Diffusion dependence of proton NMR relaxation rates in the presence of ferritin

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Ferritin is the predominant iron-storage protein in living organisms. In aqueous solutions of ferritin, protons experience a higher transverse relaxation rate, $R_2$. This is thought to occur due to a diffusive mechanism, where protons move close enough to the ferritin to pass through a region of elevated magnetic field, and a chemical exchange mechanism, where protons bind to the protein for a period of time, experiencing an even higher magnetic field. These two mechanisms exhibit different dependencies on the self-diffusion coefficient of the protons. By adding glycerol to aqueous solutions, we have been able to control the self-diffusion of protons; this has been confirmed by means of diffusion measurements employing pulsed field gradient techniques. We have measured the relaxation rate of protons in ferritin-containing binary mixtures of water and glycerol using CPMG sequences, and will compare the experimental results to theoretical predictions of diffusion dependence.