Effect of $Pb(Fe_{1/2}Nb_{1/2})O_3$ Modification on Dielectric and Piezoelectric Properties of $Pb(Zr_{0.52}Ti_{0.48})O_3$ Ceramic

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Abstract

Lead base relaxor ferroelectric materials have surged a favorable interest owing to their remarkable in dielectric properties. Ferroelectric materials are sensitiveness with a temperature and dielectric properties are known to decrease when the temperature is higher than the temperature of maximum dielectric constant. The objective of this research is to study the phase transition were investigated by XRD, microstructure by SEM, the chemical bonds of samples were identified by FTIR and the temperature dependent dielectric constants and loss tangents were investigated as functions of both temperature and frequency of $(1 - x)Pb(Zr_{0.52}Ti_{0.48})O_3$-$xPb(Fe_{1/2}Nb_{1/2})O_3$ when x = 0, 10, and 30 mol%. A phase transition from morphotropic phase boundary (MPB) to tetragonal phase was observed. Grain size of the samples was in range of 0.84–1.87 μm. The increased disorder of $Pb(Zr_{0.52}Ti_{0.48})O_3$-$xPb(Fe_{1/2}Nb_{1/2})O_3$ was also shown vibration frequency at 1,408 cm^{-1} and 1,631 cm^{-1} in FTIR according to the harmonic oscillator. The samples of x = 10 and 20 mol% showed broaddiffuse of dielectric constant and dispersive phase transition indicating ferroelectric nature. Meanwhile, piezoelectric properties were investigated on d_{33} and k_p which PZT52/48-0.1PFN exhibited maximum values and declined with rising PFN contents.

Keyword: MPB, Dielectric properties, Ferroelectric, Piezoelectric