Cobalt Doping to Influence the Electrical Conductivity of $(Bi_{-0}.Dy_{-91}(0.09))FeO_3$

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Rare earth modified bismuth ferrites are of interest as lead-free multiferroics, however reliable methods for reducing the electrical conductivity are needed. In this study ceramics with composition ($Bi_{0.91}Dy_{0.09}$) FeO_3 were doped with 0.2 mol% cobalt (Co) and the impedance spectra, high electric field hysteresis and leakage current were compared to undoped ceramics. In pristine ceramics Co addition increased the bulk conductivity of the material but removed a relaxation from the dielectric loss and modulus in the frequency range 100 Hz-1 MHz. The remanent polarization and peak-to-peak strain of both ceramics were 38 mu C/cm(2) and 0.15% respectively, but surprisingly Co doped ceramics exhibited lower electrical leakage at above-coercive fields. Significant changes in the loss, modulus and leakage current of undoped ceramics after poling suggested that de-trapped charge carriers play a dominant role in the conductivity of undoped ceramics after poling. This effect was reduced by Co doping.