

TPM2-3

A homogeneous recoverable sensitizer for singlet oxygen production in aqueous solution

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Singlet oxygen photosensitization upon visible irradiation of colloidal TiO₂-5,10,15,20-tetrakis(4-carboxyphenyl)porphyrin (TCPP) nanoparticles has been studied in aqueous solutions in a wide pH region 1-7. The quantum yields of singlet oxygen production (Φ_{Δ}) from this colloidal nanosensitizer increase with the increasing of pH ranging from 0.2 at pH 1 to 0.5 at pH 7, which is fully consistent with the pH dependent TCPP adsorption behavior on TiO₂ surface. The colloidal stability and the extent of TCPP on TiO₂ surface highly depend on pH. A complete precipitation of TiO₂-TCPP complexes occurs in neutral solution. As the formation of colloidal TiO₂-TCPP nanoparticles are irreversible upon pH change, the removal of both TiO₂ and TCPP from solution can be achieved by adjusting the pH from acidic to neutral, then back to acidic conditions again, followed by centrifugation. In this novel sensitizing system, a stable, colloidally dispersed TiO₂-TCPP nanoparticles act as a singlet-phase sensitizer and are readily recovered by heterogeneous separation. We attribute the ability of the sensitizers to retain its solubility and hence activity.