

Effect of milling time on microstructure, crystallite size and dielectric properties of SrTiO₃ ceramic synthesized via mechanical alloying method.

ABSTRACT

SrTiO₃ sample has been successfully prepared by mechanical alloying (MA) method. The effect of milling time on microstructure, crystallite size and dielectric properties of SrTiO₃ were studied. The results revealed that the mean crystallite size of milled powders decreased from 84.56 to 12.87 nm with increasing milling time. However, the average lattice strain of milled powders increased from 0.2 to 0.93% with increasing milling time. A single phase SrTiO₃ could not be formed with milling alone and required annealing process. A transformation of anatase-TiO₂ to rutile-TiO₂ was observed at 16 h of milling. After the milled powders were subjected to sintering process at 1200°C, formation of single-phase SrTiO₃-type cubic (Pm-3m) perovskite structure was observed. The peak intensities of the sintered SrTiO₃ samples decreased as the milling time was increased. For microstructural observations, the average grain size of the sintered SrTiO₃ sample milled for 8 h showed the largest. For dielectric measurements, the dielectric constant of the sintered SrTiO₃ sample milled for 8 h showed the highest among others. This could be due to the largest grain size obtained for sintered SrTiO₃ sample milled for 8 h. The decrease in the grain size with increasing milling time resulted to the decrease in dielectric constant.

Keyword: Mechanical alloying; Strontium titanate; Dielectric properties; Crystallite size.