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# 유리 ($(La_2O_3-B_2O_3-TiO_2)$) / 세라믹 조성에서의 미세 조직 과 마이크로 유전체 특성

# Microstructure and Microwave Dielectric Properties of Glass ($(La_2O_3-B_2O_3-TiO_2)$) / Ceramic Composites

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Low temperature co-fired ceramic (LTCC) technology offers significant benefits over the other established packaging technologies for high density, high microwave frequency, and fast signal application. Most conventional electroceramics do not meet the basic requirements in respect of sinterability for LTCC technology. Attention is, therefore, focused on the role of glasses because of the capability they supply with lower sintering temperatures. In this study, commercial ceramic (MBRT-90) in the system $BaO-Nd_2O_3-TiO_2$ (BNT: 40 ~ 80 wt%) and $La_2O_3-B_2O_3-TiO_2$ glass (LBT: 60 ~ 20 wt%) were prepared. These glass/ceramic composites were evaluated for sintering behavior, phase evaluation, densities, interface reaction, crystallinity, microstructure and microwave dielectric properties. It was found that the addition LBT glass frits significantly lowered the sintering temperature to below 900℃ and as temperature increased (750 ~ 900℃) densification developed dynamically which was meant to be as over 95% of relative density. It is supposed that in the microstructure, the grain size was increased accompanying with the formation of different phases such as $LaBO_3$ and $TiO_2$ under the condition of increasing sintering temperature. The sintered bodies represented applicable dielectric properties, namely 20 ~ 40 for $\varepsilon_r$, ~10000 GHz for $Q*f_0$ and 10 ~ 80 ppm/℃ for $\tau_f$. The results suggest that the composite is one of feasible candidates for the microwave use in LTCC technology.