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A systematic review of piezoelectric materials and energy harvesters for industrial applications

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Abstract

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Abstract

In the last three decades, smart materials have become popular. The piezoelectric materials have shown key characteristics for engineering applications , such as in sensors and actuators for industrial use. Because of their excellent mechanical-to-electrical and vice versa energy conversion properties, piezoelectric materials with high piezoelectric charge and voltage coefficient have been tested in renewable energy applications . The fundamental component of the energy harvester is the piezoelectric material , which, when subjected to mechanical vibrations or applied stress, induces the displaced ions in the material and results in a net electric charge due to the dipole moment of the unit cell. This phenomenon builds an electric potential across the material . In this review article, a detailed study focused on the piezoelectric energy harvesters (PEH's) is reported. In addition, the fundamental idea about piezoelectric materials , along with their modeling for various applications , are detailed systematically. Then a summary of previous studies based on PEH's other applications is listed, considering the technical aspects and methodologies. A discussion has been provided as a critical review of current challenges in this field. As a result, this review can provide a guideline for the scholars who want to use PEH's for their research.

Author keywords

Energy harvesting; Modeling; Piezoelectric energy harvester ; Piezoelectric materials ; Smart materials

Engineering controlled terms

Electric potential; Energy harvesting; Piezoelectric materials ; Piezoelectricity; Vibrations (mechanical)

Engineering uncontrolled terms
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