represented by Eq. (1), presumably indicates that the entropy associated with the lattice defects is not simply a mixing entropy, which is not at all surprising.

In conclusion, it may be said that the directly determined activation energies for the formation of lattice defects in the silver halides are in substantial agreement with those determined by the indirect method discussed in the reference of footnote 1.

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The Electric Quadrupole and Magnetic Dipole Moments of Li^6 and N^{14}

The nonspherically symmetric nuclear forces which are invoked in order to account for the existence of the electric quadrupole moment of the deuteron[1] present an opportunity to explain certain discrepancies between the theoretical and observed nuclear magnetic moments.[2] Of particular interest are the cases of Li^6 and N^{14}. On the assumption of intrinsic magnetic moments of the neutron and proton uninfluenced by binding forces one expected the magnetic moments of these nuclei to be equal to that of the deuteron. Such differences as are due to the effects of Coulomb forces and spin-orbit coupling are entirely negligible.[3] However, the observed values give $\mu(H^2)-\mu(Li^6)=0.03$ and $\mu(H^2)-\mu(N^{14})=0.45$ nuclear magnetons.[4]

The expectation of equality of the magnetic moments of H^2, Li^6 and N^{14} was based on the result following from the spherically symmetric force model that the ground state of all three nuclei were the same; *viz.*, $^3S_1$. But with angular dependent forces such as are presented by the meson field theory,[5] this is no longer valid and the ground states of these nuclei will be a mixture of $^3S_1$ and $^3D_1$ with differing amounts of the two. For the two heavier nuclei a greater admixture of the D function might be expected since the D term in Li^6 and N^{14} arises from the lowest configuration, in contrast to H^2, and there should be a smaller energy difference between the S and D levels in the unperturbed state.

It is easy to see that the effect of the D function is to decrease the calculated magnetic moments as experiment requires. In the absence of definite evidence to the contrary we may assume that the differences in magnetic moments are entirely due to the different admixtures of D function. Writing the ground state wave function as

$$\Psi=(1+\beta^2)^{-\frac{1}{2}}[\psi(^3S)+\beta\psi(^3D)] \tag{1}$$

we find

$$\beta=\left(\frac{\mu_{\mathrm{H}^2}-\mu}{\mu-\mu'}\right)^{\frac{1}{2}}=\begin{cases}0.25 & \text{for Li}^6\\ 2.4 & \text{for N}^{14},\end{cases} \tag{2}$$

in which μ is the observed magnetic moment and $\mu'=\frac{3}{4}-\frac{1}{2}\mu_{\mathrm{H}^2}$ is the magnetic moment associated with the D state. These values of β may be compared with the deuteron case where $\beta=0.07$ (neutral meson theory) and $\beta=0.21$ (symmetrical meson theory).[5] For N^{14} the large deviation from the deuteron moment resulting in the large value of β may be due in part to the fact that in the unperturbed state the spin-orbit splitting[6] brings the $^3D_1$ level closer to the $^3S_1$ level in N^{14} whereas in Li^6 the opposite is true. However, it is not likely that this is the sole factor and it is possible that either or both of the following is operative: (1) As the number of particles in the nucleus increases the angular dependent part of the forces becomes predominant or (2) the deviations from the deuteron moment are not entirely due to different admixtures of states with orbital momentum but other effects (influence of binding?) become more important for greater numbers of particles.

As a consequence of the angular dependence of the forces an electric quadrupole moment should be expected for both Li^6 and N^{14}. While no accurate calculation of the magnitude of these moments may as yet be made, approximate methods should be capable of giving the correct sign of the moments. If the Hartree model is used, and if the small effects due to excitation of the alpha-particle core are neglected so that we have essentially a two-body problem, the quadrupole moments calculated for the three nuclei all have positive sign. Part of the inaccuracies inherent in the model may be eliminated by comparing the ratios of the quadrupole moments. We find

$$Q/Q(\mathrm{H}^2)=\begin{cases}27.5\beta^2/1+\beta^2 & \text{(neutral theory)}\\ 8.9\beta^2/1+\beta^2 & \text{(symmetrical theory).}\end{cases}$$

The use of these ratios and the observed value of $Q(H^2)$, together with the values of β determined above, amounts to an empirical determination of the fictitious potential used in the Hartree model. This, of course, depends on the validity of the assumption made above in regard to the source of the anomaly in the magnetic moments. If we use the neutral theory, which would be preferred if the deuteron moment is positive,[5] and with $Q(H^2)=2.5\times10^{-27}$ cm^2,[1] the values of β from (2) give $Q(Li^6)=4\times10^{-27}$ cm^2 and $Q(N^{14})=58\times10^{-27}$ cm^2. These values can at best be regarded as an order of magnitude estimate with considerable uncertainty prevailing in the case of the latter. However, a quadrupole moment increasing rather rapidly with increasing mass is to be expected.

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