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Effect of CFO and PZT fillers on Dielectric and Ultrasonic Properties of P(VDF-TrFE) Copolymer Based Composites

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Composites are considered to be any multiphase materials that show a combination of properties of their components. PZT, CoFe2O4 and BaTiO3 are one of ingredients that can improve the dielectric properties and the ultrasonic properties of polymer based composites. In this work we report on both the dielectric and the ultrasonic properties of the conventional polymer polyvinylidene fluoride / trifluoroethylene (P(VDF-TrFE)) of the composition 70/30 mol% with various concentrations of (Pb0,75Ba0,24Sr0,01)(Zr0,53Ti0,47)O3 (BPZT) and CoFe2O4 (CFO) fillers. By the means of dielectric spectroscopy it is shown that the dielectric properties may be tuned by varying the volume fraction of the ferroelectric fillers. The dependencies of the dielectric properties of the composites on filler volume fraction are reported and analyzed in terms of an analytical model (Lichtenecker's effective medium approximation) applying electrodynamic boundary conditions. Experimental study of ultrasonic wave attenuation, velocity and piezoresponse in these composites has been performed over wide temperature range (100 K –410 K) using ultrasonic automatic pulse-echo technique. The temperature dependences of ultrasonic velocity and attenuation showed anomalies attributed to the glass transition and paraelectric-ferroelectric phase transition. Above Curie temperature Tc the piezoresponse vanishes in beforehand polarized samples.

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