Nanocomposites and nanomaterials

Peculiarities of transport properties of graphite intercalation compounds with cobalt

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The work presents the results of experimental investigations of transport properties of graphite intercalation compounds (GICs) with cobalt. As source for GICs highly oriented pyrolitic graphite (HOPG) was chosen. For intercalation a two-step method of synthesis was used. The electro- and magnetoresistivity, Hall coefficient and thermopower of GICs with cobalt were carried out in temperature interval (1.6-293) K and in magnetic field up to 5 T.

As studies have shown, intercalation leads to significant changes in the transport properties of the source for intercalation HOPG. Some of these changes are common to all intercalated compounds. In particular, the intercalation resulted in changes of sign of temperature coefficient of resistance from negative in HOPG to positive in GICs. The thermopower of GICs in all temperature range is positive, and the character of its temperature dependence varies considerably compared to source HOPG. However, some properties of GICs with cobalt are unique and were not observed in any other GICs. These are extraordinary Hall effect (EHE), effect of asymmetric magnetoresistance (AMR) and effect of linear magnetoresistance (LMR). The EHE is typical for magnetic metals. The AMR effect was observed in multilayer films with strong magnetic anisotropy (Co/Pd films, thin nickel films [1]). The LMR effect as shown in works of Abrikosov [2] occurs in systems with zero band gap and linear energy spectrum. In presented work the causes and peculiarities of these effects in GICs with cobalt are carefully analyzed.

1. *Segal A., Shaya O., Karpovski M., Gerber A.* Asymetric field dependence of magnetoresistance in magnetic films // Phys. Rev. B-2009.-**79**.-P. 144434-1-144434-6.
2. *Abrikosov A. A.* Quantum magnetoresistance of layered semimetals // Phys. Rev. B-1999.-**60**, N6.-P. 4231- 4234.