Tamara POTLOG
Laboratory of Organic/Inorganic Materials for Optoelectronics,
Institute of Applied Physics, Moldova State University,
Chisinau, Republic of Moldova
E-mail: tpotlog@gmail.com
Ion LUNGU
Laboratory of Organic/Inorganic Materials for Optoelectronics,
Institute of Applied Physics, Moldova State University,
Chisinau, Republic of Moldova
Lidia GHIMPU
D. Ghitu Institute of Electronic Engineering and Nanotechnologies,
Technical University of Moldova, Chisinau, Moldova
E-mail: lidia.ghimpu@gmail.com
Victor SUMAN
D. Ghitu Institute of Electronic Engineering and Nanotechnologies,
Technical University of Moldova, Chisinau, Moldova
Carmen GHERASIM
Laboratory Physical Chemistry of Polymers,
„Petru Poni" Institute of Macromolecular Chemistry, Iasi, Romania

E-mail: gherasim.carmen@icmpp.ro
Radu TIGOIANU
Laboratory Physical Chemistry of Polymers,
„Petru Poni" Institute of Macromolecular Chemistry, Iasi, Romania
E-mail: tigoianu.radu@icmpp.ro
Anton AIRINEI
Laboratory Physical Chemistry of Polymers,
„Petru Poni" Institute of Macromolecular Chemistry, Iasi, Romania
E-mail: airineia@icmpp.ro

ZnPc (Zinc Phtahlocyanine) derivatives as medicinal photosensitizers for photodynamic therapy

Derivați ZnPc ca fotosensibilizatori medicinali pentru terapia fotodinamică

Tetra-carboxy zinc phthalocyanine ($ZnPc(COOH)_2$) is a functionalized metallophthalocyanine that exhibits strong optical absorption and characteristic fluorescence, making it an important compound for applications in photodynamic therapy, photocatalysis, and optoelectronic devices. Its photophysical behavior is dominated by the highly conjugated phthalocyanine macrocycle and the presence of a central zinc ion, which enhances its stability and electronic transitions. In the UV–visible absorption spectrum, tetra-carboxy zinc phthalocyanine typically displays two major absorption regions: the B band (Soret band) and the Q band**.** The B band appears in the ultraviolet region around 300–400 nm and is associated with higher energy π–π^* transitions. The most intense feature is the Q band, observed in the visible to near-infrared region, usually between 650–700 nm that arised from electronic transitions within the macrocyclic ring and is highly sensitive to molecular aggregation and solvent environment. The introduction of carboxylic acid groups increases solubility in polar solvents and can reduce aggregation, leading to sharper and more intense Q-band absorption. Fluorescence emission of tetra-carboxy zinc phthalocyanine occurs when the molecule relaxes radiatively from its first excited singlet state back to the ground state. Upon excitation at the Q-band wavelength, $ZnPc(COOH)_4$ emits fluorescence typically in the range of 680–750 nm, with a relatively small Stokes shift. The fluorescence intensity depends strongly on concentration, solvent polarity, and aggregation state. In aggregated form, fluorescence is often quenched due to excitonic interactions and non-radiative energy transfer pathways.

Generally, tetra-carboxy zinc phthalocyanine is characterized by strong visible light absorption and near-infrared fluorescence, making it promising photosensitizer and light-harvesting material. Its functional carboxy groups provide additional chemical versatility for binding to surfaces, biomolecules, or nanomaterials, further expanding its technological and biomedical relevance.

* **Acknowledgment:** This paper was supported financially by a grant from the Romanian Ministry of Research, Innovation, and Digitization, CNCS-UEFISCDI, project PN-IV-P8-8.3-ROMD-2023-0048 (DSUPRAMED) within PNCDI IV.