Abstract

In this work, the feasibility of sterilizing a water suspension of poly-3-hexylthiophene nanoparticles (P3HT-NPs) is investigated using ionizing radiation, either γ-rays or high-energy electrons (e-beam). It is found that regardless of the irradiation source, the size, polydispersity, aggregation stability, and morphology of the NPs are not affected by the treatment. Furthermore, the impact of ionizing radiation on the physicochemical properties of NPs at different absorbed radiation doses (10–25 kGy) and dose rates (kGy time−1) is evaluated through different spectroscopic techniques. The results indicate that delivering a high dose of radiations (25 kGy) at a high dose rate, that is, kGy s−1, as achieved by e-beam irradiation, preserves the characteristics of the polymeric NPs. Differently, the same radiation dose but delivered at a lower dose rate, that is, kGy h−1, as attained by using a γ-source, can modify the physicochemical properties of the polymer. Sterility tests indicate that an absorbed dose of 10 kGy, delivered either with γ-rays or e-beam, is already sufficient for effective sterilization of the colloidal suspension and for reducing the endotoxin content. Finally, NPs irradiated at different doses, exhibit the same cytocompatibility and cell internalization characteristics in human neuroblastoma SH-SY5Y cells of NPs prepared under aseptic conditions.