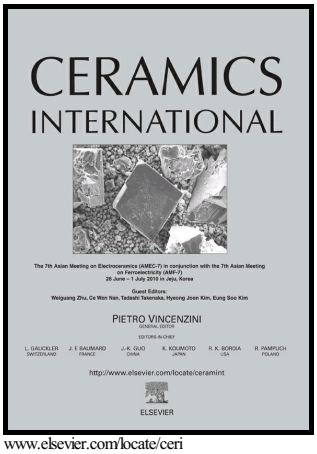

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Abstract

Novel low-temperature fired $Li_3Mg_2Nb_{1-x}V_xO_6$ (x=0.02–0.08) microwave dielectric ceramics were synthetized by the partial substitution of V^{5+} ions on the Nb^{5+} sites. The effects of V^{5+} substitution on structure and microwave dielectric properties were investigated in detail. XRD patterns and Rietveld refinement demonstrated that all of the samples exhibited a single orthorhombic structure. The structural characteristics such as the polarizability, packing fraction and NbO_6 octahedron distortion were determined to establish the correlations between the structure and the microwave dielectric characteristics. The ε_r values presented a tendency similar to that of the polarizability. The high $Q\times f$ values were mainly attributed to the effects of the grain sizes and density rather than the packing fraction. The variation in the τ_f values was attributed to NbO_6 octahedron distortion. Notably, the $Li_3Mg_2Nb_{1-x}V_xO_6$ (x=0.02) ceramics sintered at 900 °C had outstanding microwave dielectric properties: ε_r=16, $Q\times f$=131,000 GHz (9.63 GHz), and τ_f=−26 ppm/°C, making these ceramics promising ultralow loss candidates for low temperature co-fired ceramics (LTCC) applications.

Keywords: $Li_3Mg_2Nb_{1-x}V_xO_6$ ceramics, structural characteristics, correlations

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