

DTA–TG and XRD studies of the $\text{Ni}_2\text{InVO}_6\text{--CuO}$ system

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The $\text{Ni}_2\text{InVO}_6\text{--CuO}$ system is one of the cross-sections of the quaternary oxides system, i.e. $\text{CuO--In}_2\text{O}_3\text{--V}_2\text{O}_5\text{--NiO}$ (Fig. 1.). The system and the reactions occurring in the system in the solid state, in the atmosphere of air have not been subject of research so far. The thermal stability both components of the title system is known [1,2]. The preliminary measurements of electrical conductivity of Ni_2InVO_6 have shown that it falls into a group spin-glasses [3]. Copper(II) oxide is a p-type semiconductor with a narrow band gap and it is used as component to produce among others gas sensors and solar cells [4].

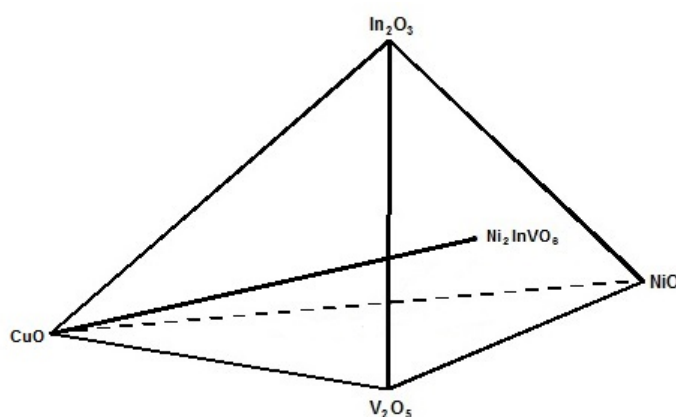


Fig. 1. Concentration tetrahedron of the $\text{CuO--In}_2\text{O}_3\text{--V}_2\text{O}_5\text{--NiO}$ system with position of the $\text{Ni}_2\text{InVO}_6\text{--CuO}$ system under study

The aim of this work was to examine of mutual reactivity of Ni_2InVO_6 with CuO and checking whether in the system the solid solution is formed in air atmosphere.

Some mixtures from CuO , In_2O_3 , V_2O_5 and $2\text{NiCO}_3\cdot 3\text{Ni}(\text{OH})_2\cdot 4\text{H}_2\text{O}$ (as precursor NiO) were prepared for the investigations. The reactions were conducted by the conventional method of sintering samples. Appropriate portions of reacting substances were homogenized by grinding and heated in the atmosphere of air, in the temperature range from $500\text{--}1100^\circ\text{C}$ in several 24h stages. After each heating stage the samples were cooled down in furnace to room temperature, weight, ground and examined for their phase composition by XRD method. Selected samples were additionally investigated by DTA–TG and UV–vis–DR and SEM methods.

The preliminary result of research demonstrated that in the system $\text{Ni}_2\text{InVO}_6\text{--CuO}$ a new solid solution with an limited solubility of the components is formed. The solution has a substitutional character and it is formed by an incorporation of Cu^{2+} ions instead of Ni^{2+} ions in the lattice matrix, i.e. Ni_2InVO_6 . The formula of the new solid solution can be written as follows $\text{Ni}_{2-x}\text{Cu}_x\text{InVO}_6$. The studies in order to establish the concentration range of the components of the $\text{Ni}_2\text{InVO}_6\text{--CuO}$ system as well as to investigate the influence of the degree of Cu^{2+} ions incorporation into the Ni_2InVO_6 structure on some of its physicochemical properties are continued.

[1] E. Filipek, A. Paczeńska, Application for a patent No. PL396804 from October 28th, 2011.

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[3] T. Groń, E. Filipek, A. Paczeńska, M. Oboz, H. Duda, *Mat.* 19th International Conference on Solid Compounds of Transition Elements, Genova, Italy (2014), P_25.

[4] M. Zhang, X. Xu, M. Zhang, *Mater. Lett.* **62** (2008) 385-8.