Seminar

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Electron transfer proteins studied by very high frequency EPR at 360 GHz / 12.9 T

In order to exploit the benefits of high-field EPR - enhanced sensitivity and spectral resolution – for the investigation of organic protein cofactors, with very small g-tensor anisotropy, new spectrometers have to be developed. Our laboratory-built high-field/high-frequency spectrometer consists of a 14 T superconducting magnet, a 360 GHz heterodyne mw-board and a semi-confocal Fabry-Perot resonator. A new probehead makes low-temperature experiments and light excitation of the sample in the resonator feasible. The spectrometer works in induction mode and uses a quasi-optical transmission line instead of lossy waveguides. With these improvements, an absolute sensitivity of $1.5*10^{10}$ spins/(mT $Hz^{1/2}$) could be achieved, which is mandatory for measurements on samples which are only available in very small amounts. Very recently the spectrometer has been up graded for proton ENDOR experiments.
Electron paramagnetic resonance (EPR) at high magnetic fields is especially well suited to study stable or transient radicals, which play an important role as catalytic centres and cofactors of electron transfer reactions. Important examples are ion radicals of chlorophylls, quinones and flavins where small shifts (10^{-5}) and splittings of the g-tensor components report on the interaction of the radical with its molecular environment.
Precise determination of the g-tensors enables mapping of the spin-density distribution and may provide an understanding of how it is modulated by interactions with the protein environment. In many cases however, a precise determination of g-tensors is hampered by the fact that they exhibit only small g-tensor anisotropy. These complications make the application of very high magnetic fields and correspondingly high microwave frequencies necessary for EPR studies.
Here we present applications of our 360 GHz/12.9 T high-field/high-frequency spectrometer on stable cofactor radicals in different electron transfer proteins. Firstly the determination of the g-tensor of flavin cofactors in the DNA repair enzymes CPD-photolyase and (6–4) photolyase. Secondly a high field EPR characterisation of the electron transfer donor $P_{865}^{\bullet+}$ and the electron acceptor molecules $Q_A^{\bullet-}$ and $Q_B^{\bullet-}$ in wild type and mutant bacterial reaction centres of *Rhodobacter sphaeroides* R26.

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Wann? Dienstag, 07.11.2006, 13:00 Uhr

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