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# ABSTRACT:

## Effect of Barium Titanate Content on the β Phase Crystallization and Piezoelectric performance of P(VDF TrFE)-Based Nanocomposites

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Piezoelectric nanogenerators (PENGs) have become key devices for powering small scale Internet of Things (IoT) technology and play an important role in the development of new smart wireless sensors. Due to the piezoelectric properties, poly(vinylidene fluoride-co-trifluoroethylene) copolymer (P(VDF TrFE)) has been positioned as an alternative to other polymer matrices to obtain enhanced piezoelectric response at a wide range of temperatures. Although P(VDF TrFE) shows relatively high piezoelectric coefficients (d33~10 40 pC/N), the addition of barium titanate-based ceramics can contribute to a better performance [1], as one of the main issues of this polymer is the relatively low dielectric permittivity.

The incorporation of these fillers strongly influences the processability, the formation of β-phase, and the piezoelectric and dielectric properties [2]. The induced modifications are studied in materials obtained by compression molding and additive manufacturing techniques (i.e. material extrusion and inkjet printing) as well as in postprocessed stretched samples. In additive manufactured materials, the d33 is strongly conditioned by the bed temperature and interfaces between layers, reaching values of ~15 pC/N without any post-processing. In contrast, post-processed stretched samples obtained by compression molding had d33 ~38 pC/N. The addition of 40, 50, and 60 vol% barium titanate-based ceramics to the system caused an increase in dielectric permittivity, obtaining d33 values of ~17 pC/N.

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[2] M. Kubin, P. Makreski, M. Zanoni, L. Gasperini, G. Selleri, D. Fabiani, C. Gualandi, and A. Bužarovska, Polym Test 126 (2023).