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Magneto-electric phase diagrams in $\mathbf{Tb_1 - xGd_xMnO_3}$ TAKESHI GOTO, YUUICHI YAMASAKI, HIDEYUKI WATANABE, Dept. of Appl. Phys., Univ. of Tokyo, TSUYOSHI KIMURA, Los Alamos National Laboratory, YOSHINORI TOKURA, Dept. of Appl. Phys., Univ. of Tokyo — $R\mathrm{MnO_3}$ with distorted perovskite structure has the ferroelectric (FE) ground state with long-period antiferromagnetic spin order for R=Tb and Dy [1], while showing the A-type (layered antiferromagnetic) paraelectric (PE) state for R=Gd. The A-type PE state in $\mathrm{GdMnO_3}$ is associated with the appreciable ferromagnetic component (0.2μB) along the c axis due to the Dyaloshinskii-Moriya interaction. When an external field of about 7T is applied along the c axis, the FE state of $\mathrm{TbMnO_3}$ is observed to turn into PE. This is likely because the A-type PE state with canted spin component is induced by the magnetic field via Zeeman coupling. In this study, we have prepared single crystals of solid solutions $\mathrm{Tb_1 - xGd_xMnO_3}$, whose both end materials are the PE and FE with different magnetic orders. Due to the exchange interaction between the Heisenberg like Gd moments and Mn spins, the series of compounds show the rich phase diagrams as functions of Gd composition x and magnetic field H. Enhanced magnetic-field response of the ferroelectric phase is demonstrated in the intermediate x-region. [1] T. Goto et al. Phys. Rev. Lett.92,257201 (2004).

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