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¹ Rush, J. H., and Trotter, Dorothy E., *Astron. J.*, 59, 191 (1954).

Magnetic Structure of Manganese Arsenide

WE have examined by neutron diffraction a number of samples of polycrystalline manganese arsenide, MnAs, prepared by Mr. A. Bentham by heating manganese and arsenic in a sealed quartz tube, with the view of confirming the antiferromagnetism postulated by Guillaud¹ in this material between the two transformation temperatures of about 40° and 130° C. No new reflexions due to antiferromagnetism have been observed, nor have we found any intensity changes within this region greater than the possible experimental errors. It seems clear that any antiferromagnetism must be very weakly developed: unfortunately, the precision of the experiment is much reduced by the fact that the important reflexions (0002) and (10 $\bar{1}$ 1) are almost coincident in the powder diffraction pattern.

In the ferromagnetic region, from room temperature down to 80° K. which is the lowest temperature we have yet employed, the results suggest that the magnetic moments of the manganese atoms are

Fig. 1. Neutron diffraction by manganese arsenide: variation of intensity of 10 $\bar{1}$ 0 reflexion with temperature. —, Heating; ---, cooling

not aligned along the c-axis, as was at first supposed, but, to a first approximation, are perpendicular to c.

We are at present engaged in the preparation of single crystals of the material, by fusion of manganese and arsenic in an atmosphere of argon at pressures of the order of 1,000 lb./sq. in., with the hope of making a thorough investigation of the magnetic moment orientation from the much more intense and well-defined single-crystal neutron reflexions. Fig. 1, which shows some results already obtained by partial isolation of a grain in a coarse-grained specimen, illustrates the power of the method. The

(10 $\bar{1}$ 0) reflexion from this grain had a peak count of 1,600 neutrons per min., compared with 200 neutrons per min. from a large powder sample: this count was sufficiently large for the temperature-intensity curve to be plotted quite accurately as the substance passed through the lower transformation temperature, due allowance being made for the change in unit-cell dimensions² which was observed in the experiments. The temperature hysteresis in the transformation, as indicated by the rise and fall of magnetic scattering with decrease and increase of temperature respectively, is clearly shown in Fig. 1.

It is hoped to publish a more detailed account of this work at a later date.

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¹ Guillaud, C., *J. Phys.*, 12, 223 (1951).

² Willis, B. T. M., and Rooksby, H. P., *Proc. Phys. Soc.*, B, 67, 290 (1954).

An Amplifier based on the Hall Effect

THE very high electron mobility shown by the semi-conducting compound indium-antimony, InSb¹, when sufficiently pure, means that the power available from the Hall effect is sufficiently high to make possible a number of new applications². We have now been able to achieve power amplification by using the effect in the following way.

The signal to be amplified, d.c. or a.c., is fed to a suitably matched coil wound on a laminated magnetic core, in which it induces a corresponding flux. The core is closed except for a narrow gap into which is inserted a thin rectangular slice of single-crystal indium-antimony. Direct current is made to flow through the slice parallel to its long axis, by means of soldered copper leads, the current being provided by a local battery. The Hall effect due to the combined field and current gives rise to an e.m.f. orthogonal to both. This is picked up by a pair of transverse leads and connected to a matched load. The current in the load is then a replica of the original signal.

In a first experimental arrangement a power gain of five has been measured; but there is no theoretical reason why

much higher values should not be attained with a single stage. Cascading of stages presents no difficulty. An upper frequency-limit is set by core losses.

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¹ Madelung, O., and Weiss, H., *Z. Naturforsch.*, 9(a), 527 (1954).

² Saker, E. W., and Cunnell, F. A., *Research*, 7, 114 (1954).