# Numerical simulation of piezoelectric energy harvesting system


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**ABSTRACT**

Piezoelectric materials can be used as mechanisms to transfer ambient vibrations into electrical energy that can be stored and used to power other devices. In this study, the mechanical energy of vibrational beam will be converted to electrical energy using Macro Fiber Composite (MFC) piezofiber composite actuators. The MFC piezofiber composite actuator consists of rectangular piezo ceramic rods sandwiched between layers of adhesive, electrodes and polyimide film. The electrodes are attached to the film in an interdigitated pattern which tranfers the applied voltage directly to and from the ribbon shaped rods. The major advantages of a MFC piezofiber composite actuator are higher performance, flexibility, durability, and directional actuation compared to a traditional piezoceramic actuator. In this study, the MFC bonding location and impedance match of harvesting circuit which govern the effectiveness of piezoelectric energy harvesting system are carefully investigated. The vibrational and electrical energy transfer is improved by introducing the distribution characteristics of MFC. The strain distributions of vibrational beams with different boundary conditions are obtained by MATLAB simulation. The integration of strain distributions of beams are utilized to determine the effectiveness of the energy transfer. Finally, the impedances between MFC and harvesting circuit are investigated regarding to energy transfer efficiency.



Keywords : MFC piezoelectric actuator, Piezoelectric Energy Harvesting, impedance matching, modes of vibration.


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