independent of H_t. Maximum magnetic hardness apparently corresponds to initiation of an optimum number of nuclei between 800° and 900°C and growth of the precipitate in plates at 600°C which divide the matrix into plate and rod-like units whose shortest dimensions may be 100 to 1000A, so that they will behave as single ferromagnetic domains.

The coercive force presumably may be accounted for by the crystalline and magnetostatic anisotropy energy of the matrix units: the plate-like part of the volume will have $H_c=2K/I_s$, requiring a K of only $\sim 5\times 10^5$ ergs/cc, which is not unreasonable; additional coercivity of $\sim 2\pi p\Delta I_s$(20°C) from the rods may be important for reasonable values of ΔI_s and p, the fractional volume of precipitate.

The above theory does not require internal strains to have an important effect on the coercive force, and is in keeping with the fact that the disregistry strain of the transition lattice[5] is unusually small in Alnico V as compared with other permanent magnet alloys; further, on geometrical grounds it seems likely that the plate-like portion of the volume should be under large loading with symmetry axis normal to the plates. This gives no contribution to the coercive force if the magnetostriction is isotropic; if the magnetostriction is anisotropic, as in Ni, a strain of 0.1 percent (the disregistry strain) will give a small directional anisotropy in the plane of the plate, but in Ni this would only be about 2×10^4 ergs/cc, and it seems unreasonable to suppose a 25 times larger value in Alnico V.

We are indebted to J. H. Hollomon for general education on nucleation theory, to R. M. Bozorth under whose stimulus the experimental part of this investigation was undertaken, and to W. P. Mason, R. D. Heidenreich, and J. K. Galt for discussions on particular points.

[1] E. A. Nesbitt, J. App. Phys. (to be submitted).
[2] K. Hoselitz and M. McCaig, Proc. Phys. Soc. **B62**, 163 (1949).
[3] V. I. Drozhjina, M. G. Luzhinskaya, and Y. S. Shur, J. Tech. Phys. U.S.S.R. **19**, 95–99 (1949).
[4] J. C. Fisher, J. H. Hollomon, and D. Turnbull, J. App. Phys. **19**, 775 (1948).
[5] A. H. Geisler, Elec. Eng. **69**, 32–34 (1950).

The Thermal Neutron-Capture Cross Section of A^{36}

G. E. McMurtrie and D. P. Crawford*
Chalk River Laboratories, National Research Council of Canada, Chalk River, Ontario, Canada
January 16, 1950

THE thermal neutron-capture cross section of A^{36} has been measured as 6.5±1.0 barns. Approximately 500 cc (N.T.P.) of commercial argon were sealed in a boron-free glass flask and irradiated in the thermal column of the N.R.X. pile for one hour. The neutron flux through the gas was measured with manganese foils and found to be 8.6×10^9 neutrons/cm²/sec. These foils had been calibrated[1] by irradiating them in a neutron flux, the value of which was measured by means of a small pulse ion chamber filled with a known amount of BF_3. The neutron flux through the argon was thus based on the neutron-capture cross section of boron, the number of boron atoms in the ion chamber and the counting rate. The experimental error is given as 3.5 percent.

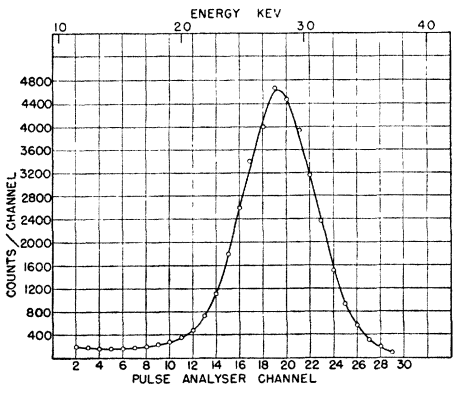

FIG. 1. Activity caused by K-capture in A^{37}.

It was found by comparing foils irradiated inside and outside of a similar glass flask that neutron absorption in this glass was negligible.

After removal of the flask from the reactor, the 110-minute A^{41} activity was allowed to decay through forty half-lives before introducing an accurately measured pressure (10.58 cm) of the irradiated gas into a proportional counter[2] preparatory to counting the A^{37} activity. The pulses from the counter were suitably amplified and fed to a thirty-channel pulse analyzer in parallel with a commercial scaler. (The latter served as a check on the total number of counts.)

The operation of the counter and the location of the 2.8 kev K-capture peak of A^{37} were checked by comparing the amplitude of the argon pulses with those produced by a beam of 17.4 kev x-rays (Mo $K\alpha$ line, selected by a crystal spectrometer). A typical run is shown in Fig. 1. The fraction of K-capture radiation which escapes from the counter must be allowed for, and has been estimated as 4.5 percent. Moreover, there is a low energy tail associated with the K-capture peak due to the reduced field strength at the ends of the counter. This tail must be extrapolated down to zero pulse size and its contribution added to the counting rate. The active volume of the counter (130.2 cc) was taken as the volume enclosed by the cylindrical cathode. It should be noted that the measurements do not extend below 1.2 kev and thus the L-capture radiation was not included. The contribution from L-capture has been measured by Pontecorvo, Kirkwood, and Hanna[2] as between 8 and 9 percent and calculated by Rose and Jackson[3] as 8.2 percent. A correction of 8.5 percent is applied.

The activity thus determined was corrected back to zero decay time using a half-life value of 34.1 days[4] for A^{37}. The calculation of the cross section was based on an isotopic abundance of 0.307 percent for A^{36}. The error shown in the value of the cross section 6.5±1.0 barns is the standard error. We thank Mr. G. C. Hanna for putting his apparatus at our disposal and for valuable help with the experiment.

* Now at Mount Allison University, Sackville, New Brunswick, Canada.
[1] F. W. Fenning, Montreal Report MP-252 (1946), National Research Council of Canada.
[2] This was the counter used by Pontecorvo, Kirkwood, and Hanna, Phys. Rev. **75**, 982 (1949).
[3] M. E. Rose and J. L. Jackson, Phys. Rev. **76**, 1540 (1949).
[4] Weimar, Kurbatov, and Pool, Phys. Rev. **66**, 209 (1944).

Temperature Dependence of Microwave Line Widths*

Raydeen Howard and William V. Smith
Department of Physics, Duke University, Durham, North Carolina
February 2, 1950

IN their pioneering work on the pressure broadening of the ammonia inversion spectrum, Bleaney and Penrose[1] assumed that the cross section σ for collisions interrupting the microwave radiation or absorption was independent of the average velocity of impact $\bar{v}$. Although the agreement between their data and theory is actually independent of any possible variation of σ with $\bar{v}$, their assumption has crept into many estimates of microwave intensities, by way of the assumed dependence of the line width parameter $\Delta\nu=(n\bar{v}\sigma)/(2\pi)$ on temperature. Thus the above "hard sphere" theory predicts a line width at constant pressure proportional to $T^{-\frac{1}{2}}(V\simeq T^{\frac{1}{2}}; n\simeq P/T)$.

Recent theories proposed by Anderson[2] and Margenau,[3] while differing in their basic assumptions, both predict a line width independent of the impact velocity, with σ inversely proportional to $\bar{v}$. These theories, too, are in agreement with Bleaney and Penrose's data, although Anderson's theory alone includes an explanation of observed saturation effect.[4]

We have performed the simple experiment of measuring $\Delta\nu$ for the ammonia 3,3 line as a function of temperature. The results