

ORIGINAL PAPER

Applicability of photochemically generated pendant benzoyl peroxides in both “grafting from” and “grafting to” techniques

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Dedicated to Professor Štefan Toma on the occasion of his 75th birthday

Methyl methacrylate and styrene copolymers containing pendant benzil groups, such as 1-[4-(2-methacroyloxyethoxy)phenyl]-2-phenyl-1,2-ethanedione-*co*-methyl metacrylate (BzMA/MMA), 1-[4-(2-methacroyloxyethoxy)phenyl]-2-phenyl-1,2-ethanedione-*co*-styrene (BzMA/S), and 1-phenyl-2-(4-propenoylphenyl)-1,2-ethanedione-*co*-styrene (PCOCO/S), were prepared and used as precursors for photochemically generated pendant benzoyl peroxides. Decomposition of the pendant benzoyl peroxides was subsequently used in grafting processes. Either irradiation or a combination of irradiation with subsequent thermal treatment was adopted for grafting a thin layer of BzMA/MMA copolymer onto the surface of LDPE films. The grafting resulted in a significant decrease in contact angle of the film surface. The same activation strategy was successfully adopted to initiate the polymerisation of acrylic or methacrylic acids from the surface of styrene copolymer films containing the initiator precursor in the polymer side chains (BzMA/S and PCOCO/S). The successful surface grafting was proved by contact angles measurement as well as by infrared spectroscopic analysis.

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Introduction

The surface properties of polymers frequently equal their bulk properties in importance. The surfaces of most engineered polymers in use today are all somewhat hydrophobic; hence it is difficult to bond these hydrophobic polymer surfaces directly with other substances, such as adhesives, printing inks, and paints, which generally consist of polar groups or components. Methods investigated for the modification of polymer surfaces without altering the bulk properties include plasma treatment (Chan et al., 1996), corona discharge treatment (Catoire et al., 1984), flame treatment (Briggs et al., 1979), and exposure to high-energy radiation, such as gamma rays

(Hoffman, 1984), electron and ion beams (Lunkwitz et al., 1995), and UV sources (Yang & Rånby, 1999; Mosnáček et al., 2007; Novák et al., 2007). Various polar groups are introduced onto the polymer surface as a result of these treatments. However, the large quantity of free radicals generated by these methods imposes several disadvantages, principally those of low specificity, degradation, and cross-linking of the macromolecules.

Two main strategies exist for modification of the polymeric or inorganic surfaces by polymers: the “grafting onto” technique, representing grafting of the polymer chains onto the surface, and the “grafting from” technique, representing the polymerisation of monomers from initiating sites covalently anchoring

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