Determination of electron-electron interspin distance by electron spin echo and saturation recovery electron paramagnetic resonance

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Time domain electron paramagnetic resonance (EPR) has the potential to determine electronelectron interspin distances that is longer than can be determined by continuous wave EPR. To test techniques for these measurements a series of spin-labeled low-spin Fe(III) hemes with iron-nitroxyl distances between 9 and 16 Å were examined by continuous wave (CW), saturation recovery (SR) and electron spin echo (ESE) EPR. These distances are toward the long-distance limit for CW measurements and the short-distance limit for the time-domain measurements. The iron-nitroxyl distances obtained by analysis of the effect of the rapidly relaxing low-spin Fe(III) on the SR and ESE decays for the nitroxyl radical were in good agreement.