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Effects of Sintering additives on the Sintering and Microwave Dielectric Properties of $(Zn_{0.8}Mg_{0.2})TiO_3$ System

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The effects of sintering additives such as $Bi_2O_3+V_2O_5$ and B_2O_3 on the microwave dielectric and sintering characteristics of $(Zn_{1-x}Mg_x)TiO_3$ system were investigated. Highly dense samples were obtained for $(Zn_{0.8}Mg_{0.2})TiO_3$ at the sintering temperature range of 870~910°C with $Bi_2O_3+V_2O_5$ and B_2O_3 additions The microwave dielectric properties of $(Zn_{0.8}Mg_{0.2})TiO_3$ with 0.45 wt%Bi_2O_3 and 0.55 wt%V_2O_5 sintered at 900°C were as follows. $Q\times f_0$=50,800 GHz, ε_r=22, and τ_f=−53 ppm/°C In order to improve temperature coefficient of resonant frequency, TiO_2 was added to the above system The optimum amount of TiO_2 was 15 mol% when sintered at 870°C, at which we could obtain following results $Q\times f_0$=32,800 GHz, ε_r=26, and τ_f=0 ppm/°C When B_2O_3 is added, temperature coefficient of resonance frequency(τ_f) changes to a positive value with increasing the amount of B_2O_3 because of the increased amount of rutile phase The $Q\times f_0$ values of the B_2O_3 added system were determined by the microstructures and sintering shrinkages which in turn are affected by the existing rutile or second phases When 6.19 mol% of B_2O_3 added and sintered at 910°C for 5 h, it exhibits ε_r=23.7, $Q\times f_0$=74,420 GHz, and τ_f=−1.42 ppm/°C

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$MgTiO_3$ 마이크로파 유전체 세라믹스의 품질계수에 미치는 열변형의 효과

Effect of Thermal Strain on the Quality Factor of Microwave $MgTiO_3$ Ceramics

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마이크로파 주파수 대역에서 $MgTiO_3$ 세라믹스의 품질계수(quality factor)에 미치는 열 변형(thermal strain)의 효과에 대하여 냉각속도를 변수로 하여 고찰하였다 냉각속도는 각각 1°C/분, 5°C/분, 30°C/분 및 공기 중 급랭으로 변화를 주었다 냉각속도가 증가함에 따라 $MgTiO_3$ 세라믹스의 공진주파수에 따른 온도계수와 유전상수는 변화가 없었다 그러나 결정학적으로 반치폭(FWHM)에 의해 계산된 변화 량은 0.00565에서 0.0101로 냉각속도가 증가함에 따라 증가하였고, 품질계수는 240,000 GHz에서 150,000 GHz으로 감소하였다. 이러한 결과는 품질계수가 열 변형에 영향을 받는 것으로 판단되며, 고유손실(intrinsic loss)과 외부손실(extrinsic loss)과의 관계를 적외선분광(FT-IR) 분석을 통해 고찰하였다