

Sintering Time Dependence on Microwave Dielectric Properties and Crystal Structure of Y_2BaZnO_5 Ceramic

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In the Y_2O_3 -BaO-ZnO system, although the Y_2BaZnO_5 ceramic which is a green phase-type structure have been reported to be high- Q dielectric material, the effects of variations in the sintering time on the crystal structure and microwave dielectric properties of the Y_2BaZnO_5 ceramic have not been clarified up to date. Thus, the sintering time dependence on the Y_2BaZnO_5 microwave dielectric ceramics was investigated by refining the crystal structure of the Y_2BaZnO_5 ceramic. The Y_2BaZnO_5 ceramics were sintered at 1300°C for 2-100h in air; the site occupancy of Zn in each sample was refined by using the Rietveld analysis. Moreover, the microstructure of the samples were investigated in terms of the field emission scanning electron microscopy (FE-SEM) and the energy dispersive X-ray (EDX) analysis. The quality factors of the samples sintered for 2-50h increased from 50000 GHz to 189000 GHz. However, when the sample was sintered for 100h, the quality factor of the sample was 113000 GHz. From FE-SEM and EDX results, the grain growth of the samples was observed with increasing the sintering time from 2 to 50h; the increase in the $Q \times f$ values of the samples as described above is attributed to the grain growth of the samples. In the case of the samples sintered for 100h, the deviation from the stoichiometric composition of Y_2BaZnO_5 ceramic was observed in the microstructures of the ceramics from the result of EDX analysis. Moreover, in the Rietveld analysis, the refined site occupancy of Zn was found to be 0.954; the sintering time dependence on the vaporization of Zn in the Y_2BaZnO_5 ceramic was suggested. Thus, it is considered that the decrease in the $Q \times f$ values of the samples by the variations in the sintering time is closely related with the vaporization of Zn.