About negative magnetization in non-superconducting intermetallics

W. Suski

Institute of Low Temperature and Structure Research, Polish Academy of Sciences
Okólna 2, P.O. Box 1410, 50-950 Wrocław 2, Poland
and
International Laboratory of High Magnetic Fields and Low Temperatures
Okólna 2, 50-985 Wrocław 47, Poland

Since eighties some papers reported anomalous behavior of the negative magnetization observed at low temperatures. As far as the author is informed this type of the temperature dependence of magnetization has been described for the magnetically ordered materials with two types of the relative complicated crystal structures , namely the tetragonal $ThMn_{12}$ and the rhombohedral Th_2Zn_{17} ones. As a rule this phenomenon has appeared in the temperature dependence of the magnetization for the zero field cooled (ZFC) samples and has vanished in the field cooled (FC) samples. Such a behavior is demonstrated by the alloys of the rare earths: $SmFe_5Al_7$, $TbFe_5Fe_7$ and $Tb_{2.1}Co_{14..9}Si_3$, which are ferromagnetic and exhibit tetragonal crystal structure for the two former materials whereas the last one is rhombohedral. Also in the tetragonal uranium compound $UCu_{3.5}Fe_{1.5}Al_7$ which seems to be ferrimagnetic, the negative magnetization is observed in ZFC sample. In turn, antiferromagnetic tetragonal $YbFe_4Al_8$ shows the negative magnetization in FC sample in lower magnetic field below about 200 Oe. It has been suggested that this feature can result from different anisotropy directions of the *f*-metal and transition metal sublattices, respectively. The hypotesis of the superconductivity (field induced?) for the Yb compound is clearly less realistic. Recently, the single crystal of $YbFe_4Al_8$ was obtained and the temperature dependence of the magnetic susceptibility does not exhibit negative values neither in ZFC nor FC runs. Therefore, one can conclude that the negative magnetization results most probably from the crystallographic imperfections, at least for the last compound.

Name of the presenting author (poster): Wojciech Suski
e-mail address: w.suski@int.pan.wroc.pl
url's: http://www.int.pan.wroc.pl