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ITINERANT ANTIFERROMAGNETISM OF TiBe_2 (*) (**)

B. T. MATTHIAS (***), A. L. GIORGI, V. O. STRUEBING and J. L. SMITH

Los Alamos Scientific Laboratory, University of California
 Los Alamos, New Mexico 87545, U.S.A.

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Résumé. — TiBe_2 est le premier antiferromagnétique itinérant.

Abstract. — TiBe_2 is the first itinerant antiferromagnet.

FIG. 1. — Inverse magnetic susceptibility and electrical resistivity of TiBe_2 as a function of temperature.

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(***) Department of Physics, University of California, San Diego, La Jolla, California 92093 and Bell Laboratories, Murray Hill, New Jersey 07974. Research in La Jolla sponsored by NSF/DMR77-08469.

Itinerant electron ferro- or antiferromagnetism in metallic compounds can only be taken for certain, if neither of the elements is known ever to have a local moment in its metallic state. Until now, of all known materials only Sc_3In [1] and ZrZn_2 [2] fulfilled this criterion. On the basis of a recent theoretical analysis [3] it seemed quite probable that TiBe_2 , crystallizing in a cubic Laves phase would also be an itinerant magnet. We have now verified this expectation and thus found a third, truly itinerant magnet. In figure 1 the inverse magnetic susceptibility shows TiBe_2 to be an antiferromagnet with its Néel point near 10 K and a magnetic moment of $1.64 \mu_B$. The metallic nature is obvious by the Ti-Ti distances,

FIG. 2. — Effect of replacement of 10 at. % Ti by other elements. Zr and Nb essentially coincide with Sc.

which are identical to those of the pure element as well as through its R vs. T behaviour as shown in the insert (Fig. 1). The lattice parameter of the material is $a_0 = 6.4532 \pm 4 \text{ \AA}$.

Both elements in TiBe_2 are superconductors by themselves and the resemblance to ZrZn_2 is unmistakable. However, while ZrZn_2 is a weak ferromagnet with a Curie point near 30 K, there is as expected from figure 1, no evidence for a spontaneous magne-

tization in TiBe_2 below its critical temperature. We have not found any superconductivity above 20 mK. As had been anticipated [3], titanium is essential for the magnetism and any dilution with neighbouring elements will invariably reduce the magnetic moment, see figure 2. With this discovery of itinerant antiferromagnetism in TiBe_2 , based on the theory of ZrZn_2 , it may well be possible now to predict further itinerant electron magnets.

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