Photodynamic activity of Chlorin e6 and Methylene Blue bound to Au@Carbynoid/Pluronic F-127 nanocomposites synthesized by laser ablation in water

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Photodynamic therapy (PDT) is a medical treatment based on the optical excitation of a drug, called photosensitizer. When photosensitizers are exposed to light of specific wavelength, they produce singlet oxygen that kills nearby cells, such as cancer cells. Hybrid nanomaterials, comprising rigid metallic nanoparticles and soft polymeric components, are investigated for their potential biomedical applications due to their ability to simultaneously allow detection, diagnosis and therapy. Thanks to the multi functionality assured by the plasmonic properties and therapeutic activity of the nano drug carriers, encapsulation of metal nanoparticles in biocompatible polymeric shells is becoming a fascinating route to approach PDT, with the further advantage to prevent the aggregation effects under biological conditions. Our research is focused on the stabilization and photodynamic activity of new hybrid nanomaterials constituted by Au@Carbynoid nanocomposites (NCs) synthesized by laser ablation of a gold target in water [1], Pluronic F-127 as polymeric component and a photosensitizer (chlorin e6 or methylene blue). The decay of the absorption peak of diphenylisobenzofuran (DPBF) was used as a probe for the detection of singlet oxygen produced by the photosentizer. Samples were irradiated with a LED emitting 650 nm light. Absorbance was monitored as a function of time during irradiation. Quantum yields of singlet oxygen generation and rates of photosensitizers photobleaching were obtained.