Magnetism, Ferroelectricity and Lattice Modulation of RMn_2O_5

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A series of rare-earth manganese oxides RMn_2O_5 (R =rare-earth, Y, Bi) shows unique characteristic on magnetism and ferroelectricity. They transform successive phase transitions of antiferromagnetic and incommensurate magnetic ordering accompanied by a dielectric phase transitions. Measurements of the dielectric constant and pyroelectric current revealed that the spontaneous polarization along the *b*-axis appears at the paraelectric (PE)–ferroelectric transition temperature at T_{C1} (FE1 phase), followed by anomalies both of the dielectric constant and spontaneous polarization at T_{C2} (FE2 phase). Phase transition temperatures of magnetic ordering and dielectric anomalies are completely coincidental.

In order to know the displacement pattern and the origin of the electric-polarization, we have performed synchrotron x-ray diffraction experiments at PF-4C beam line. New satellite reflections were found just at the position of $2\mathbf{q}_M$, where $\mathbf{q}_M$ means the magnetic propagation vector observed by neutron diffractions. Then, FE1 phase is simultaneously commensurate in magnetic and crystal structures, while PE and FE2 phases are incommensurate both in magnetic and crystal structures. We will discuss the possible structure of the ferroelectric phase.

Keywords: phase transitions, ferroelectrics, magnetic ordering