COMMUNICATION

ChemComm
www.rsc.org/chemcomm

Magnetic field effect on singlet oxygen production in a biochemical system

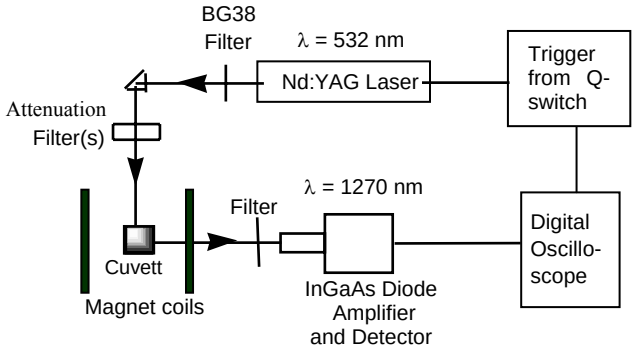
Yan Liu,[a] Ruth Edge,[a] Kevin Henbest,[b] Christiane R. Timmel,[b] P. J. Hore*[b] and Peter Gast[a]

[a] *Department of Biophysics, Huygens Laboratory, Leiden University, 2300 RA Leiden, The Netherlands. E-mail: gast@physics.leidenuniv.nl*
[b] *Department of Chemistry, University of Oxford, Physical and Theoretical Chemistry Laboratory, Oxford, OX1 3QZ, UK. Fax: +44 1865 275410; E-mail: peter.hore@chem.ox.ac.uk*

Supplementary Information

Rb. sphaeroides R-26 reaction centre (RC) isolation and quinone removal were performed as described previously.[1] Reaction centres were suspended in perdeuterated buffer (final composition, 99.5% D_2O) containing 10 mM sodium phosphate buffer, 1 mM EDTA and 0.1% LDAO, pH 8.0.

Time-resolved near-infrared luminescence was detected as described previously (Scheme 1).[2] Reaction centres, having absorption of 0.15 at 532 nm, were excited with 9 mJ, 15 ns laser pulses at 532 nm from a Q-switched frequency-doubled Nd:YAG laser operating at 1 Hz. Emission at $\lambda > 1050$ nm from the 10 mm quartz cuvette was detected at 90° by an InGaAs photodiode, amplified and then signal-averaged (1024 shots) on a digital oscilloscope (HP Infinium). A 1260 nm interference filter (FWHM = 75 nm) was used to restrict the wavelength detection range.



Scheme 1 Experimental set-up

The emission signals were fitted to a first order decay and extrapolated to zero time. This zero-time luminescence intensity is proportional to the quantum yield of singlet oxygen, Φ_Δ. Thus, under the same experimental conditions, the value of Φ_Δ for Q-depleted RCs of *Rb. sphaeroides* R-26 can be determined as the ratio of the slopes of the linear plots of zero-time luminescence intensities against laser pulse energy (Figure 1) for RCs and for a standard sensitizer, rose bengal (quantum yield, 75% in D_2O[3]). The quantum yield of singlet oxygen in Q-depleted RCs from *Rb. sphaeroides* R-26 was determined to be 9 ± 4%.

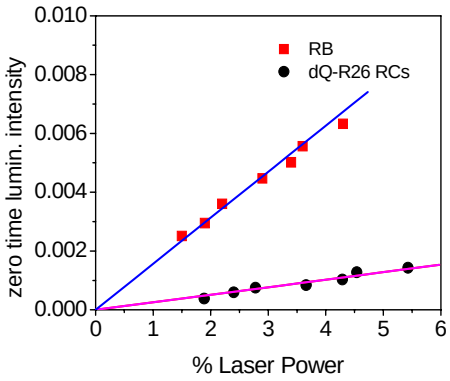


Fig. 1 Energy dependent $^1O_2$ luminescence extrapolated from fitting the data for rose Bengal (RB, squares) and Q-depleted (dQ) RCs from *Rb. sphaeroides* R-26 (circles).

A magnetic field up to 100 mT was supplied by two home-built Helmholtz coils. The strength of the magnetic field was measured by a gaussmeter probe (Applied Magnetics Laboratory) with resolution 0.1 mT.

All experiments were carried out at room temperature.

Steady-state absorption measurements before and after 12,000 laser flashes were carried out using a 10 × 10 mm quartz cuvette, adapted for the oxygen-saturated measurements so that the sample could be bubbled gently with oxygen for 1 hour and then sealed.

Absorption spectra were measured on a Shimadzu UV-visible spectrophotometer (Shimadzu UV-160A).

References

1. Feher, G.; Okamura, M. Y. The Photosynthetic Bacteria. Clayton, R. K.; Sistron, W. R. (eds.) 1978, 349-386.
2. Keene, J. P., Kessel, D., Land, E. J., Redmond, R. W., Truscott, T. G. *Photochem. Photobiol.* 1986, **43**, 117-120.
3. Bilski, P., Dabestani, R., Chignell, C. F. *J. Phys. Chem.* 1991, **95**, 5784-5791.