AC magnetic susceptibility studies of spin-glass phase in Ge$_{1-x-y}$Sn$_x$Mn$_y$Te mixed crystals

L. Kilanski$^a$, M. Arciszewska$^a$, V. Domukhovski$^a$, W. Dobrowolski$^a$, V. E. Slynko$^b$, and I. E. Slynko$^b$

$^a$Institute of Physics, Polish Academy of Sciences,
Al. Lotnikow 32/46, 02-668 Warsaw, Poland

$^b$Institute of Material Science Problems, Ukrainian Academy of Sciences,
5 Wilde Street, 274001 Chernovtsy, Ukraine

We present studies of magnetic and transport properties of Ge$_{1-x-y}$Sn$_x$Mn$_y$Te mixed crystals with $0.083 \leq x \leq 0.142$ and $0.012 \leq y \leq 0.119$. Magnetic investigations consisted of AC magnetic susceptibility measurements including linear and harmonic susceptibilities measured as a function of temperature and of applied magnetic field amplitude and frequency. Qualitative analysis of experimental results showed appearance of a spin-glass phase at $T < 80$ K. Moreover, measurements of AC magnetic moment $m$ as a function of magnetic field showed hysteretic behavior characteristic of spin-glass systems. Via alloying we are able to tune spin freezing temperature in the range of 10-50 K. Transport characterization (resistivity and Hall effect measurements) of our samples was performed for temperatures between 4.2-300 K. The results showed semimetallic p-type conductivity with large carrier concentrations ($p > 10^{21}$ cm$^{-3}$) and relatively low mobilities ($\mu < 100$ cm$^2$V$^{-1}$s$^{-1}$). We have also observed the dependence of transport properties on the chemical composition of the sample. Thus, both magnetic and electrical properties in the investigated compound can be tuned via alloying in a wide range.

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**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