

Materials and Systems for Piezoelectric Vibration Energy Harvesting

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Piezoelectric vibration energy harvesters (PVEHs) have received considerable attention as an enabling technology for self-powered wireless sensor networks. PVEHs are particularly attractive because of the potential to deliver power indefinitely and their ability to be integrated concurrently with microfabrication of sensor nodes. A key challenge has been insufficient power generation for practical applications. In order to realize enhanced power generation, there have been research efforts on improved materials, efficient electronics, and fabrication of devices along with model development. The research focus presented here lies on the development and experimental verification of an improved electromechanically-coupled model that includes the ability to analyze proof mass effects and different electrode configurations. The effects of piezoelectric material properties on device performance are also studied to gain insight into the design and selection of optimal piezoelectric materials for power generation. This work contributes to the development of PVEHs by offering new insights at both the materials and system levels.