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Dielectric properties of niobium-based oxide

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Abstract

Oxygen deficient doped niobate, $Nd_{0.7}Sr_{0.3}NbO_{2.7}$, has been prepared by the conventional solide solide route. Then, dielectric data has been carried out by means of impedance spectroscopy in a wide frequency and temperature ranges. Dielectric properties are analyzed using different dielectric formalisms such as complex permittivity ε*, dielectric loss tangent tan(δ) and complex electric modulus M*. These formalisms obey to the Arrhenius law with low values of the activation energy. The highest dielectric constant has been observed at room temperature up to 0.5 MHz which can be suitable for various potential applications. The colossal dielectric constant is related to electrons hopping. The dielectric loss tangent spectra prove the contribution at least of two mechanisms. The scaling behavior of both dielectric loss tangent and imaginary component of electric modulus suggests the relaxation mechanism is temperature independent. The complex electric modulus plot only emphasizes the grain capacitance as smallest capacitance.

Keywords: niobate; oxygen deficient; colossal dielectric constant; relaxation mechanism

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