Magnetic, transport and positron annihilation studies of 
Zn$_{1-x}$(Mn;Co)$_x$GeAs$_2$ semimagnetic semiconductor

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We have performed magnetic, transport, and defect studies of Zn$_{1-x}$(Mn;Co)$_x$GeAs$_2$ 
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 concen-
trations $p > 10^{19}$ 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.

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