SMART PIEZOPOLYMERIC MATERIALS

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Abstract

In aerospace applications, composites have offered multiple advantages by reducing weight and consequently saving fuel consumption but they are more expensive and vulnerable to flaws during fabrication. They reduce the strength of composites with usage. Also failure mechanisms of composites are not well understood as compared to metals, which lead to increasing probability of accidents. These failures and damages can be reduced by real-time monitoring techniques. One such method is using distributed sensors on the structure while in-use, which can detect the damages. It is possible only if sensors are of good quality so that signal from sensor can be interpreted accurately to reflect the *insitu* conditions of the structures. One such sensor is PVDF sensor. PVDF is a widely used fluorocarbon polymer with varied range of applications. It is flexible, chemically inert, machinable creep resistant and has excellent resistance to sunlight. When it is subjected to proper deformation and electrical polarization treatment, it exhibits strong piezoelectric and pyroelectric properties i.e., the material can be used as a plastic transducer element, which will generate electrical charge as a result of externally, imposed mechanical or thermal fields. It is more sensitive to mechanical loads over a wider range of loading conditions than piezoceramics. Consequently, they are good candidates for transducer applications.

β-phase of Polyvinylindine fluoride (PVDF) is well known for piezoelectricity. So films of PVDF have been prepared using solvent cast method and are hot stretched mechanically to get the required β-phase. Films are characterized for structural, mechanical, surface, and electrical properties using X-ray diffraction, tensile testing, scanning electron microscopy, and frequency response spectral analysis respectively. PVDF films in β-phase are further characterized for sensor applications.