

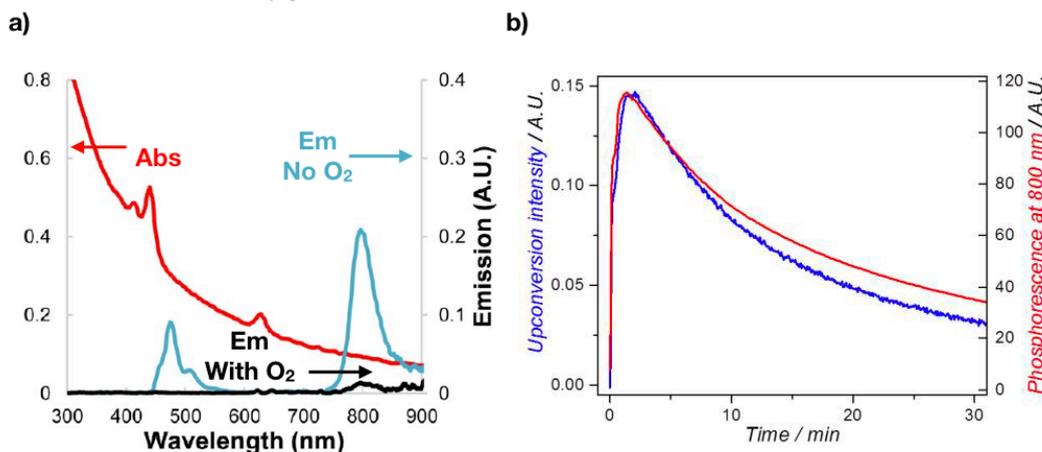
Upconversion at lipid bilayers: sensitivity to dioxygen and ROS production

Sylvestre Bonnet*

¹ Leiden Institute of Chemistry, Leiden University, Einsteinweg 55, 2333 CC Leiden, The Netherlands

bonnet@chem.leidenuniv.nl

Photoactivated chemotherapy (PACT) and photodynamic therapy (PDT) consists in a range of techniques aimed at activating with light photosensitive medicinal compounds, either in oxygen-poor or oxygen-rich tumors, respectively. These techniques are regarded as a promising alternative to chemotherapy as it might limit side effects and increase treatment efficacy. However, many photosensitive compounds require UV or blue light to be activated, which penetrates sub-optimally in biological tissues. We have developed upconverting liposomes, polymersomes, and lipid-coated upconverting nanoparticles, that can produce blue light upon red or near infrared light irradiation, to activate blue-light sensitive ruthenium-based anticancer compounds. In upconverting vesicles, the triplet-based upconversion emission is quenched in presence of O₂ (Figure 1a). However, antioxidants simply added to the solution can stabilize for hours the upconversion intensity in air. By introducing antioxidants in the membrane composition of polymersomes, it is even possible to stabilize upconversion in air without a need for exogeneous antioxidants (Figure 1b). In lipid-coated upconverting nanoparticles, ruthenium PDT sensitizers added to the lipid formulation generate reactive oxygen species upon 980 nm light irradiation, but it is difficult to detect the primary nature of the light-generated ROS because we miss the appropriate probe. In this presentation I will compare the lipid-containing upconverting nanosystems developed in Leiden and their interactions with dioxygen and ROS.



References:

1. S. H. C. Askes, A. Bahreman, S. Bonnet, *Angew. Chem. Int. Ed.* **2014**, *53*, 1029; S. H. C. Askes, M. S. Meijer, T. Bouwens, I. Landman, S. Bonnet, *Molecules* **2016**, *21*, 1460
2. S. H. C. Askes, W. Pomp, S. L. Hopkins, A. Kros, S. Wu, T. Schmidt, S. Bonnet, *Small*, **2016**, *12*, 5579
3. S. H. C. Askes, V. Leeuwenburgh, W. Pomp, S. Grecea, T. Schmidt, S. Bonnet*, *ACS*

