PHOTOCHEMICAL SYNTHESIS AND POTENTIAL APPLICATIONS OF NANOMATERIALS AND NANOCOMPOSITES

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The UV-Curing method is used to rapidly convert a liquid monomer or macromer into a polymer, mainly by free radical polymerization. To form free radicals which can initiate polymerization, photoinitiators interact with visible or UV light. The photoinitiator is dissolved in the precursor solution (monomer or macromer) and when exposed to a suitable light source, the precursor solution is converted to polymeric form. In this context, thioxanthone (TX) and its derivatives are widely used as photoinitiators for photoinitiated polymerization reactions. The role of thioxanthones in photopolymerization reactions both as photoinitiator and photosensitizer has been thoroughly investigated. TX and TX based photoinitiators were synthesized by several research groups. TX derivatives were also used for the preparation of metal and metal oxide nanoparticles and nanocomposites.

Metal/polymer and POSS/polymer nanocomposite films display superior properties as functional coatings for application in various fields such as cosmetics, textiles, healthcare, tissue engineering, catalysis, medical diagnostics, sensors and communication engineering. In recent years, various methods such as chemical, thermal and photochemical have been reported for the preparation of nanocomposite materials. Among them photochemical synthesis is a very effective and fast method for obtaining nanocomposite materials with desired properties due to photoreduction of the metal salt to the nanoscale and simultaneous polymerization . For this reason, the photopolymerization method presents several advantages, such as speed, area selectivity and convenience and therefore it can be widely used in the preparation of nanocomposite materials. Photoreducing the ionic species and achieving good distribution are important goals. Indeed, the unique properties and improved performance of nanomaterials are determined by their size, surface structure and interparticle interactions.

Polyhedral oligosilsesquioxanes or polyhedral oligomeric silsesquioxanes, abbreviated as POSS are cage-like silsesquioxanes and POSS derivatives are nonvolatile, odorless and environmentally friendly. The incorporation of POSS moieties into a polymeric material can dramatically improve its surface mechanical properties (e.g., strength, modulus, rigidity) and reduce its flammability, heat evolution, and viscosity .

In this study, we present the report of studies involving a very efficient, fast and easy way to prepare functional nanocomposites using the photochemical method and reported the various applications of these nanocomposites.

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