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STRUCTURAL AND MAGNETIC PHASE DIAGRAMS OF RMn 1-x Fe x O 3 SYSTEM WITH PEROVSKITE CRYSTAL STRUCTURE

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The transition metal oxides, with perovskite structure, have been largely studied because these materials exhibit strong coupling between orbital, electronic, spin and lattice degrees of freedom. The atomic substitution at the dodecahedral sites in stoichiometric compounds has been extensively studied and recently, interest has turned on to the effect of the substitution at the octahedral sites, where the experimental studies have been mainly focused on the magnetic behaviour, and few on the multiferroic properties. In our paper we focus on construction of structural and magnetic phase diagrams of RMn 1-x Fe x O 3 system with perovskite crystal structure (R = Nd, Pr, Tb and Dy). Our study was performed on single crystals prepared by optical floating zone method. We studied creation of the substitutional solid solutions in whole concentration range, evolution of Jahn-Teller (JT) effect and orbital ordering with substitution at the octahedral sites with non-active JT ion Fe 3+ . Construction of magnetic phase diagrams was undertaken with particular emphasis to determination of magnetic structure by means of magnetization, heat capacity and neutron diffraction measurements. We paid special attention to tuning of magneto-electric (ME) coupling in multiferroic compounds (RMnO3, R = Tb, Dy) with magnetically induced ferroelectricity by low concentration doping with Fe.

Author: MARIAN MIHALIK, MATÚŠ MIHALIK, MÁRIA ZENTKOVÁ

Presenter: MIHALIK M. (Institute of Experimental Physics, Slovak Academy of Sciences, Košice)

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