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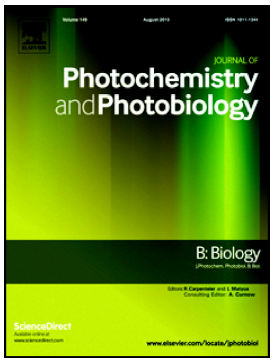

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The chitosan – porphyrazine hybrid materials and their photochemical properties

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Abstract

Three magnesium sulfanyl porphyrazines differing in the size of peripheral substituents (3,5-dimethoxybenzylsulfanyl, (3,5-dimethoxybenzyloxy)benzylsulfanyl, 3,5-bis[(3,5-bis[(3,5-dimethoxybenzyloxy)benzyloxy]benzylsulfanyl) were exposed to visible and ultraviolet radiation (UV A+B+C) in order to determine their photochemical properties. The course of photochemical reactions in dimethylformamide solutions and the ability of the systems to generate singlet oxygen were studied by UV-Vis spectroscopy, which additionally gave information on aggregation processes. The porphyrazines were found to be stable upon visible light irradiation conditions, but when exposed to high energy UV radiation, the efficient photodegradation of these macrocycles was observed. Therefore, these three magnesium sulfanyl porphyrazines were incorporated into chitosan matrix. The obtained thin films of chitosan doped with porphyrazines were subjected to polychromatic UV-radiation and studied by spectroscopic methods (UV-Vis, FTIR), scanning electron microscopy (SEM) and atomic force microscopy (AFM). Application of chitosan as a polymer matrix for porphyrazines was found to be successful method that effectively stopped the unwelcome degradation of macrocycles, thus worth considering for their photoprotection. In addition, the surface properties of the hybrid material were determined by contact angle measurements and calculation of surface free energy. Intermolecular interactions between these novel porphyrazines and chitosan were detected. The mechanism of photochemical reactions occurring in studied systems has been discussed.