## THERMODYNAMIC AND ELECTROPHYSICAL CHARACTERISTICS OF THE $Nd_2O_3$–MgO–NiO–$Mn_2O_3$ SYSTEM

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Modification and combination of alloying elements in $NdMnO_3$-based compounds allow for the production of materials with valuable physical and chemical properties.

In the $Nd_2O_3$-MgO-NiO-$Mn_2O_3$ system, the compound $NdMg_2NiMnO_6$ was synthesized using a high-temperature ceramic method at 400–1200 °C.

The temperature dependence of the heat capacity of $NdMg_2NiMnO_6$ in the range 298.15–673 K was studied using the IT-C-400 calorimeter, the principle of operation of which is described in detail in [1].

The temperature dependence of the heat capacity of $NdMg_2NiMnO_6$ shows λ-shaped peaks at 348 and 473 K, which are probably related to phase transitions. Using these peaks, the following equations for $C^0_p \sim f(T)$, [J/(mol·K)], have been calculated:

$C^0_p = -(75\pm3) + (1024\pm41)\cdot10^{-3}T$, (298-348 K)
$C^0_p = (1004\pm40) - (2077\pm84)\cdot10^{-3}T$, (348-398 K)
$C^0_p = (2109\pm85) - (2286\pm92)\cdot10^{-3}T - (1618\pm65)\cdot10^{5}T^{-2}$, (398-473 K)
$C^0_p = (1187\pm48) - (1867\pm75)\cdot10^{-3}T$, (473-548 K)
$C^0_p = (541\pm22) + (33\pm1{,}32)\cdot10^{-3}T - (1185\pm48)\cdot10^{5}T^{-2}$. (548-673 K)

$S^0(298{,}15)$ of the $NdMg_2NiMnO_6$ compound is estimated by the method of ion entropy increments of Kumok. Using the experimental dependence of $C^0_p \sim f(T)$ and the calculated $S^0(298{,}15)$, $C^0_p(T)$, $S^0(T)$, $H^0(T)-H^0(298{,}15)$, $\Phi^{xx}(T)$ are determined.

Using the LCR-781 setup in the 293-483 K (1, 5, and 10 kHz) range, it was found that the dielectric constant of $NdMg_2NiMnO_6$ increases sharply with increasing temperature ($\varepsilon \approx 1.16\times10^7$ at 483 K), while the resistance decreases ($1.53\times10^6 \rightarrow 1.38\times10^4$ Ohm), confirming the semiconductor nature of the conductivity.

1. Kasenova Sh.B., Sagintaeva Zh.I., Kasenov B.K., Kuanyshbekov E.E., Ordabaeva A.T., Isabaeva M.A. Heat Capacity and Thermodynamic Characteristics of Sodium and Potassium Nickelite-Manganites of Neodymium of $NdNa_2NiMnO_5$ and $NdK_2NiMnO_5$ // Applied Sciences, 2025, 15, 6751. https://doi.org/10.3390/app15126751

*This research has been/was/is funded by the Science Committee of the Ministry of Science and Higher Education of the Republic of Kazakhstan (Grant No. AP23486147).*