

**SYNTHESIS AND THERMODYNAMIC STUDY OF COMPOUNDS
BASED ON BISMUTH, LUTETIUM AND INDIUM OXIDES**

Semerikova A.N.⁽¹⁾, *Matskevich N.I.*^(1,2), *Rozhina M.Yu.*⁽¹⁾, *Dobretsov P.A.*^(1,2)

⁽¹⁾ Nikolaev Institute of Inorganic Chemistry SB RAS

630090, Novosibirsk, Acad. Lavrentiev Ave., 3

⁽²⁾ Novosibirsk State Technical University

630073, Novosibirsk, K. Marksa Ave., 20

Compounds on the basis of bismuth, lutetium and indium oxide are promising materials for environmentally friendly energy conversation technologies and engineering utilized photocatalytic activity, magnetic properties et al. Solid oxide fuel cells (SOFC) might become one of the most actively developing endeavors near term. Electrolytes based on yttria stabilized zirconia and gadolinia doped ceria have been widely used, however possess disadvantages: high operation temperature, certain demands on condition. That is why new high efficient oxide ion conductors are required. δ - Bi_2O_3 demonstrates high ion conductivity, but can exist within narrow band (1000-1100K). The inclusion lanthanide ions in cubic Bi_2O_3 -structure may result to high conductivity with stability at intermediate temperatures. Lu^{3+} is the smallest amid lanthanide ions; therefore Lu could be a better dopant [1-2].

$\text{Bi}_{1.5}\text{Lu}_{0.5}\text{O}_3$ and $\text{Bi}_{1.5}\text{Lu}_{0.4}\text{In}_{0.1}\text{O}_3$ were obtained by solid state reaction method. Pure Bi_2O_3 , Lu_2O_3 and In_2O_3 were applied as precursors. Planetary mill Fritsch Pulverisette 6 with corundum grinding jar and balls, a manual hydraulic press, a furnace SNOL 4/1300 were used to received $\text{Bi}_{1.5}\text{Lu}_{0.5}\text{O}_3$ and $\text{Bi}_{1.5}\text{Lu}_{0.4}\text{In}_{0.1}\text{O}_3$. Stoichiometric amounts of precursors were grinded for 10 cycles (160-200 rpm), total time is 7 h. A mixture was pressed into 5 pallets (13×2 mm). The pallets were placed in the furnace at 750° for $\text{Bi}_{1.5}\text{Lu}_{0.5}\text{O}_3$ and 700°C for $\text{Bi}_{1.5}\text{Lu}_{0.4}\text{In}_{0.1}\text{O}_3$ during 50h. Samples were characterized by X-ray diffraction method (Tongda TD-3700, 5–70 2 θ , $\text{CuK}\alpha$).

The dissolution enthalpies of Bi_2O_3 , $\text{Bi}_{1.5}\text{Lu}_{0.5}\text{O}_3$ and $\text{Bi}_{1.5}\text{Lu}_{0.4}\text{In}_{0.1}\text{O}_3$ were measured by solution calorimetry at 298.15K in 2M HCl. Based on measured experimental and literature data the standard formation enthalpy, lattice enthalpy and stabilization energy were calculated.

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2. Ozturk E., Kalaycioglu N.O. Synthesis, Characterization and Oxide Ionic Conductivity of Binary δ - $(\text{Bi}_2\text{O}_3)_{1-x}(\text{Lu}_2\text{O}_3)_x$ System // J. Chin. Chem. Soc. 2013. Vol. 60. P. 605–607.

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