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...and macromolecules within the cell plays an important ...role in cellular phenomena. There are two opposing views ...of the state of cellular water. The "classical" view ...maintains that the bulk of the cell water is in a state ...equivalent to pure water. An opposing view maintains ...that a substantial fraction of the cell water differs in ...its physical properties from free water. Previous high-...resolution NMR studies have shown line-broadening that ...has been associated with structural changes in the cell ...water. We have used pulse methods to measure the relaxa-...tion times and diffusion coefficients for water in rat ...skeletal muscle. Measurements on four different animals ...give the following results. T_1 = 730±70 ms, T_2 = 46±2 ms, ...D = 1.5±.2x10^{-5} cm^2/sec. For pure water, we obtain ...T_1 = 3.0 s, T_2 = 1.5 s, D = 2.8x10^{-5} cm^2/sec. The impli-...cations of these results for the structure of the cell ...water will be discussed.

*Supported in part by the Robert A. Welch Foundation and the U. S. Public Health Service.

BE 3. Pressure Dependence of Internal Rotation in $FeSiF_6 \cdot 6H_2O$* G. L. Nicolaides and R. W. Vaughan, California Institute of Technology and D. D. Elleman, Jet Propulsion Laboratory - Molecular motion in ferrous fluorosilicate ($FeSiF_6 \cdot 6H_2O$) has been studied as a function of pressure to 80 kilobars using conventional wideline nuclear magnetic resonance techniques. This material has a slightly disordered CsCl structure with SiF_6^{--} and $Fe(H_2O)_6^{++}$ groups occupying the lattice sites. Second moments calculated from the F^{19} spectra indicate the rapid reorientation of SiF_6^{--} octahedra at room temperature and pressure slows with the application of pressure. Second moments approaching the estimated rigid lattice values are obtained near 70 kilobars.

In addition to a detailed discussion of these results a brief discussion of the high pressure cell developed for these studies will be given.

* work supported by the National Science Foundation, The Caltech President's Fund, and NAS 7-100.

BE 4. EPR Studies of Np^{4+} in ThO_2.* R.P.RICHARDSON† and J.B.GRUBER, Washington State Univ.--The EPR spectrum of Np^{4+} in ThO_2 has been investigated, principally at 1.7°K in the K-band. Three basic Zeeman resonances are energetically isotropic about one [001] crystal axis, with g values 2.02, 2.31, and 2.48. These resonances appear to come from three sites in which the Np^{4+} ions are slightly displaced along the [001] axis from the usual O_h point group site. A final basic Zeeman resonance, isotropic about the [110] crystal axis with g=2.06, is thought to arise from a fourth site in which the Np^{4+} ion is displaced along the [110] axis. The splittings of the cubic field ground Γ_8 quartets that arise due to these four axial displacements must be between $5cm^{-1}$ and $20cm^{-1}$ in order to fit the EPR and optical data. The parameter x, related to the cubic portion of the crystal field, is found to be x=-0.667, -0.631, -0.604 and -0.661 for the four nearly cubic sites. The hyperfine lines are fit best with (390±30)X$10^{-4}$$cm^{-1}$ for the absolute value of the hyperfine coupling constant.

*Work supported by the U.S. Atomic Energy Commission.

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BE 5. Nuclear Spin Diffusion In ... magnetic Impurities in Nonconducting ... PHILIP HORVITZ, Rice Univ.*--It is shown that paramagnetic impurities can induce nuclear spin diffusion in nonconducting solids inside the so-called "barrier radius." The static field created by the impurity spin splits the states $|1/2,-1/2\rangle$ and $|-1/2,1/2\rangle$, where the quantum numbers refer to the component in the direction of the external magnetic field of two neighboring spins. The nuclear dipole-dipole interaction mixes these two states so that to first order $\Psi_1 = |1/2,-1/2\rangle + \epsilon|-1/2,1/2\rangle$, and $\Psi_2 = |-1/2,1/2\rangle - \epsilon|1/2,-1/2\rangle$. The Fourier component of the impurity spin at the frequency corresponding to the energy difference of Ψ_1 and Ψ_2 causes transitions between these states. This is a spin diffusion process because ϵ is small. Typically the induced nuclear spin diffusion is on the order of $10^{-12}$$cm^2$/sec. Thus, Bloembergen's differential equation should include spin diffusion inside the "barrier radius."

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BE 6. Theory of Pressure-Induced Demagnetization of Porous Polycrystalline Cubic Ferrites.* DENNIS E. GRADY and G. E. DUVALL, Washington State Univ.--A theory is presented which predicts the demagnetization of porous cubic ferrites induced by hydrostatic pressure for values of applied field which would normally saturate the magnetic material. The theory considers magnetoelastic coupling with the deviation in local strain field due to the porosity. Agreement is found with existing data on nickel ferrite, manganese ferrite and yttrium iron garnet.

*Research supported by AFOSR Contract #69-1758.

BE 7. Clustering and Magnetic Behavior in Au-Fe Alloys.* R. J. BORG and C. E. VIOLET, Lawrence Rad. Lab., Univ. of California, Livermore. — We have been able to induce, by various heat treatments, significant variations in the magnetic response of Au-16.6 at.% Fe alloys which were examined using the Mossbauer effect.

The following are the salient results: (1) there is no discrete ordering temperature for either the quenched or annealed state, (2) the temperature dependence of the magnetic hfs cannot be even approximated by a Brillouin function, (3) the isomer shift does not change detectably with heat treatment, and (4) the splitting of the magnetic hfs for the quenched state is greater than for the annealed state except at the lowest temperature, at which they are equal.

Alloys more dilute in Fe behave otherwise, demonstrating relatively sharp ordering temperatures, Brillouin-like temperature dependence, and no detectable response to varying temperature.

*Work performed under the auspices of the U. S. Atomic Energy Commission.