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BOOK OF ABSTRACTS



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The growing interest in science community today is finding the ways to safely use mechanical energy which is being released in small portions around us. The idea of this work is to use vibrational energy present everywhere in small quantities to power the small-scale electronic devices used in everyday life. Flexible electronics, which can be bent, rolled, and stretched into arbitrary shapes, would significantly expand the application of modern electronic devices [1, 2].

As a lead-free piezoelectric material bismuth sodium titanate-barium titanate (BNBT) was selected and prepared by a solid state reaction. Since, polymer polyvinylidene fluoride (PVDF) has interesting properties and advantages over the other polymers, it was used as a matrix for the processing of polymer/ceramics flexible films by hot pressing. Implementation of piezoelectric powder into the matrix of α - phase PVDF was performed under the carefully optimized conditions of temperature and pressure. Three different volume ratios of active phase vs. polymer (BNBT 30, 35 and 40 vol%) were used for the preparation of flexible films. The homogeneous distribution of piezoelectric powder in the polymer was obtained. IR analysis pointed that after the hot pressing, in the obtained flexible films, there is a transformation of electrically inactive PVDF α -phase into electrically active β and γ phases. Ferroelectric analysis evidenced the difficulties to obtain fully saturated hysteresis loops in inhomogeneous ferroelectric materials due to the formation of charge layers at the ferroactive-polymer phase interfaces. The dielectric permittivity for 40 vol% is nearly two times higher than for 30 vol% and eight times higher than for pure PVDF, while the losses at room temperature (at 1 kHz) remain below 3 %. Anelastic measurements confirmed the results obtained with the dielectric spectroscopy.

[1] A. Jain et al. Polymer Engineering and Science, (2015) 1589-1616

[2] H. Li, Applied Physics Reviews 1, 041301 (2014)