STRUCTURAL, MAGNETIC AND THERMAL PROPERTIES OF SEMICONDUCTING $ZnCr_2Se_4$ - SINGLE CRYSTALS DOPED WITH HOLMIUM

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Magnetic spinels with general formula AB_2X_4 (A and B are transition-metal ions, X is a chalcogenide ion), are attractive because of their thermoelectric properties, which have potential application in thermoelectric devices. Moreover, spinels can be applied in chemical industry as catalysts and ceramic carriers catalysts, as well as, in electronics, nuclear energy and many more industries [1]. Therefore, seleno-spinels are promising compounds for this purpose [2] due to rather large cubic unit cell of 10Å, a large ion radius of selenium (1.98Å) and its covalence. $ZnCr_2Se_4$ crystallizes in the cubic structure (*Fd*-3*m*). Pure $ZnCr_2Se_4$, both in mono- and polycrystalline form combines *p*-type semiconducting conductivity and a helical antiferromagnetic (AFM) order below the Néel temperature T_N = 20K with a strong ferromagnetic (FM) component evidenced by a large positive Curie-Weiss temperature (θ) of 115 K.

In this presentation, we present details of $ZnCr_2Se_4$:Ho – single crystal growth together with the thermodynamic computations of equilibrium constants for the chemical transport reactions, as well as, the results of structural, magnetic and electrical studies in order to show the effect of magnetic holmium ions on physical and chemical properties of $ZnCr_2Se_4$ – single crystals.

The $ZnCr_2Se_4$:Ho single crystals were obtained by chemical vapour transport and then their chemical composition was defined using SEM method. In order to determine full structural and characteristic, the obtained crystals were investigated using various methods: XRD, magnetic (SQUID) and electrical method. The results will be presented during the conference.

References

1. Magnetic Spinels: Synthesis, properties and Applications, edited by Mohindar Sechra, IntechOpen, 8 March 2017, DOI:10.5772/63249.

2. G. J. Snyder, T. Caillat, J. P. Fleurial, „ Thermoelectric Properties of Chalcogenides with the Spinel Structure", Mat. Res. Innov. 5 (2001) 67 – 73.