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Nanocomposite PVDF/ZnO Piezoelectric Foams

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Poly(vinylidene difluoride), PVDF as a semi-crystalline polymer was widely investigated due to its ferro-, pyro- and piezoelectric behavior, combined with its excellent flexibility and mechanical properties[1]. The piezoelectric activity of this polymer is primarily dependent on the development of a specific crystal β-phase. Various procedures and post-treatments have been proposed for achieving a high β-phase content in the corresponding PVDF materials, such as spin coating, electrospinning and mechanical stretching[2]. The addition of various nanofillers in appropriate amounts in PVDF matrix, was found to act as nucleators promoting the crystallization into the desired β-phase[3].

In this work, PVDF/ZnO nanocomposites with ZnO nanoparticles content of 0.5, 1, 2, and 5 wt.%, were produced using a thermally induced phase separation method (TIPS), resulting in highly porous materials. The content of the developed beta crystal phase and the thermal properties of the produced foams were analyzed using FTIR, XRD, DSC and TGA analyses.

The results showed that the addition of ZnO nanoparticles induced high content of desired β-phase, enhancing the overall degree of crystallinity of the PVDF matrix.

Keywords: PVDF, ZnO, nanocomposites, piezoelectric foams

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