VANILLIN ACRYLATE-BASED POLYMERS FOR OPTICAL 3D PRINTING

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3D printing, also known as additive manufacturing, is a growing technology which has drawn an increasing attention globally and makes a revolutionary impact on products fabrication in areas like medicine, food industry, textile, architecture, and construction [1]. In stereolithography, one of 3D printing technology, resin can be cured by UV light to create 2D patterned layers. By repeating this procedure 3D structure can be created layer by layer [2]. In the last years vanillin and its derivatives are starting to be used in polymer synthesis as their aromatic resin provides high rigidity and thermal stability of resulting polymers [3].

In this study, cross-linked polymers were obtained by photopolymerization of vanillin diacrylate and vanillin dimethacrylate with 1 or 0.5 mol.% of 1.3-benzenedithiol, using phenylbis(2,4,6-trimethylbenzoyl)phosphine oxide (BAPO) as photoinitiator. Photorheometry was used to monitor the evolution of photocross-linking process. The UV/Vis real-time photorheometry curing tests were performed on a MCR302 rheometer from Anton Paar equipped with the plate/plate measuring system.

All components of the resins have a significant influence on photocuring kinetics. The addition of solvent into the resin slowed down photocuring process and less rigid polymers were obtained. The addition of thiol increased the photocuring rate but reduced the rigidity of resulting polymers. Dual curing, combining free-radical and thiol-Michael mechanisms, resulted in slightly slower photocuring process than thiol-Michael photopolymerization, but more rigid polymers were formed.

Acknowledgement. This research was funded by the Research Council of Lithuania (project no. S-MIP-20-17), the EU ERDF, through the INTERREG BSR Programme, (ECOLABNET project #R077), and the European Social Fund under the measure no. 09.3.3-LMT-K712 “Development of Competences of Scientists, other Researchers and Students through Practical Research Activities”.

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