Magnetic and photoluminescent properties of $La_{1-x}Nd_xInO_3$ solid solutions ($0.007 \le x \le 0.05$) with perovskite structure

L.A. Bashkirov[1], E.K. Yukhno[1], N.A. Mironova-Ulmane[2], A.G. Sharakovsky[2], P.P. Pershukevich[3], L.S. Lobanovsky[4], S.V. Truhanov[4], E.I. Bogdanov[1]

[1]*Belarusian State Technological University, Minsk*

[2]*University of Latvia Institute of Solid State Physics, Riga*

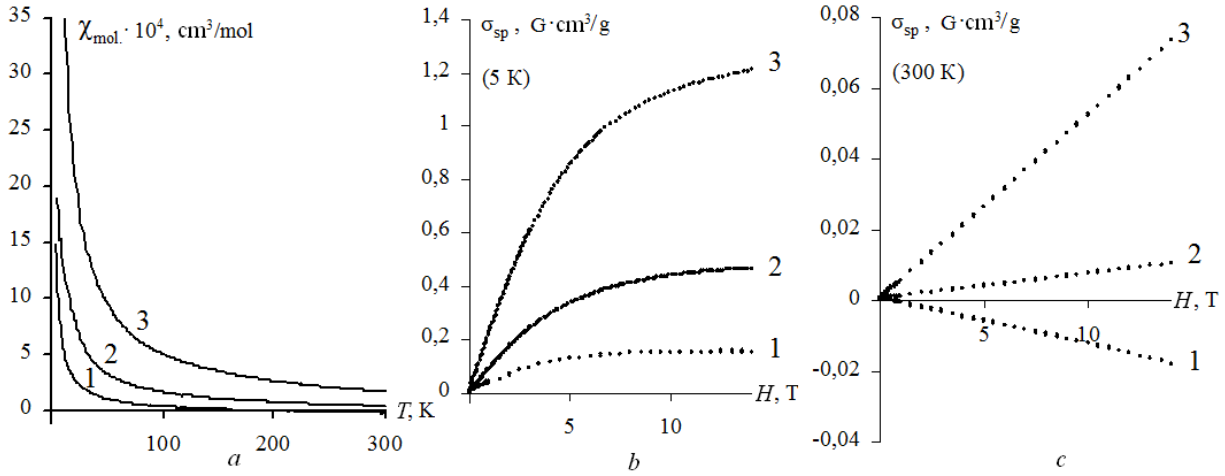
[3]*B. I. Stepanov Institute of Physics NAS of Belarus, Minsk*

[4]*Scientific-Practical Materials Research Centre of NAS of Belarus, Minsk*

e-mail: bashkirov@belstu.by

For $La_{1-x}Nd_xInO_3$ (x = 0.007, 0.02, 0.05), $La_{1-x}Nd_xIn_{1-y}Cr_yO_3$, $La_{1-x}Nd_xIn_{1-y}Mn_yO_3$ (x = 0.05, y = 0.005) solid solutions magnetic susceptibility in the temperature range of 5–300 K in a magnetic field of 0.86 T was measured and effective magnetic moment of Nd^{3+} ions was calculated (Fig. *a*). Magnetization dependences of these solid solutions on the magnetic field up to 14 T were investigated at 5 K and 300 K.

X-ray diffraction patterns showed that the samples were single-phase and had the structure of orthorhombically distorted perovskite.



x = 0.007 (1); 0.02 (2); 0.05 (3)

Fig. 1 Magnetic properties of $La_{1-x}Nd_xInO_3$ solid solutions: *a* – the temperature dependence of the molar magnetic susceptibility, *b*, *c* – the field dependence of the specific magnetization at 5 K and 300 K

The effective magnetic moment of the Nd^{3+} ion for $La_{1-x}Nd_xInO_3$ solid solutions with x = 0.007, 0.02, 0.05 was significantly smaller than its theoretical value (3.62 μ_B). The magnetic moments of Nd^{3+} ions for $La_{1-x}Nd_xInO_3$ solid solutions with x = 0.007, 0.02, 0.05 calculated from their magnetization value at 5 K in a field of 14 T (Fig. *b*) were equal to 1.18 μ_B, 1.26μ_B, 1.31 μ_B, respectively.

With an increase in Nd^{3+} ions content in $La_{1-x}Nd_xInO_3$ from x = 0.007 to 0.05 there was a significant increase in photoluminescence intensity at infrared wavelengths. The intensity of the photoluminescence band at λ = 860–960 nm for $La_{0,95}Nd_{0,05}In_{0,995}Cr_{0,005}O_3$ sample was higher than that for $La_{0,95}Nd_{0,05}InO_3$ sample due to the superposition of Nd^{3+} and Cr^{3+} ions photoluminescence bands.