HIGHLY EFFICIENT COUMARIN BASED IODONIUM SALT AS AN ONE-COMPONENT PHOTOINITIATING SYSTEM FOR SILICA/ZINC OXIDE FILLED EPOXIDE/VINYL ETHER COMPOSITES

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The addition of nanocomposites to polymers has drawn attention in recent years. Different nanoparticles are used as fillers, but silica and zinc oxide are most popular. These additions allow for improvement in various properties, e. g. resistance to scratching, abrasion, heat and other mechanical properties. The advantage of silica particles is modifying them with various substances that provide a good base for obtaining materials with different properties, e. g. either hydrophilic or hydrophobic [1]. Also, the addition of silica to epoxy resins enables a higher photo-curing rate than standard epoxy resin [2]. Zinc oxide is excellent reinforcement for polymers due to high-quality dispersion, low tendency to form large aggregates, and oxidizing solid power [3].

In our work, we tested the impact of silica/zinc oxide on the behavior of the photo-curing process of typical representative epoxy monomer - 3,4-epoxycyclohexylmethyl 3,4-epoxycyclohexanecarboxylate (CADE), and vinyl monomer - tri(ethylene glycol) divinyl ether (TEGDVE) in the presence of our highly efficient one-component coumarin-based cationic photoinitiators (Sylanto®) [4]. Using one-component coumarin-based cationic photoinitiators allows us to test the process at UV and visible light ranges (up to 405 nm) where commercially available iodonium salt does not show activity. Real-time FT-IR controlled the effect of nanoparticles on the monomer conversion rate during irradiation. Comparison of epoxy and vinyl monomers was made as well as a comparison of process conducted via Sylanto photoinitiators and other photoinitiators that are commercially available. The possibility of using obtained materials in 3D printing was tested.

The addition of silica/zinc oxide particles to the reacting composition increases the rate of the photopolymerization process, while using coumarin-based iodonium salts as photoinitiators allows obtaining highly reactive systems.

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