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Giant dielectric properties with excellent temperaturestability of (Ga0.5Nb0.5)xTi1-xO2 ceramics

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In this work, we investigate the giant dielectric properties of (Ga0.5Nb0.5)xTi1-xO2(where x=0.01, 0.025, 0.05 and 0.1) prepared by a solid state reaction method.The phase composition,microstructure,and oxidation statesare characterized by X-ray diffraction, field-emission scanning electron microscopy and X-ray photoelectron spectroscopy, respectively.The single phase of rutile-TiO2with dense microstructure are obtained in all sintered (Ga0.5Nb0.5)xTi1-xO2ceramics. The existence of Ti3+ and oxygen vacancies are confirmed. The dielectric constant increased with increasing co-doping (Ga+Nb)concentration. Excellent dielectric properties are obtained in the (Ga0.5Nb0.5)xTi1-xO2ceramic with x= 0.1 sintered at 1550oC for 1h.Low dielectric loss tangent (< 0.05) and very large dielectric constant (e = 41267) with excellent temperature coefficient (<⊠15%) in the range of -70 to 170 oC are achieved. The giant dielectric response over a broad temperature range of the (Ga0.5Nb0.5)xTi1-xO2ceramics is primarily attributed to the interfacial polarization at internal insulating interfaces.

Keyword: TiO2, Giant dielectric permittivity, Temperature coefficient, Electron-pinned defect-dipole.

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