APPLICATIONS OF CARBON DOTS TO A NANO-PHOTOINITIATING SYSTEM IN FREE-RADICAL PHOTOPOLYMERIZATION

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Over the past few years, the field of photopolymerization has been established among the most widely and rapidly developing industrial sectors. The materials fabricated through photopolymerization processes have therefore been widely used in the coating, ink, photolithography, and medical industries to obtain hydrogel polymer materials. In this context, the carbon dots derived specifically from citric acid (CA-CDs) and doped with amine (N-doped-CA-CDs) and sulfur (N,S-doped-CA-CDs) precursors were employed for the free radical photopolymerization of acrylates, including hydrogel formation. The free radical photopolymerization of 2-hydroxyethyl acrylate (HEA) in an aqueous medium was carried out since carbon dots are known to absorb over a wide range of wavelengths, so the possibility of their use with different light sources was investigated. A photo-curable composition was prepared from the following materials: carbon dots (0.2 wt.%), bis-(4-t-butylphenyl)iodonium hexafluorophosphate, IOD (2 wt.%), and a mixture of HEA monomer and water in a weight ratio of 1:1. The composition (0.5 mm thick) was deposited onto a specially prepared barium fluoride spacer, allowing the polymerization reaction to be monitored despite the presence of water. The double bond conversion was observed on an FT-IR spectrometer at about 6125 cm-1. HEA/H_2O mixture (1:1) with 0.2 wt.% iodonium salt was used as a reference. The experiments were conducted in the air for 300 s using an LED light source with a wavelength in the visible range @405 nm. These experiments confirmed that during photopolymerization the investigated carbon dots are appropriate as highly efficient photosensitizers

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