Efficient Power Generation via Controlled Porosity in Ferroelectric Polymers

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Energy harvesting from ambient has emerged in recent years as potential mode of powering small-scale portable electronic devices, wearable electronics and biomedical implants. Ambient vibrations, such as those associated with human movements, which are of low frequency and random (in terms of both frequency and amplitude) can be scavenged using piezoelectric nano-generators. Porosity has been suggested as promising route to achieve higher efficiency power generators. Ferroelectric polymers are promising for flexible power generation applications. Here we employed phase separation method to prepare porous poly(vinylidene fluoride-trifluoro ethylene) (P(VDF-TrFE)) nanofibers in the form of nonwoven mats. The P(VDF-TrFE) mats were used as a power-generator. The electrical output of the nanofiber mats shows an increase by increasing the bulk porosity. While dense P(VDF-TrFE) nanofibers show obtained open circuit voltage of 4V, we have obtained open circuit voltage in excess of 20V for sample with porosity around 50%. The newly developed piezoelectric power generators open a promising route toward developing portable/wearable electronic devices.

Keywords: Ferroelectric polymer, Power generation, ambient vibration, porous ferroelectric, energy harvesting