Synthesis, Structural and Electrical Characterization of $Pb[(Zn_{1/3}Nb_{2/3})_x(Zr_{0.48}Ti_{0.52})_{1-x}]O_3$ Pizoelectric Ceramics with Low Sintering Temperature

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Lead Zinc Niobate $Pb(Zn_{1/3}Nb_{2/3})O_3$-(PZN) is a piezoelectric material with low sintering temperature, however, in polycrystalline form it usually contains pyrocholore phase which negatively affects the electrical properties. Therefore PZN has been alloyed with certain amount of perovskite stabilizers; such as Lead Zirconium Titanate $Pb(Zr_xTi_{1-x})O_3$-(PZT) to form solid solution to be formulated as $Pb[(Zn_{1/3}Nb_{2/3})_y(Zr_x\ Ti_{01-x})_{1-y}]O_3$ in order to obtain a pyrocholore free perovskite phase. In this study PZN was stabilized with PZT in the $Pb[(Zn_{1/3}Nb_{2/3})_x(Zr_{0.48}Ti_{0.52})_{1-x}]O_3$ composition where x=0.1-0.6. PZN-PZT powders were synthesized by the solid state calcination method. Calcination temperature ranged from 800ºC to 925ºC for 4 hours in close alumina crucibles. X-ray diffraction (XRD) results were pointed out that x=0.4 samples calcined at 850ºC - 4 hours was sufficient to obtain PZN-PZT at pure perovskite phase. As second stage of study pellet samples were prepared with die press from previously calcined powders to observe densification behavior during sintering at 860-950ºC for 4 hours in double alumina crucibles. Densification was evaluated by Archimedes method and highest density of 8.05 gr/cm^3 was obtained from samples sintered at 880ºC - 4 hours. Curie temperature (T_c) of these specimens was 287ºC and piezoelectric charge constant (d_{33}) was measured as 405-417 pC/N

Key Words: Piezoelectric, PZN-PZT, low temperature sintering

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