Sintering Temperature Dependence on Microstructure and Microwave Dielectric Properties of Low-Temperature Sintered $Mg_3(VO_4)_2$

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The growth of the wireless communication system has resulted in an increasing the demand for the development of new dielectric ceramics. As for an application to the dielectric substrate, a low dielectric constant, a high quality factor and a near zero temperature coefficient of resonant frequency are required. Moreover, the low costs of individual components and processing are a critical requirement because the dielectric substrate such as Al_2O_3 has the high processing temperature □ 1500□. Thus, there is a considerable interest in the development of new dielectric substrate with the low sintering temperature. Then, this paper focused on the evaluation of microwave dielectric properties for the $Mg_3(VO_4)_2$ ceramic, because it is known that the $Mg_3(VO_4)_2$ ceramic produces at the sintering temperature of 700□.

Specimens of $Mg_3(VO_4)_2$ were prepared by mixing regend-grade (purity>99.9%) MgO and V_2O_5 powders using the solid-state reaction method. The microwave dielectric properties were measured by Hakki and Coleman's method. The samples were identified using X-ray powder diffraction. The microstructure of the specimens was observed by means of a field emission scanning electron microscope (FE-SEM).

The highest bulk density of the samples was obtained at the sintering temperature of 1100□. The dielectric constant of the samples increased from 7.8 to 9.5 with increasing the sintering temperature, depending on the increase in the bulk density. However, the quality factors of the samples sintered at the higher sintering temperatures than 1050□ drastically decreased from 48835 to 22203 GHz; these results were attributed to the decomposition of the $Mg_3(VO_4)_2$ ceramic.