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Report:

We have used high-resolution x-ray diffraction to study the structural evolution of $YTiO_3$ and $LaTiO_3$ through the magnetic phase transition at $T_C \sim 30$K and $T_N \sim 145$K, respectively. The results are analyzed, using a group theoretical approach, in terms of subgroups of the room-temperature $Pbnm$ symmetry, to investigate the structural response of a possible orbitally ordered $3d^1$ state. No evidence for a monoclinic distortion was observed. Moreover, we indicate that the $RTiO_3$ are not Jahn-Teller distorted.

The transition metal perovskite oxides ABO_3 with partially-filled d-orbitals have been intensively investigated in order to understand the nature of their electronic states. In cases where the occupied orbitals are degenerate, the degeneracy is usually lifted below a transition temperature and long-range ordering of the occupied orbitals occurs. Such ordering is accompanied by a coherent Jahn-Teller (JT) distortion, which often results in a change of crystal symmetry. The most widely studied of such systems is doped $LaMnO_3$, where the JT effect due to degeneracy of the e_g orbitals, is known to play an important role in the mechanism of the colossal magnetoresistance phenomenon displayed in these materials upon doping. One of the recent topics is the quantum effect in the orbital ordering dominated by electron correlations. Especially, Mott insulators with t_{2g} degenerated orbitals are of interest, since the JT coupling for t_{2g} orbitals is five times smaller than e_g states and the large degeneracy enhances the quantum effect.

We have performed a comparative study between different possible space-groups based on the hypothesis of a monoclinic distortion. We have found only tiny anomalies at the magnetic transition temperatures for both studied compounds. We have interpreted these anomalies in term of magnetostriction. Moreover we will discuss in the article version the relationships between the $GdFeO_3$ distortion and the Jahn-Teller type which have been observed in the parent compounds RVO_3 based on our data collection with two order of resolution better than the previous reported neutron data (Cwik et al.).