Microwave Dielectric Properties of zirconium titanate ceramics doped with MgNb2O6

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Abstract

The sintering behaviour, microstructure and microwave dielectric properties of the ZrTiO4 doped with MgNb2O6 were investigated systematically by X-ray diffractometry (XRD), scanning electron microscopy (SEM) and a network analyser at microwave frequencies. The XRD analysis confirmed a multi-phase orthorhombic a-PbO2 type structure. The chosen composition, 0.67ZrTiO4 0.33Mg1/3Nb2/3O2 (0.67ZT 0.33MN), was sintered at 1400°C both in air and oxygen. The density improved significantly for the samples sintered in oxygen from 88% to 92%. Subsequently, the relative permittivity (er) increased from 33 to 36 as the sintering atmosphere changed from air to oxygen. The quality factor increased from 27,500 GHz in air to 37,000 GHz in oxygen, while the temperature coefficient of resonant frequency (t—) for 0.67ZrTiO4 0.33Mg1/3Nb2/3O2 was reduced to 12.4 ppm/°C, much lower than that for the end member ZrTiO4 (+ 58 ppm/°C) and independent of sintering atmosphere.