Typically (meth)acrylate-based monomers are used in that field. Disadvantage is the uncontrolled radical polymerization leading to inhomogeneous polymer networks that are rather brittle and suffer from low toughness.

Alternatively, thiol-ene polymerization is used in industrial application since many years. These more homogenous step-growth polymer networks lead to significantly tougher, thermoplast-like, materials. Unfortunately, there are also several drawbacks associated with this technique. Especially with acrylates there are significant issues with the storage stability of these formulations. Furthermore, the bad odor of thiols also limits the range of possible applications. Finally, there are only very few compounds on the market

#### TECHNOLOGY

The new photocatalyst system can be used to substitute the well known thiol-ene system with the so called oxa-ene reaction where thiols are exchanged to multifunctional alcohols. A big advantage of this system is the wide and cheap availability of such building blocks, which are frequently also received from bio-resources.

Similar to thiols, homogenous step- growth polymer networks with excellent toughness are formed. Contrary to thiols, there are no issues regarding storage stability and bad odor.

#### ADVANTAGES

- Good availability of components
- Excellent toughness due to step growth mechanism
- Good storage stability
- Odorless formulations
- Broad range of applications

