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Microstructure and electrical properties of b($Zr_{0.5}Ti_{0.5}$)O_3-Pb($Zn_{1/3}Nb_{2/3}$)O_3-Pb($Ni_{1/3}Nb_{2/3}$)O_3+x$S_3Ti_2O_7$ ceramics

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Pb($Zr_{0.5}Ti_{0.5}$)O_3-Pb($Zn_{1/3}Nb_{2/3}$)O_3-Pb($Ni_{1/3}Nb_{2/3}$)O_3 (PZNNT) ceramics with different content of plate-like $Sr_3Ti_2O_7$ compound was prepared through conventional solid state methods. The effect of $Sr_3Ti_2O_7$ amount and the sintering temperature on the microstructures and piezoelectric properties of PZNNT ceramics were investigated. Analyses of phase and microstructure indicated that both of grain size and the content of tetragonal phase at the MPB decreased significantly by increasing $Sr_3Ti_2O_7$ while dilute the Pb-O covalency with more lower ferroelectric properties. When the $Sr_3Ti_2O_7$ was 5wt%, the specimen had relative optimum properties due to the close content of tetragonal and rhombohedral phase at the MPB. Additionally, with further increase of sintering temperature for mature grain, the content of tetragonal phase and electric properties of PZNNT-5wt% $Sr_3Ti_2O_7$ ceramics gradually increased. The optimal piezoelectric and dielectric properties of PZNNT-5wt% $Sr_3Ti_2O_7$ ceramics sintered at 1040°C for 2h was $d33$=572pC/N, $d33 \times g33$=17630×10^{-15} m^2/N and k_p=0.57 due to the content of tetragonal and rhombohedral phase coexisted and relative larger grain size ceramics, which is potential candidate materials used for the application in energy harvesting.

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