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Room temperature multiferroics in rare earth doped BiFeO₃ ceramics

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Multiferroics is a special and rare class of unique materials that exhibit the coexistence of two or more ferroic order parameter particularly in single phase materials at the specific temperature. In an attempt to enhance multiferroicity in BiFeO₃ (only the highly promising materials which shows ferroelectric Curie temperature (T_c= 1103 K) and antiferromagnetic Neel temperature (T_N=643 K) with large value of leakage current), rare earth doped BiFeO₃ bulk ceramics are prepared by novel slow step sintering schedule which shows monophasic character with significant reduction of leakage current. Incorporation of rare earth ion (for example Gd) nucleates and develops orthorhombic grain growth habit by suppressing the original rhombohedral phase. We observed room temperature enhanced P-E as well as M-H loop when a rare earth ion (Gd) is critically optimized at a certain level in the composite matrix of Bi Gd FeO₃. We recommend that this class of materials have the potential ability to couple both ferroelectric and magnetic order parameter which is the basic blocks of future generation spintronics devices, biferroic memory and electric field controlled ferromagnetic resonance devices. The basic idea on the subject as well as important experimental finding in this direction will be discussed in the talk.

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