

Development, Characterization, and Energy Storage in Barium Titanate Nano- and/or Micro- Polymer Composites

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Recently there is an increasing interest upon polymer matrix/ferroelectric ceramic particles composites, due to the technological demands for flexible, high dielectric permittivity and high dielectric breakdown strength materials. Possible applications of these composite systems include integrated capacitors, by-passing, filtering, self-current regulators and timing capacitors [1,2]. The electrical response of these micro- or nano-composites can be suitably adjusted by controlling the type and the amount of the ferroelectric inclusions [3-5]. Ferroelectric particles are considered as active dielectrics, since they undergo a structural transition from the polar ferroelectric phase to the non-polar paraelectric phase, at a critical temperature. The resulting variable polarization provides functional behaviour to the composites.

In this study micro- or nano-BaTiO₃/epoxy composites, as well as hybrid micro- and nano -BaTiO₃ /epoxy composites were prepared and studied, varying the amount of the filler. Morphology, thermal properties and dielectric response of the prepared systems were investigated by means of Scanning Electron Microscopy (SEM), X-ray diffraction (XRD), Differential Scanning Calorimetry (DSC) and Broadband Dielectric Spectroscopy (BDS) respectively. Functional behaviour, and energy storage efficiency were examined with parameters the type and the amount of the employed filler, temperature, and frequency.

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