Nb_2O_5가 도핑된 (1-x)$BaTiO_3$ - x($Bi_{0.5}K_{0.5}$)TiO_3 무연 세라믹스의 PTCR 효과

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The PTCR Effect in Lead-free (1-x)$BaTiO_3$ - x($Bi_{0.5}K_{0.5}$)TiO_3 Ceramics Doped with Nb_2O_5

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Abstract : The positive temperature coefficient of resistivity (PTCR) effect in (1-x)$BaTiO_3$ - x($Bi_{0.5}K_{0.5}$)TiO_3 doped with Nb_2O_5 was investigated. ($Bi_{1/2}K_{1/2}$)TiO_3 (BKT) is more environment-friendly than $PbTiO_3$ in order to use in PTC thermistors. The incorporation of 1 mol% BKT to $BaTiO_3$ increased the Curie temperature (T_C) to 148°C. Doping of Nb_2O_5 to $Ba_{0.99}(Bi_{0.5}K_{0.5})_{0.01}TiO_3$ (BaBKT) ceramic has enhanced its PTCR effects. For the sample containing 0.025 mol% Nb_2O_5, it showed good PTCR properties; low resistivity at room temperature (ρ_r) of 30 Ω·cm, a high PTCR intensity of approximately 3.3×10^3, implying the ratio of maximum resistivity to minimum resistivity (ρ_{max}/ρ_{min}) in the measured temperature range, and a large resistivity temperature factor (α) of 13.7%/°C along with a high Curie temperature (T_C) of 167°C. In addition, the cooling rate of the samples during the sintering process had an influence on their PTCR behavior. All the samples showed the best ρ_{max}/ρ_{min} ratio when they have cooled down at a rate of 600°C/min.

Key Words : PTC, $Ba_{0.99}(Bi_{0.5}K_{0.5})_{0.01}TiO_3$, Curie temperature, Microstructure