Magnetic, transport and positron annihilation studies of $Zn_{1-x}(Mn;Co)_xGeAs_2$ semimagnetic semiconductor

L. Kilanski[a,b], M. Gorska[a], V. Domukhovski[a], W. Dobrowolski[a], A. Zubiaga[b], F. Tuomisto[b], J. R. Anderson[c], C. Rotundu[c], S. Varniavskii[d], and S. F. Marenkin[d]

[a]Institute of Physics, Polish Academy of Sciences, Warsaw, Poland
[b]Department of Engineering Physics, Helsinki University of Technology, Espoo, Finland
[c]Department of Physics, University of Maryland, College Park, USA
[d]Kurnakov Institute of General and Inorganic Chemistry RAS, Moscow, Russia

We have performed magnetic, transport, and defect studies of $Zn_{1-x}(Mn;Co)_xGeAs_2$ mixed crystals with $0.052 \leq x \leq 0.182$. Magnetic investigations showed appearance of a ferromagnetic phase for $x \geq 0.078$ with $T_C > 320$ K. Transport measurements performed at $1.3 \leq T \leq 400$ K included basic resistivity and Hall effect measurements as well as high magnetic field (up to $B = 13$ T) studies. Our results showed p-type conductivity (semiconducting or metallic, depending on the alloy composition) with carrier concentrations $p > 10^{19}\,\mathrm{cm}^{-3}$. High magnetic field studies revealed negative magnetoresistance for $T < 15$ K (up to 33%) with values strongly depending on the sample composition. We were also studying Schottky type defects using positron annihilation spectroscopy technique. Results of positron lifetime and Doppler broadening measurements showed that there are significant differences in defect parameters for samples with different compositions. Performed measurements showed that via alloying we are able to control significantly many properties of studied semimagnetic semiconductor.

9.7 cm

13.4 cm

Subject category :
4. Spin Electronics and Magneto-Transport

Presentation mode :
poster

Corresponding author :
L. Kilanski

Address for correspondence :
Lukasz Kilanski (ON 1.3)
Institute of Physics,
Polish Academy of Sciences,
Al. Lotnikow 32/46,
02-668 Warsaw, Poland

Email address :
kilan@ifpan.edu.pl