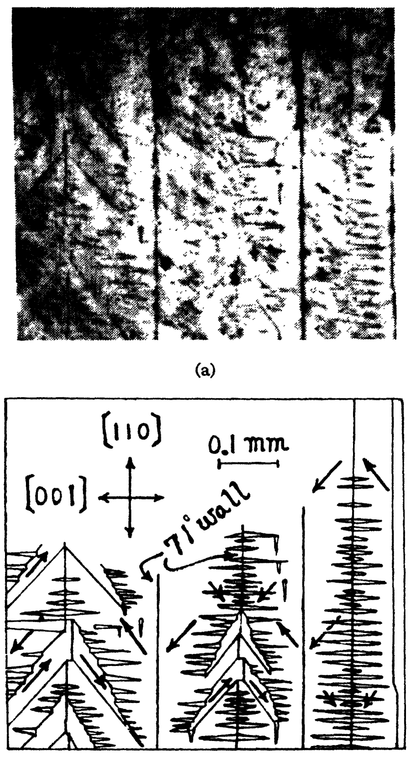

FIG. 2. Powder pattern on a $(\bar{1}10)$ surface of a nickel crystal as demagnetized by alternating field parallel to the [001] direction.

Although the domain patterns shown in the figures have been observed on nearly the same portion of the crystal surface, the pattern of Fig. 1 is characteristic of the state demagnetized by an alternating magnetic field parallel to the [110] direction in the $(\bar{1}10)$ plane, while we always observe the pattern of Fig. 2 immediately after the electrolytic polishing; and the domain pattern, obtained after demagnetization by an alternating field parallel to the [001] direction in the $(\bar{1}10)$ plane, is similar to the latter.

Finally, it should be noted that, even when the strain in the surface of the crystal is large, we never observe a maze pattern such as is reported for iron and silicon-iron crystals, although a dot-like pattern similar to that observed by McKeehan and Elmore[3] on the (100) plane of a nickel crystal has been obtained.

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Paramagnetic Resonance in Metal Ammonia Solutions at Very Low Fields

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December 29, 1950

HUTCHISON has reported paramagnetic resonance at 23,700 Mc in a solution of potassium in liquid ammonia.[1] A program of research on resonance of sodium in ammonia at low frequency has been underway at the Naval Research Laboratory, and preliminary results are reported herewith.

We have observed paramagnetic resonance in solutions of sodium in liquid ammonia at a field strength of 6.7 gauss, which corresponds to a frequency of about 19 Mc. The line width of the sodium solution resonance was less than 0.25 gauss between the points of maximum slope on the absorption line. The observations were made at dry ice temperatures and at atmospheric pressure. About 10 cc of solution was used, the concentration for sodium varying from 0.1 to 0.5 M per liter of ammonia.

For all of the concentrations used the signal was much weaker than that observed in diphenyl picryl hydrazyl $(C_6H_5)_2N-NC_6H_2(NO_2)_3$ at these same low fields (i.e., as much as fifty times smaller in signal to noise). The signal strength appears to depend very sharply on the concentration of the solution. The exact relationship between concentration and signal strength is being investigated further.

The resonance in Na was also observed at 9230 Mc which correspond to a field of about 3300 gauss.

Similar observations have been made at these low fields on solutions of potassium in ammonia, with results which agree with the observations of Hutchison.[1]

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Heat Production in Potassium

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January 2, 1951

RECENT determinations of the decay constants, gamma-ray and beta-ray energies, and the shape of the beta-ray spectrum of K^{40} now permit a more precise evaluation of the rate of heat production in potassium. Experiments of Sawyer and Wiedenbeck[1] have shown that 28.3 ± 1.0 beta-rays and 3.6 ± 0.3 gamma-rays are emitted per gram K per sec. The gamma-ray occurs in the K-capture branch and has an energy of 1.47 ± 0.01 Mev, an average value taken from the measurements of Bell and Cassidy,[2] of Pringle, Standil, and Roulston,[3] and of Hofstadter and McIntyre.[4]

The predominant heat energy occurs in the beta-branch and estimates thus depend strongly on the characteristics of the beta-ray spectrum. A calculation of the mean beta-ray energy of K^{40} has been made based on the work of Bell, Weaver, and Cassidy,[5] of Alburger,[6] and of Feldman and Wu.[7] Their values for the end-point energy have a weighted mean of 1.34 ± 0.02 Mev, and all three groups find that the shape of the spectrum agrees with the third forbidden correction factor above 500 to 700 kev. Since the deviations below 500 kev are attributed to source thickness effects, it is assumed here that the spectrum has the third forbidden shape over the entire range of energies.

The idealized momentum plot for a third forbidden type beta-emitter with end point at 1.34 Mev was constructed using the nonrelativistic function $f(Z, \eta)$ corrected for relativistic effects according to the table of Feister.[8] This was then converted to the energy distributions $N(W)WdW$ and $N(W)dW$ *versus* W and the areas under these curves were measured with a planimeter. The ratio of areas gives a mean energy for K^{40} beta-rays of 0.605 ± 0.010 Mev, somewhat higher than the older value, 0.49 ±0.06 Mev, listed by Marinelli, Brinckerhoff, and Hine.[9]

The total heat production using the revised beta- and gamma-ray energy values and Sawyer and Wiedenbeck's emission rates is readily computed to be $(27\pm1)\times10^{-6}$ cal per gram K per year. This may be compared with $(22\pm3)\times10^{-6}$ cal per gram K per year calculated by Gráf[10] from earlier data.

The author is indebted to Dr. Francis Birch of Harvard for pointing out the desirability of a re-evaluation of the mean beta-ray energy and to Mrs. Dale Meyer who carried out the detailed calculations.

* Under contract with AEC.
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