Advanced Paramagnetic Resonance of Iron-Sulfur Proteins and Enzymes

Joshua Telser[1], Matthew O. Ross[2], Peter E. Doan[2], George E. Cutsail III[3], Nicholas S. Lees[2], and Brian M. Hoffman[2]

[1] Department of Biological, Chemical and Physical Sciences, Roosevelt University, Chicago, IL 60605 USA;
[2] Department of Chemistry, Northwestern University, Evanston, IL 60208 USA
[3] MPI für chemische Energiekonversion, Mülheim/Ruhr, D-45470, Germany
E-mail: jtelser@roosevelt.edu

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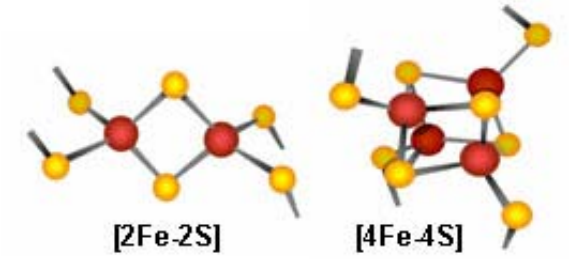
Electron paramagnetic resonance (EPR) and its derivative techniques, electron nuclear double resonance (ENDOR) and electron spin echo envelope modulation (ESEEM) spectroscopies, provide unique insights into the structure, coordination chemistry, and biochemical mechanism of Nature's widely distributed iron-sulfur cluster (FeS) proteins.[1,2] These include the electron-transfer proteins (e.g., 2Fe and 4Fe ferredoxins (Fds), shown below, and Rieske protein) and enzymes, such as the hydro lyase aconitase (EC 4.2.1.3), found in humans. Another major role of 4Fe4S proteins is in the superfamily of radical SAM (S-adenosylmethionine) enzymes, which includes an alphabet soup of enzymes, such as BioB, BtrN, HydE,F,G, IspG,H, MiaB, MoaA, QueE, RlmN, SkfB, SufA, ThiC. We will describe studies on FeS proteins including 2FeFds and 4FeFds; the latter with both the "normal" tetracysteinyl ligation to protein and with unusual tris(cysteinyl) ligation (with an exogenous fourth ligand, which can include cyanide ion). Radical SAM enzymes will also be discussed, specifically two members of the isoprenoid biosynthetic pathway, IspG and IspH, which is relevant to the development of new antibiotics.[3] The use of natural abundance isotopes (^{1}H, ^{31}P) and isotopically labeled (^{2}H, ^{13}C, ^{15}N, ^{57}Fe) enzyme/ substrates /inhibitors will be described. An emphasis will be on ^{57}Fe ENDOR which uniquely provides information on electronic structure and biochemical activity of FeS proteins.



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