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Control of magnetic and ferroelectric phase in multiferroic (Tb, Bi)MnO_3 system TAE-HWAN JANG, MURALIDHARAN RAJARAM, CHAN-HO YANG, TAE YEONG KOO, YOON HEE JEONG, Dept. of Physics and Electron Spin Science Center and Pohang Accelerator Laboratory, Pohang University of Science and Technology — Various magnetic ferroelectrics have been discovered and extensively studied because of the possibility of coupling between electric and magnetic degrees of freedom and their potential technological applications. However, the two transitions from electric and magnetic origins have a big difference in their temperature range of occurrence and there is a rare possibility to get two critical points in the same temperature region. We report highly polarizable cation modification effects of multiferroic $TbMnO_3$ polycrystalline system on magnetic and ferroelectric phase transition. Random replacement of Tb^{3+} with Bi^{3+} induces low frequency relaxation in magnetic susceptibility reminiscent of relaxor behavior. The special role of Bi^{3+} ions is emphasized because the anomalous behavior has not been observed in other non-magnetic cation substituted $TbMnO_3$ systems. Various accompanying phenomena such as magnetic and ferroelectric relaxational behavior, structural anisotropy, and tuning of electromagnetic coupling are also discussed. Controllability of both magnetic and ferroelectric phase by the combination of Bi-substitution and driving frequency suggests a new possibility for getting two transitions having different origin at the same temperature point.

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