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Phase transition in $Ba_2Ti_{13}O_{22}$ with Ti^{3+} quasi-triangular lattice
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— In $Ba_2Ti_{13}O_{22}$, Ti^{3+} ($3d^1$) ions form quasi-triangular lattices, and three layers of them ("trilayer") compose a building block for the crystal structure. We found that this compound exhibits a phase transition at $T_c \sim 200$ K, below which the electrical resistivity increases and magnetic susceptibility decreases. We found by electron diffraction measurement that the space group changes at T_c from $Cmce$ to $C2/m$, which means that one trilayer and the next trilayer become inequivalent. We also found that a pseudogap appears in the optical conductivity spectra below 0.3 eV at low temperatures. These experimental results suggest that the phase transition is caused by the formation of charge density wave (CDW). However, the almost T-linear dependence in the decrease of the magnetic susceptibility below T_c is not what is observed in the conventional CDW state, and suggest an exotic nature of the state below T_c in the present compound.

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