Nanocomposites and nanomaterials

Influence of phase content on physical properties of nanostructured Cu_Mn-Al and Cu alloys

V.M. Nadutov [1], A.O. Perekos [1], V.V. Kokorin[2], T.V. Efimova[1], V.P. Zalutsky[1], V.V. Trachevsky[1], S.M. Konoplyuk[2]

[1] *Institute of Magnetism, National Academy of Science of Ukraine and Ministry for Education and Science of Ukraine, Vernadsky Blvd. 36-b, Kyiv 03680, Ukraine*
E-mail: ksm@imag.kiev.ua

[2] *G.V. Kurdyumov Institute for Metal Physics, National Academy of Science of Ukraine, Vernadsky Blvd. 36, Kyiv 03680, Ukraine.*

Specimens of compacted Cu-Mn-Al [1] and Cu powders have been investigated to find effect of constituent phases on their transport properties and magnetic ordering. Nanocrystalline powders were prepared by the electric-spark dispersion method from bulk materials and then consolidated using pressing and following annealing at high temperatures in different gas atmospheres. X-ray diffractometry, nuclear magnetic resonance (NMR) methods were used to find phase compositions and determine magnetism of the specimens obtained.

The structural phase analysis showed that metallic nanoparticles were covered by metal oxide film that was responsible for the transport properties typical for semiconductors. Study demonstrated that annealing of Cu leads to changing semiconducting character of electric conductivity for metallic one. This change advances as temperature of annealing increases. In case of Cu-Mn-Al, annealing has minor effect on amount of oxide phases and therefore semiconducting behavior remains unchanged.

NMR study has detected satellite lines in NMR spectrum of the Cu-Mn-Al specimens, which are indicative of the Zeeman hyperfine splitting of nucleus energy levels due to ferromagnetism of Cu_2MnAl phase.

1. *Konoplyuk, S. M.; Kokorin, V. V.; Kolomiets, O. V.; Perekos, A. E.; Nadutov, V. M.* Magnetoresistance of Cu-Mn-Al melt-spun ribbons containing the system of interacting ferromagnetic inclusions // JMMM.-2011.-**323**, N 6.-P. 763-766.