

2D Time-resolved singlet oxygen luminescence scanning on microorganisms on surfaces

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The concept of monitoring the distribution of photosensitizers (PS) in biological systems is a well-known and common procedure but it is limited to obtaining information about its localization only. Even evaluating the PS fluorescence does not necessarily correlate one-to-one with singlet oxygen ($^1\text{O}_2$) generation efficiency. It is well accepted that $^1\text{O}_2$ is the main mediator of the photodynamic effect.¹ For this reason, numerous efforts have been made to detect $^1\text{O}_2$ *in vitro* as well as *in vivo*. The detection methods of $^1\text{O}_2$ range from indirect methods using monitor molecules, other indirect methods that do not require additional drugs, to direct $^1\text{O}_2$ detection via its weak near-infrared (NIR) phosphorescence at around 1270 nm.^{2,3,3-8} Beside using the photodynamic effect in photomedicine for the treatment of different diseases it is also important for the inactivation of microorganisms like bacteria, phototrophic organisms and fungi.

REFERENCES

1. B. Röder, Photodynamic Therapy, in: *Encyclopedia Analytical Chemistry*, R.A. Meyers (Ed.), pp. 302-320, © John Wiley & Sons Ltd, Chichester, 2000.
2. S. Hackbarth, J. C. Schlothauer, A. Preuss, C. Ludwig, B. Röder, *Laser Phys. Lett.*, 2012, **9**(6), 474.
3. J. C. Schlothauer, S. Hackbarth, L. Jäger and K. Drobniowski, et al., *J. Biomed. Opt.*, 2012, **17**(11), 115005.
4. Y. Shen, H. Lin, Z. F. Huang and D. F. Chen, et al., *Laser Phys. Lett.*, 2011, **8**(3), 232.
5. B. Hu, N. Zeng, Z. Liu and Y. Ji, et al., *J. Biomed. Opt.*, 2011, **16**(1)..
6. S. Lee, M. E. Isabelle, K. L. Gabally-Kinney, B. W. Pogue, S. J. Davis, *Biomed. Opt. Express*, 2011, **2**(5), 1233.
7. J. F. B. Barata, A. Zamarrón, Neves, M Graça P M S, Faustino, M Amparo F, et al., *Eur. J. Med. Chem.*, 2015, **92**.
8. J. C. Schlothauer, J. Falckenhayn, T. Perna, S. Hackbarth, B. Röder, *J. Biomed. Opt.*, 2013, **18**(11), 115001.