

EFFICIENT PHOTOINITIATING SYSTEMS BASED ON STILBENE DERIVATIVES AS PHOTSENSITIZERS OF IODONIUM SALT FOR VARIOUS PHOTOPOLYMERIZATION REACTION

Krok Dominika^a, Wiktor Tomal^a, Ortyl Joanna^{a,b}

^aCracow University of Technology, Faculty of Chemical Engineering and Technology,
Laboratory of Photochemistry and Optical Spectroscopy, Warszawska 24,
31-155 Cracow, Poland

^b Photo HiTech Ltd., Bobrzyńskiego 14, 30-348 Cracow, Poland

Photopolymerization processes are recently playing a significant role in many applications, including the composite industry, the solvent-free paint and varnish industry, 3D printing technologies, and others. The crucial role in light-initiated polymerization processes is played by the initiating system, which influences, among others, the speed of polymerization and the degree of monomer conversion.

In this study, new meta- and para-cyano-derivatives of 1,4-di(styryl)benzene and 1,3-di(styryl)benzene were synthesized and investigated for their use as photosensitizers of iodonium salt for various photopolymerization processes. Detail spectroscopic characteristics of this compound were performed, and the mechanism of initiation in the binary photoinitiating system and iodonium salt was investigated. Using real-time FT-IR, the usefulness of the proposed derivatives of di(styryl)benzene as highly efficient photosensitizers for various photopolymerization processes was tested. Besides, the formation of interpenetrating polymer networks with the use of proposed two-component initiating systems was performed. Finally, the developed initiating systems were used in vat polymerization 3D printing to manufacture high-resolution 3D printouts.

Acknowledgments:

This work was supported by the Foundation for Polish Science (Warsaw, Poland) - Project TEAM TECH (Contract No. POIR.04.04.00-00-204B/16-00 - TEAM TECH/2016-2/15 – “Molecular design, synthesis and application of photoinitiator-catalysts (PICs) for photopolymerization reactions”).

[1] E. Andrzejewska. Photopolymerization kinetics of multifunctional monomers, Progress in Polymer Science, 2001

[2] E. Hola, J. Ortyl, M. Jankowska, M. Pilch, M. Galek, F. Morlet-Savary, B. Graff, C. Dietlin and J. Lalevée. New bimolecular photoinitiating systems based on terphenyl derivatives as highly efficient photosensitizers for 3D printing application, Polym. Chem., 2020