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Design parameters impact on output characteristics of flexible hybrid energy harvesting generator: Experimental and theoretical simulation based on a parallel hybrid model

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Abstract

The impact of design and external parameters on the intrinsic output properties and the load characteristics of hybrid energy harvesting generator is significant in both designing the generator and power management circuit and achieving high energy conversion efficiency. In this work, the intrinsic output characteristics of a hybrid triboelectric and piezoelectric generator is investigated, where the impacts of design parameters on the output properties and load characteristics under resistive and capacitive load conditions are demonstrated using a wide-ranging setting of the design parameters and compared with the theoretical calculations using a parallel hybrid model. The regularities concluded from the experimental results reflect the actual output behavior of a typical hybrid generator and provide evidence that the parameters have significant impacts on the intrinsic output properties, resistive load behavior and charging behavior. The outcomes of this study can be used as guidance toward designing of effective structures and power management circuit as well as in future simulation of a wide range of hybrid generators.

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