Synthesis, structure and properties investigation of complex perovskites with manganese

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In the last few decades, perovskite type compounds (ABX_3) are probably the most researched group of compounds. The great scientific interest in these compounds is due to the flexibility in their composition and structure, which results in a number of important and unique properties. Among the large number of different perovskites, of particular interest are the oxide perovskites containing manganese in the B position and some lanthanides in the A position. This is because of their properties which are very interesting from scientific and applied point of view. This abstract presents the initial research related to the attempt to synthesize and characterize new complex perovskites with the general formula $GdMn_{0.5}M_{0.5}O_3$ (Ln=Gd; M=Cr,Fe,Co). The assumption that compounds with this composition would have a perovskite structure was confirmed by calculating the so-called tolerance factor. The solution combustion method was chosen for the synthesis of these compounds and all the assumed perovskites were obtained according to this method using glycine as fuel. The obtained precursors of the indicated perovskites were annealed at 800 °C in a muffle furnace for 8 hours. For the identification and characterization of the obtained samples, X-ray powder diffraction (XRPD) was applied. The comparison of the diffractograms of the synthesized compounds with the diffractograms of known perovskites, showed perovskites with general formula $GdMn_{0.5}M_{0.5}O_3$ (M = Cr, Fe, Co). The perovskites are isostructural to each other, and according to the appearance of the diffractograms, it can be assumed that they have orthorhombic structure. The composition was also established by vibrational spectroscopy and by EDX analysis. The EDX analysis confirmed the 1:1 ratio of Mn/M, and accordingly the general formula $GdMn_{0.5}M_{0.5}O_3$ (M = Cr, Fe, Co). In order to determine the impact of the method of synthesis on the morphology and the size of the particles, SEM was employed. Results show that the compounds within the series are of same polycrystalline porous morphology, typical for perovskites obtained by solution-combustion method.