$LaAlO_3$-$BaZrO_3$계 perovskites의 제조 및 유전특성

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Fabrication and dielectric properties of $LaAlO_3$-$BaZrO_3$ perovskites

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Abstract

The perovskites in the $LaAlO_3$-$BaZrO_3$ system (i.e., (1-x)$LaAlO_3$-x$BaZrO_3$) were fabricated by a solid state reaction and their dielectric properties were investigated. For the compositions of x=0.1~0.9, the mixture of $LaAlO_3$ with a rhombohedral structure and $BaZrO_3$ with a cubic was observed when the sintering was conducted at 1500°C, indicating that the solubility of constituent elements was very low and a narrow solid solution region might exist. The large difference of ionic radii between La^{3+} ion (0.136nm, C.N.=12) and Ba^{2+} ion (0.161nm) or Al^{3+} ion (0.0535nm, C.N.=6) and Zr^{4+} ion (0.072nm) might hinder the mutual substitution. Within the compositions of x=0~0.7, the dielectric constant of the mixture increased with the amount of $BaZrO_3$, i.e., x value, which was in good agreement with the logarithmic mixing rule ($\ln \varepsilon_{r,i} = \Sigma v_i \ln \varepsilon_{r,i}$). The increase in $BaZrO_3$ doping decreased $Q \times f$ value significantly due to the low $Q \times f$ value of $BaZrO_3$ itself, a poor microstructure of the mixture with an increased grain boundary area per volume, and defects in the cation and oxygen sub-lattices which were respectively caused by the evaporation of barium during the sintering process and the substitution of Ba on La-site or Al on Zr-site.

Key Words : $LaAlO_3$-$BaZrO_3$ system , perovskites, dielectric properties, rhombohedral structure,