

Preparation of High-Purity PZT Powders and Ceramics Made by Spray Drying Technique

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Abstract

Fine homogeneous PZT powder in the composition of $\text{Pb}(\text{Zr}_{0.52}\text{Ti}_{0.48})\text{O}_3$ was produced by a modified chemical method. Considerably low-purity and low-price chemicals were mixed and subsequently spray-dried and calcined. Phase evolution, thermal properties and microstructure of the spray dried granules were studied using X-ray diffractometry (XRD), Differential thermal analysis (DTA) & Thermogravimetric analysis (TG) and Scanning electron microscopy (SEM) techniques respectively. The results showed that the high-purity PZT phase started to appear at 500 °C and become increasingly pronounced as temperature rose. No impurity was detected as can be confirmed by transmission electron diffraction (TED) analysis and energy dispersive spectroscopy (EDS). The corresponding ceramics were sintered between 900 °C and 1250 °C. The planar coupling coefficient (K_p), piezoelectric constant (d_{33}), loss angle ($\tan\delta$), density and dielectric constant (ϵ), as well as grain size of the ceramics were measured.