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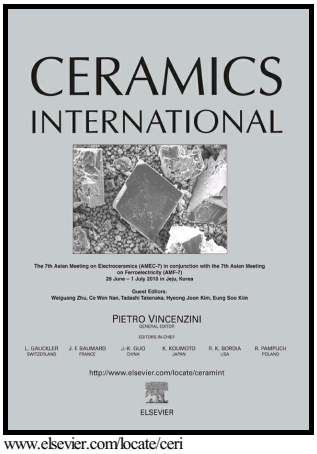

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Electrical transport properties of $M_2FeV_3O_{11}$ (M = Mg, Zn, Pb, Co, Ni) ceramics

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Abstract

Multicomponent oxide systems have been widely studied in the last few decades and can be used as cathode materials in high-energy cells. However, the electrical characteristics have not yet been fully disclosed. We report the electrical conductivity, thermoelectric power, the *I-V* characteristics, conductance and dielectric spectroscopy measurements made for $M_2FeV_3O_{11}$ (M = Mg, Zn, Pb, Co, Ni) ceramics. This multicomponent oxide system was found to show semiconducting properties strongly thermally activated above room temperature, *n*-type conduction at higher temperatures, higher conductance for the ceramics containing Co^{2+}, Ni^{2+} and Mg^{2+} ions as well as a strong dependence of relative dielectric constant and loss tangent on temperature and frequency. Moreover, the transition metal ions, which have unfilled 3*d*-shells strongly affected polarization and conductivity of the ceramics, while the effect of porosity could be neglected. These effects are discussed in terms of microstructure, thermal activation of charge carriers, small polarons as well as the Maxwell–Wagner polarization.

Keywords: Ceramics; Electrical properties; Dielectric spectroscopy

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