Microstructural and Dielectric Properties of $Ba(Ti_{1-x}Zr_x)O_3$ Nano-ceramics

Kerim Emre Öksüz[1], Şaduman Şen[2] and Uğur Şen[2]

[1]*Cumhuriyet University, Department of Metallurgical & Materials Engineering, 58140, Sivas, Turkey*

[2] *Sakarya University, Department of Metallurgical & Materials Engineering, 54187, Sakarya, Turkey*

$Ba(Ti_{1-x}Zr_x)O_3$, (x=0, 0-0.3) lead-free nano-ceramics were synthesized using the solid-state reaction method by adopting the ball milling technique. The influence of the substitution content on crystallographic structure, phase transition, microstructure and dielectrical behavior of BT (Barium Titanate) and BZT (Barium Zirconium Titanate) ceramics were investigated. XRD analysis at room temperature revealed a structural transformation from tetragonal to rhombohedral with enhancement of the ZrO_2 content in the barium titanate matrix. The scanning electron microscope (SEM) and energy-dispersive x-ray spectroscopy (EDS) were used to investigate the microstructure and surface morphology of the sintered samples. Dielectric characteristics of Zr doped barium titanate were studied using a Hioki 3532-50 LCR meter in the frequency range of 1 kHz-1 MHz. It is found that dielectric permittivity (ε_r) decreases and loss tanδ decreases with increase in zirconium oxide percentage. Zr^{+2} ions occupy the atomic spaces took place in the ZrO_2 added $BaTiO_3$ ceramics, and so caused to high dielectric constant values than that of the $BaTiO_3$ ceramics.