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Powering the Future Night and Day: MANA Develops Cutting-Edge Thermoelectric Generator

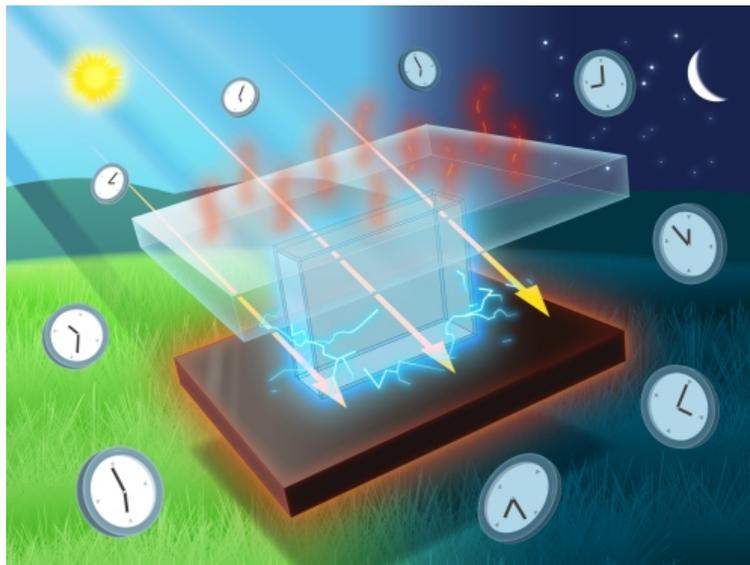
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Researchers from the Research Center for Materials Nanoarchitectonics (MANA) have developed a thermoelectric generator that can use both radiative cooling and solar heating to produce electricity, opening doors to applications in powering small off-grid sensors.



Daytime radiative cooling is typically used to cool surfaces that face the sky, like the roof of a building. Since these devices thermally radiate towards the sky, they also generate a slight temperature difference with respect to their surroundings. This difference in temperature can be leveraged to produce electricity using a thermoelectric generator.

However, most radiative cooling materials also reflect sunlight, limiting the solar energy that can be utilized for generating electricity.

This limitation was addressed in a recent study, where a research team from MANA, including Dr. Satoshi Ishii, Dr. Cédric Bourgès, Nicholaus K. Tanjaya, and Dr. Takao Mori, developed a mostly transparent thermoelectric device that is capable of harnessing both radiative cooling and solar heating to generate power.

The device consists of a top transparent plate that acts as a radiative cooler and a bottom plate coated in blackbody paint which absorbs incoming sunlight. Separated by a transparent thermoelectric junction, the innovative “co-planar” design of the device allows sunlight to reach the bottom plate for solar absorption, unlike previous versions with separate solar absorbing and radiative cooling regions.

Through several experiments, the researchers demonstrated the ability of this thermoelectric generator to produce power during daytime via radiative cooling and solar heating, and through radiative cooling during nighttime. *"The ability of our device to continuously generate thermoelectric voltage day and night makes it an ideal standalone power supply for off-grid sensors, which have become increasingly common in recent years,"* remarks Dr. Ishii.

Replacing batteries in remote devices can be inconvenient and expensive. This innovative thermoelectric generator offers a reliable power solution, eliminating the need for frequent battery changes and paving the way for the operation of critical devices even in off-grid locations.

Reference

Journal	Materials today
Title	Transparent thermoelectric device for simultaneously harvesting radiative cooling and solar heating
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