Contribution ID: **182** Type: **Poster**

DEVELOPMENT AND CHARACTERIZATION OF PVDF/BaTiO3 COMPOSITES FOR SUSTAINABLE ENERGY HARVESTING

Energy harvesting from renewable sources through advanced materials offers a sustainable option to reduce dependency on fossil fuels while meeting increasing energy demands. This study proposes an advanced piezoelectric polymer composite consisting of polyvinylidene fluoride (PVDF) and barium titanate (BaTiO3). The composite aims to combine piezoelectric and elastic properties for efficient energy conversion. BaTiO3 powders were synthesized via the sol-gel method using barium acetate (Ba(CH3COO)2) and titanium isopropoxide (Ti(OC4H9)4) as precursors with deionized water (H2O) and methanol (CH3O) as solvents, followed by thermal treatment at 1300℃ for 2 h. Additionally, cubic BaTiO3 powder from Aldrich was subjected to the same thermal treatment. Structural characterization using X-ray diffraction (XRD) and scanning electron microscopy (SEM) revealed an asymmetric tetragonal phase with an irregular morphology. PVDF films were synthesized via the solvent-casting method and characterized using XRD and Fourier-transform infrared spectroscopy (FTIR), identifying the predominance of the beta phase. Two composites were developed: one with synthesized BaTiO3 and one with BaTiO3 from Aldrich. Electrical characterization was performed using an impedance analyzer to obtain capacitance curves as a function of frequency, from which the dielectric constant (k) was calculated by comparing the results of both cases. The experimental results confirmed that the synthesized BaTiO3 exhibited enhanced piezoelectric properties and sufficient mechanical elasticity in the PVDF/BaTiO3 composite for effective deformation and energy conversion, suggesting its effective application in sustainable energy harvesting technologies.

Keywords

Energy harvesting, piezoelectric composite, polyvinylidene fluoride, barium titanate

Reference

C. Wan and C. R. Bowen, Multiscale-structuring of Polyvinylidene fluoride for energy harvesting: The impact of molecular-, micro- and macro-structure, J. Mater. Chem. A, 5, (2017), 3091. https://doi.org/ 10.1039/c6ta09590a

This work was supported by

Instituto Politécnico Nacional

Author approval

I confirm

Author will attend

I confirm

Authors: RUIZ RAMOS, Alicia Natalia (Instituto Politécnico Nacional); Dr GARCÍA PACHECO, Georgina (Instituto Politécnico Nacional); Dr ANDRADE SÁNCHEZ, Martín Ernesto (Tecnológico de Estudios Superiores de Ecatepec); Dr JACOBO ESTEBAN, Munguía Cervantes (Instituto Politécnico Nacional)

Presenter: RUIZ RAMOS, Alicia Natalia (Instituto Politécnico Nacional)

Session Classification: RENEWABLE ENERGY

Track Classification: Renewable Energy: Materials and Devices