

## Simultaneously Enhanced Magnetic and Ferroelectric Properties of $\text{Bi}_{0.9}\text{Dy}_{0.1}\text{Fe}_{0.97}\text{Co}_{0.03}\text{O}_3$ compound

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Multiferroic material  $\text{BiFeO}_3$  (BFO) is a typical multiferroic material with a room-temperature magnetoelectric coupling in view of high magnetic- and ferroelectric-ordering temperatures (Neel temperature  $T_N \sim 647$  K and Curie temperature  $T_C \sim 1,103$  K). Rare-earth ion substitution at the Bi sites is very interesting, which induces suppressed volatility of the Bi ion and improved ferroelectric properties. At the same time, the Fe-site substitution with magnetic ions is also attracting, since the enhanced ferromagnetism was reported. In this study, BFO,  $\text{Bi}_{0.9}\text{Dy}_{0.1}\text{FeO}_3$  (BDFO),  $\text{BiFe}_{0.97}\text{Co}_{0.03}\text{O}_3$  (BFCCO) and  $\text{Bi}_{0.9}\text{Dy}_{0.1}\text{Fe}_{0.97}\text{Co}_{0.03}\text{O}_3$  (BDFCO) compounds were prepared by conventional solid-state reaction and wet-mixing method. High-purity  $\text{Bi}_2\text{O}_3$ ,  $\text{Dy}_2\text{O}_3$ ,  $\text{Fe}_2\text{O}_3$  and  $\text{Co}_3\text{O}_4$  powders with the stoichiometric proportions were mixed, and calcined at  $500^\circ\text{C}$  for 24 h. The samples were immediately put into an oven, which was heated up to  $800^\circ\text{C}$  and sintered in air for 1 h. The crystalline structure of samples was investigated at room temperature by using a Rigaku Miniflex powder diffractometer. The field-dependent magnetization measurements were performed with a vibrating-sample magnetometer. The electric polarization was measured at room temperature by using a standard ferroelectric tester (RT66B, Radiant Technologies). Dy and Co co-doping at the Bi and the Fe sites induce the enhancement of both magnetic and ferroelectric properties of  $\text{BiFeO}_3$ .

**Keywords:** Multiferroic,  $\text{BiFeO}_3$ , Magnetic properties, Ferroelectric properties

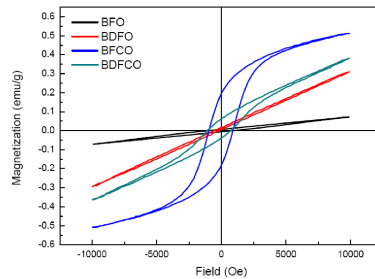


Fig. 1:  $M$ - $H$  hysteresis loops of BFO, BDFO, BFCCO and BDFCO samples.

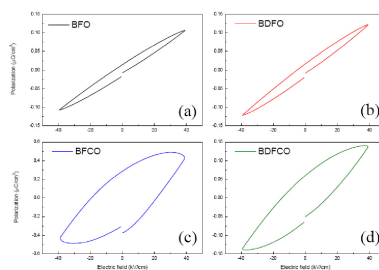


Fig. 2:  $P$ - $E$  hysteresis loops of (a) BFO, (b) BDFO, (c) BFCCO and (d) BDFCO samples.