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Electrospray Deposition of Polyvinylidene fluoride (PVDF) Microparticles: Impact of Solvents and Flow Rate

Abstract

Polymeric microparticles have been shown to have great impact in the area of drug delivery, biosensing and tissue engineering. Electrospray technology, which provides a simple and yet effective technique in the creation of microparticles, was utilized in this work. In addition, altering the electrospray experimental parameters such as applied voltage, flowrate, collector distance, solvents and the polymer-solvent mixtures can result to difference in size and morphologies of the produced microparticles.

The effects of the flowrate at (0.15, 0.3, 0.45, 0.6, 0.8 and 1 $mLhr^{-1}$) and N, N-Dimethylformamide (DMF)/acetone solvent ratios (20:80, 40:60, 60:40, 80:20, 100:0 v/v) in the production of PVDF microparticles were studied. Scanning Electron microscopy (SEM) was used to observe changes in morphology of the microparticles, and this revealed that a higher acetone to DMF ratio produces deformed particles, while flowrates at (0.3 and 0.45$mLhr^{-1}$) and a more optimized DMF to acetone solvent ratio (60:40 v/v) produced uniform spherical particles. We discovered from the Raman spectroscopy results, that the electrosprayed PVDF microparticles had an increase in piezoelectric β phase compared to the α phase dominant PVDF pellet which is non piezoelectric.

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