

عنوان مقاله:

Modeling of a novel magneto-electro-elastic energy harvester under applied voltage with simultaneous use as actuator

محل انتشار:

دومین کنفرانس بین المللی کاربرد مواد و ساخت پیشرفته در صنایع (سال: 1401)

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خلاصه مقاله:

This paper introduces a novel harvester to store the electrical power, which comes from external applied electrical voltage power. The beam of energy harvester consists of an active Magneto-electro-elastic (MEE) layer attached to the homogeneous elastic substrate layer. Assuming that the connection of these layers is perfect, the uni- and bi-morph configurations of the MEE layers (including serial, parallel, and single-layer connections) are investigated. The coupled magneto-electro-mechanical (MeM) governing differential equations of the MEE energy harvesting system are derived for a harmonic external applied electrical voltage in the transversal direction based on Euler-Bernoulli theory, Gaussian law, and Faraday law. These equations are solved analytically to determine the amount of harvested power and voltage. As a result, a new circuit has been designed and implemented to store power in capacitors. The results show that the single-layer uni-morph configuration is the best choice for storing more overall power. Furthermore, the most optimal parameters of the energy-harvesting circuit for extracting the maximum energy from the various configurations have been determined. Finally, these results prove the usefulness and efficiency of the dual-usage (actuator-harvester) of the new energy harvester.

کلمات کلیدی:

External applied electrical voltage, Uni- and bi-morph, Magneto-electro-elastic (MEE), Dual-usage, Actuator-harvester

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