

Phosphorescence of Singlet Oxygen and 5,10,15,20-tetrakis(1-methyl-4-pyridinio)porphyrin: Time and Spectral Resolved Study

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Photogeneration of singlet oxygen ($^1\text{O}_2$) via triplet states of water soluble porphyrin photosensitizers is the first step in photodynamic therapy as well as in recent $^1\text{O}_2$ imaging of cells [1]. High sensitive spectroscopic experimental set-up was built to detect time- and spectral- resolved infrared phosphorescence of both photosensitizers and $^1\text{O}_2$ [2]. In this contribution, new data obtained on 5,10,15,20-tetrakis(1-methyl-4-pyridinio)porphyrin (TMPyP) in buffer (pH = 7.4) are presented. TMPyP belongs to cationic photosensitizers which are known to photocleave DNA due to their affinity towards nucleic acids. Using TMPyP phosphorescence around 846 nm, lifetime of the triplet states of $(1.8 \pm 0.1) \mu\text{s}$ was determined for all TMPyP concentrations ($5 \mu\text{M} - 100 \mu\text{M}$). The corresponding rise time of $^1\text{O}_2$ slightly decreases from $(1.8 \pm 0.2) \mu\text{s}$ to $(1.5 \pm 0.2) \mu\text{s}$ with increasing TMPyP concentration. On the other hand, $^1\text{O}_2$ lifetime increases from $(3.7 \pm 0.2) \mu\text{s}$ to $(4.1 \pm 0.2) \mu\text{s}$ with increasing TMPyP concentration. Typical $^1\text{O}_2$ phosphorescence kinetic is shown in Fig. 1 together with its single exponential fit. The obtained results are discussed in the frame of TMPyP aggregation and quenching.

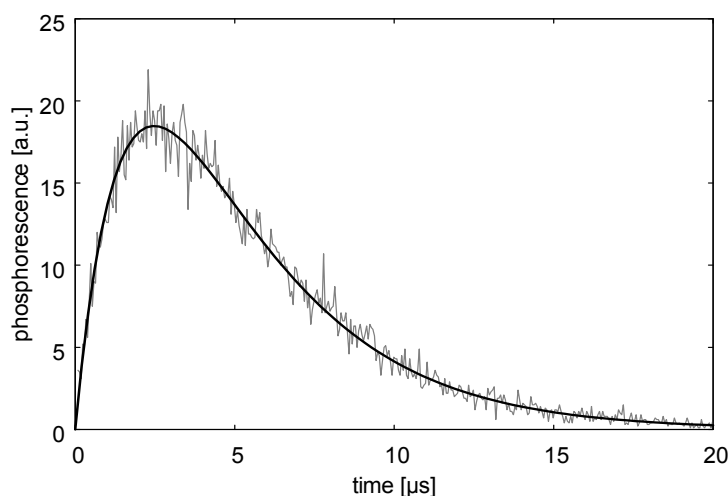


Fig. 1: Time resolved IR luminescence of $^1\text{O}_2$ detected at 1278 nm photogenerated at 420 nm in tetrakis(1-methyl-4-pyridinio)porphyrin tetra(*p*-toluenesulfonate) in buffer (air saturated, $10 \mu\text{M}$, pH = 7.4)

- [1] J.W. Snyder, J.D.C. Lambert, P.R. Ogilby: 5,10,15,20-tetrakis(N-Methyl-4-Pyridyl)-21 H, 23 H-Porphine (TMPyP) as a Sensitizer for Singlet Oxygen Imaging in Cells: *Characterizing the Irradiation-dependent Behavior of TMPyP in a Single Cell*. Photochemistry and Photobiology 82 (2006) 177–184.
- [2] R. Dědic, A. Molnár, M. Kořínek, A. Svoboda, J. Pšenčík, J. Hála: *Spectroscopic study of singlet oxygen photogeneration in meso-tetra-sulphonatophenyl-porphin*. J. Luminescence 108 (2004) 117–119.