THE MAGNETIC PROPERTIES OF EuTe THIN FILMS

A. Radomska and T. Balcerzak
Department of Solid State Physics, University of Łódź
ul. Pomorska 149/153, 90-236 Łódź, Poland

9.7 cm

The theoretical studies of ultra-thin magnetic films of EuTe have been carried out. It is assumed that the thin film is composed of several monoatomic (111) planes, with the boundary conditions depending on the interaction of the surface layers with the substrate. The ferromagnetic interaction with the nearest-neighbours and the antiferromagnetic interactions with the next-nearest-neighbours have been considered in the frame of the Heisenberg model (S=7/2). In addition, the biquadratic and the long-range dipolar interactions existing in EuTe, have also been taken into account. In the molecular field method, supplemented by the Gibbs energy analysis, the phase diagrams and the magnetization distributions have been studied, depending on the surface exchange parameter. It has been found that for the bilayer and trilayer, above a certain threshold value of the surface parameter, the phase transition takes place from the 2-nd type antiferromagnetic phase (which is typical for bulk EuTe) to the ferromagnetic phase. However, for thicker films, in such case the new phase occurs, which is characterized by the ferromagnetic ordering between the surface and adjacent plane, and the antiferromagnetic coupling of inner planes. The results are illustrated in the figures and discussed.

13.4 cm

Subject category :

2. Magnetic Films, Surfaces and Multilayers

Presentation mode :
poster

Corresponding author :
Tadeusz Balcerzak

Address for correspondence :
Solid State Physics Department
University of Łódź
ul. Pomorska 149/153, 90-236 Łódź, Poland

Email address :
tbalcerz@krysia.uni.lodz.pl