Potential barrier increase due to Gd doping of $BiFeO_3$ layers in Nb:$SrTiO_3$-$BiFeO_3$-Pt structures displaying diode-like behavior

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Abstract

The rectifying properties of Nb:$SrTiO_3$-$Bi_{1-x}Gd_xFeO_3$-Pt structures ($x=0$, 0.05, 0.1) displaying diode-like behavior were investigated via current-voltage characteristics at different temperatures. The potential barrier was estimated for negative polarity assuming a Schottky-like thermionic emission with injection controlled by the interface and the drift controlled by the bulk. The height of the potential barrier at the Nb:$SrTiO_3$-$Bi_{1-x}Gd_xFeO_3$ interface increases with Gd doping. The results are explained by the partial compensation of the *p*-type conduction due to Bi vacancies with Gd doping in addition to the shift of the Fermi level towards the middle of the bandgap with increasing dopant concentration.