

Complex Impedance and Conductivity Studies of Nd Doped Ferroelectric Oxide

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Abstract. In the present work, electrical properties of tungsten-bronze structured $\text{Na}_2\text{Pb}_2\text{Nd}_2\text{W}_2\text{Ti}_4\text{Ta}_4\text{O}_{30}$ ceramic, synthesized by conventional high temperature solid-state reaction route, have been studied using complex impedance spectroscopy. Compound formation and phase identification has been confirmed by X-ray diffraction (XRD). Impedance (experimental and theoretical fitting), modulus and electrical conductivity of the material exhibit a strong correlation between its micro-structure (i.e., bulk, grain boundary, etc) and electrical parameters. The nature of temperature variation of dc conductivity follows Arrhenius rules. The frequency dependence ac conductivity (fitting) shows the signature of Jonscher's universal power law. The existence of non-exponential-type of conductivity relaxation in the compound was confirmed by detailed studies of its transport properties. It shows that the material has negative temperature coefficient of resistance similar to that of semiconductors. The same behavior has also been observed in the study of I-V characteristics of the material.

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