

Letter

Magnetic properties of CeAg_2Ge_2

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Received 4 July 1995

Abstract

A.c. susceptibility and magnetization measurements of CeAg_2Ge_2 are reported. Two phase transitions at $T = 7$ and 11 K are detected. The magnetization curve at $T = 4.2$ K has a two-step character.

Keywords: Magnetic properties; CeAg_2Ge_2

1. Introduction

The 1-2-2 Ce compounds have been investigated extensively because of their anomalous magnetic properties, such as superconductivity, valence fluctuations, Kondo effects and magnetic transitions depending on the magnitude of hybridization between 4f magnetic electrons and conduction band electrons [1]. The CeAg_2Ge_2 compound belongs to this group. It is an antiferromagnet with $T_N = 7$ K [2]. The neutron diffraction experiment shows a sine-modulated structure with a magnetic moment equal to $1.85(15) \mu_B$ at $T = 1.5$ K [3].

In this work we studied the magnetic properties of CeAg_2Ge_2 in low and high magnetic fields.

2. Experiment and results

A polycrystalline sample of CeAg_2Ge_2 was prepared by arc melting the high-purity constituent and annealing at 500°C for 10 d. The X-ray diffraction showed that the sample crystallized in the body-centered tetragonal ThCr_2Si_2 -type structure. The a.c. susceptibility was measured using a mutual inductance bridge. The magnetization was measured by means of a vibrating sample magnetometer. The high-field mag-

netization measurement was carried out with a ballistic magnetometer in a Bitter-type magnet.

The temperature dependence of the a.c. susceptibility and d.c. magnetization in the magnetic field $H = 160$ Oe indicates two anomalies at 7 and 13 K when measured with a.c. susceptibility, and 7 and 11 K when measured with d.c. magnetization (Fig. 1). The first one is equal to that observed in Ref. [2], whereas the second indicates a new phase transition. The magnetization curve at $T = 4.2$ K increases linearly with increasing magnetic field up to 5 kOe (Fig. 2),

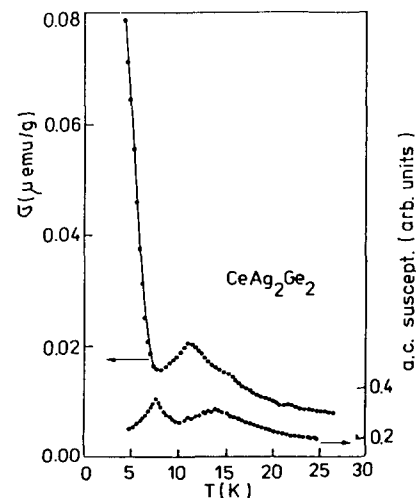


Fig. 1. Temperature dependence of the d.c. magnetization (at $H = 160$ Oe) and a.c. magnetic susceptibility for CeAg_2Ge_2 .

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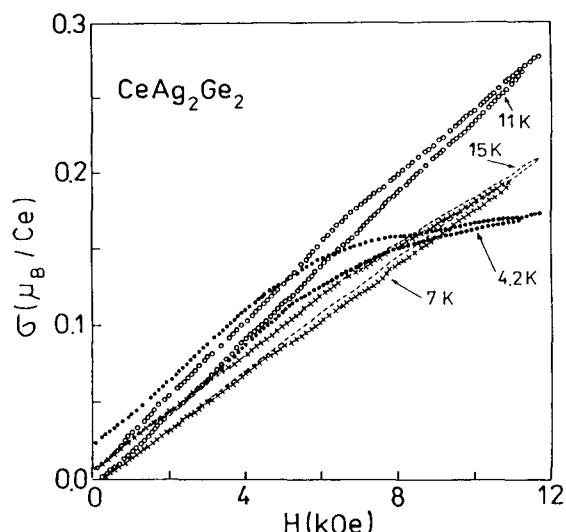


Fig. 2. Magnetization curves of CeAg_2Ge_2 at various temperatures.

and another increase is observed in the magnetic field greater than 20 kOe (see Fig. 3). The magnetic moment at $T = 4.2$ K and $H = 140$ kOe is $0.8 \mu_B$, which is only 43% of the value observed in the neutron

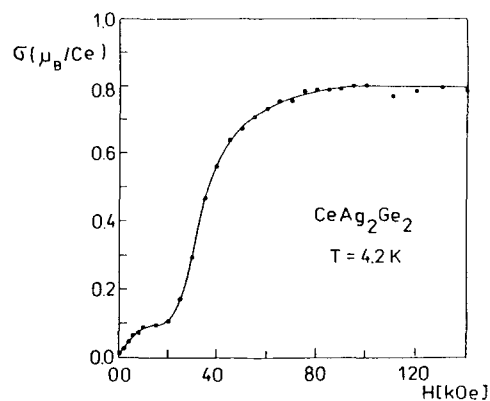


Fig. 3. High-field magnetization curve for CeAg_2Ge_2 at $T = 4.2$ K.

diffraction experiment. At temperatures of 7, 11 and 15 K (see Fig. 2) the magnetization is a linear function of the magnetic field. A small hysteresis of the magnetization is observed at all temperatures.

3. Conclusions

The results presented in this work indicate that in CeAg_2Ge_2 two magnetic phase transitions at 7 and 11 K exist. Below 7 K a sine-modulated structure is observed [3]. In the temperature region 7–11 K there are no neutron diffraction data. In the isostructural CeRh_2Ge_2 and CeRu_2Ge_2 compounds two phase transitions are also observed [4].

The magnetization curve of CeAg_2Ge_2 at $T = 4.2$ K has a two-step character.

Acknowledgement

This work has been partially supported by the State Committee for Scientific Research in Poland with Grant No. 2 PO3B 087 08.

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