FERROMAGNETIC (Ge,Mn)Te SEMICONDUCTOR THIN LAYERS

T. Story[a], W. Knoff[a], V. Domukhowski[a], P. Dziawa[a], M. Gorska[a], B. Taliashvili[a], J.R. Anderson[b], C.R. Rotundu[b]

[a]Institute of Physics, Polish Academy of Sciences, Warsaw, Poland

[b]Department of Physics and Center for Nanophysics and Advanced Materials, University of Maryland, College Park, MD, USA

Magnetic properties of monocrystalline (Ge,Mn)Te epitaxial layers with varying crystal stoichiometry and carrier concentration have been studied experimentally. The 0.5-1 micron thick (Ge,Mn)Te layers were grown on insulating BaF_2 substrates by molecular beam epitaxy technique with crystal stoichiometry controlled during the growth by applying additional Te molecular flux. Superconducting magnetometry (SQUID) technique was used to study the temperature and magnetic field (up to 7T) dependence of the magnetization of the (Ge,Mn)Te layers with Mn content of 5-20 atomic percent. The results indicated a ferromagnetic transition with the Curie temperature in the range 10-100 K. Depending on the growth conditions, (Ge,Mn)Te layers exhibit either a standard (mean-field like) or an unsual (concave-like) temperature dependence of magnetization, with a broad paramagnet to ferromagnet transition region. In (Ge,Mn)Te layers both standard (in-plane) as well as unusual (normal to the layer plane) location of magnetization easy axis is observed. These experimental findings are discussed considering crystal lattice distorsions and stress present in (Ge,Mn)Te layers as well as possible micro-scale phase separation effects of either electronic or physico-chemical origin.

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corresponding author: T. Story
address: Al. Lotnikow 32/46, 02-668 Warsaw, Poland
e-mail: story@ifpan.edu.pl