TWO COMPONET INITIATION SYSTEM FOR THE MANUFACTURING OF PHOTOCURABLE (MWCNTS) COMPOSITES

Wiktoria Tomal[a], Anna Chachaj-Brekiesz[b], Joanna Ortyl[a,c]

[a]Cracow University of Technology, Faculty of Chemical Engineering and Technology, Warszawska 24, 31 155 Cracow, Poland
[b]Photo HiTech Ltd., Bobrzyńskiego 14, 30-348 Cracow, Poland
[c]Jagiellonian University, Faculty of Chemistry, Gronostajowa 2, 30-387 Cracow, Poland

A series of 2-(diethylamino)-4-(1-ethylpropyl)-6-phenyl-benzene-1,3-dicarbonitrile derivatives were investigated as photosensitizers of iodonium salt in various photopolymerization processes in UV-A and visible light conditions. A full spectroscopic analysis of biphenyl derivatives was performed. In addition to excellent spectroscopic and thermodynamic properties, these compounds enable highly efficient photopolymerization processes, including free-radical, cationic and hybrid photopolymerization. Finally, the investigated biphenyl derivatives were used to obtain multiwalled carbon nanotubes (MWCNTs) composites for which the degree of conversion was determined using real-time FT-IR and Photo-Differential Scanning Calorimetry (Photo-DSC). Selected derivatives were applied as photosensitisers in two-component photoinitiating systems, operating according to the mechanism of photo-oxidation and photo-reduction, for the preparation of photo-cured MWCNTs composites. The importance of the quantity of multiwalled carbon nanotubes (MWCNTs) added to the polymeric matrix on the curing degree is also discussed in this study. The structures of the MWCNTs composites were analyzed using an optical and fluorescence microscope. Moreover, this study also examines the applicability of new photoinitiating systems for printing (MWCNTS) nanocomposites by vat photopolymerization [1].

———

[1] Tomal, Wiktoria, et al. "Multifunctional biphenyl derivatives as photosensitisers in various types of photopolymerization processes, including IPN formation, 3D printing of photocurable multiwalled carbon nanotubes (MWCNTs) fluorescent composites." RSC Advances 10.53 (2020): 32162-32182.