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The Water-Soluble Zinc Phthalocyanine Substituted with Sulfur-Containing Groups

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Abstract

In this paper we describe [phthalocyaninato]zinc octakis (methylene isothiuronium) chloride and [phthalocyannato]zinc octamethanethiol having as the starting substance octakis(chloromethyl) phthalocyanine zinc obtained by chloromethylation reaction of zinc phthalocyanine. The structures of the synthesized compounds were characterized by elemental analysis, FTIR and $^1\text{H-NMR}$ spectroscopies. The UV–Vis spectra of mentioned compounds depend on its concentration and generally present, a wavelength region with – the B band situated at approx. 300–400 nm and the Q band at approx. 600–800 nm. The UV–Vis spectra of [phthalocyaninato]zinc oktakis (methylene isothiuronium) chloride presented a broader Q-band in water solution with a shoulder on the red side. It is noticeable, the disappearance of Q peak splitting, with a slight hypsochromic shift at 639 nm, characteristic of the α -form of aggregation. Laser flash photolysis has been used to characterize the triplet state of [phthalocyaninato]zinc oktakis (methylene isothiuronium) chloride compound in dilute DMSO: H_2O , NVP: H_2O and H_2O solutions. The fluorescence decay curves for [phthalocyaninato]zinc oktakis (methylene isothiuronium) chloride at the interval of excitation wavelengths ($\lambda_{\text{exc}} = 341\text{...}703$ nm) show a biexponential behavior with lifetime values being yielded 2.31 μs and 1.23 μs in DMSO: H_2O , 1.22 μs and 9.22 μs in NVP: $9\text{H}_2\text{O}$ solvents. The decay curve of phosphorescence of [phthalocyaninato]zinc oktakis (methylene isothiuronium) chloride in H_2O are multi-exponential and are represented by the relatively long triplet lifetimes of 1.09 μs , 4.96 μs and 15.23 μs . The triplet lifetime and triplet quantum yield values of [phthalocyannato]zinc octamethanethiol in DMSO: H_2O are lower than of [phthalocyaninato]zinc octakis (methylene isothiuronium) chloride compound.



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Keywords: zinc phthalocyanine derivatives, isothiuronium group, sulfur-containing groups, thiol group, fluorescence

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