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Abstract

Flexible Thermoelectric Generator Module as Body Energy Harvester †

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One of the technical issues for enabling in situ sensors is to energize them through a battery pack which is often obtrusive and compromises the ecological validity of the system performance. A flexible thermoelctric generator became an attractive technology due to its wide use, especially for curved surfaces applications. This study proposes a unique approach to replace or supplement existing battery power through harvesting thermal energy from the human body in order to transform wearable sensors into personalized care. The energy harvester module includes ink-based thermoelements made of nano-carbon bismuth telluride materials. N- and P-type thermoelectric elements that are designed electrically in series and thermally in parallel provide electrical potential due to temperature difference available between the body skin and ambient. The proposed design of heat transfer surfaces in this work improves thermal conductance between the skin and the warm side of the harvester and between the cold side of the harvester and the ambient, and can enhance the electrical energy conversion performance of the thermoelectric harvester. The presented harvester in this study is supposed to produce 100 μV to feed the used sensor in the thermoelectric system. In this design, the effect of ambient conditions, such as temperature and heat transfer coefficient due to natural convection, and also dimension of the TEG thermoelements on the power generation, are studied.

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