MAR13-2012-020129

Abstract for an Invited Paper
for the MAR13 Meeting of
the American Physical Society

Chemistry and synthesis of new polar perovskites with small tolerance factors[1]

ALEXEI BELIK, International Center for Materials Nanoarchitectnics (WPI-MANA), National Institute for Materials Science

"Usual" perovskite-type compounds with the general formula ABO3, where A is La-Lu and Y and B is V, Cr, Mn, Fe, Co, Ni, and Cu have been attracting a lot of attention for decades. "Exotic" perovskites are also highly interesting because new phenomena may emerge in them. The term "exotic" may include compounds with unusual oxidation states, unusual ion distribution, and unusual ions at the A site and B site. Perovskites with A = Sc and In have small tolerance factors, and they can be prepared only at high pressure. We will discuss "exotic" perovskites with A = Sc and In. A limited number of compounds can be prepared at 6 GPa. Results on (A1-yMy)MnO3 (A = Sc and In, M = Mn, Mg, Co, and Ni), InCrO3, ScCrO3, InRhO3, ScRhO3, InNi0.5Mn0.5O3, and ScNi0.5Mn0.5O3 will be presented. We will also describe a new class of multiferroic polar materials: In-based perovskites. We show that (In1-yMy)MO3 with y = 0.112-0.176 and M = Fe0.5Mn0.5 is isostructural with BiFeO3 (space group R3c) and has a high ferroelectric Curie temperature; (In1-yMy)MO3 is a canted antiferromagnet with the Néel temperature close to RT. Our results give a significant contribution to the development of RT multiferroics and also show new ways for the preparation of perovskite-type materials.

[1]This work was supported by WPI Initiative (MEXT, Japan), JSPS FIRST Program, and the Grants-in-Aid for Scientific Research (22246083).