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Twofold spin reorientation and field induced incomplete phase transition in single crystal $Dy_{0.5}Pr_{0.5}FeO_3$[1] SHIXUN CAO, WEI REN, XIAOLING QIN, BAOJUAN KANG, JINCANG ZHANG, Shanghai University — Recently, rare earth orthoferrites show emerging magnetoelectric effect, ultrafast optomagnetic effect, promising applications in multiferroics and ultrafast optomagnetic recording. All these properties come from its intrinsic coupling between R-4f and Fe-3d electrons, and strongly correlated with the spin reorientation (SR) transition. We report an intriguing twofold SR transition for the Fe- magnetic sublattice near SR temperatures TSR1=77 K and TSR2=45 K in Dy0.5Pr0.5FeO3 single crystal. Magnetic field-induced incomplete spin configuration transition was observed by measurement of magnetization as a function of temperature. The SR temperature of Dy0.5Pr0.5FeO3 single crystal can be controlled by changing the magnitude of the applied magnetic field. We also show that SR between TSR2 and TSR1 can be induced by an applied magnetic field along c axis. The origin of the magnetic behavior is ascribed to the anisotropic effective field whose strength is determined by the interactions with rareearth spins and can be modified by the external applied magnetic field. It provides deeper insights into the R-4f and Fe-3d magnetic interaction which dominate the sophisticated magnetic phase transitions in the rare earth orthoferrites.

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