LOW TEMPERATURE MAGNETIC PROPERTIES OF SOLID SOLUTIONS BASED ON LANTANUM INDATE

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When considering the magnetic properties of materials, only the contributions of ferro- or paramagnetic ions are usually taken into account. The contribution of diamagnetic ions is usually neglected. However, for magnetically diluted materials containing small amounts, for example, of paramagnetic particles, one can expect that the contribution of diamagnetism may be comparable with the contribution of paramagnetic particles and even exceed it (especially at low temperatures). Only a few cases of experimental verification of this assumption are known. In this work, an attempt is made to compare the contributions of dia- and paramagnetic ions to the magnetic properties of ceramic samples of $La_{1-x}Ln_xInO_3$ solid solutions (*Ln* = Pr, Sm, Eu, Nd; $x = 0.001 - 0.1$).

It was found that the specific magnetization (σ_{sp}) of the majority of the studied solid solutions with increase of the magnetic field (up to 14 T) increases nonlinearly with a gradual approach to magnetic saturation, which, however, is not achieved in a field up to 14 T.

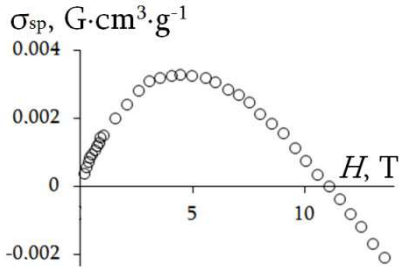

Figure 1. Field dependence of the specific magnetization of $La_{0.995}Eu_{0.005}InO_3$ at 5 K.

At 5 K for $La_{0.995}Eu_{0.005}InO_3$ (**Figure 1**) and $La_{0.999}Pr_{0.001}InO_3$, an increase of the magnetic field up to 5 T leads to a gradual increase of the paramagnetic specific magnetization. With a further increase of the magnetic field, a gradual decrease in the value of the specific magnetization occurs, which then passes into the negative (diamagnetic) region. This is due to the fact that the diamagnetic contribution to the magnetization of these solid solutions becomes larger than the paramagnetic one, and in magnetic fields above 11 T it is determined by the diamagnetic contribution. Specific magnetization at 5 K of other solid solutions based on lanthanum indate is positive in magnetic fields up to 14 T. Undoped $LaInO_3$ is diamagnetic in magnetic fields up to 14 T. Thus, the results of this work indicate that in the case of dilute magnetic materials, the diamagnetic contribution to the magnetization of the samples can indeed prevail over the paramagnetic contribution.