ENERGY HARVESTING

Return to sender

Nat. Commun. **9**, 1437 (2018)

Energy loss in electrical systems often occurs in the form of excess heat, presenting engineers with ever increasing thermal management problems. While heat removal is commonplace, harvesting this energy remains challenging as the underlying physical mechanisms vary. Dielectric loss, where heat energy is lost as a result of polarization switching under alternating electromagnetic fields, is one mechanism where direct gains could potentially be made. Yong Tae Park, Sangmin Lee and colleagues have now demonstrated an approach that can harness waste dielectric switching energy and enhance power generation in triboelectric generators (TEGs).

Under normal operation, TEG electrodes generate alternating voltages leading to energy loss in the surrounding dielectric as heat. The researchers — who are based at Chung-Ang University, Korea Institute of Industrial Technology, Kyung Hee University and Myongji University — developed an energy-loss return gate in which a high-permittivity liquid dielectric is placed in contact with the lossy dielectric. This allows polarization energy to be transferred to a secondary electrode, inducing charges that can be returned to the system as electrical energy. Compared to a TEG without the energy-loss return gate, and at an equivalent input energy, Lee and colleagues are able to boost the TEG peak power generation by 350% and boost charging performance by 240%. The use of the liquid dielectrics could also enable further energy savings via concurrent convective cooling.

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Published online: 14 May 2018
https://doi.org/10.1038/s41928-018-0082-4