THERMOELECTRIC DEVICE INFLUENCED BY REDOX SPECIES

DESCRIPTION OF THE TECHNOLOGY

Researchers from the Thermal and Electrical Systems Laboratory (TESLab) at the Universitat Jaume I in Castelló have developed a thermoelectric device, consisting of an electrically conductive solid material and an electrolyte (liquid with dissolved ions), which allows the direct conversion of heat into electricity by means of a temperature difference between the ends of the device with an extremely higher efficiency than current devices.

A good thermoelectric system should have a high Seebeck coefficient (voltage provided per degree of temperature difference between the ends of the material), allow good conduction of electricity (high electrical conductivity) and have low thermal conductivity to achieve the largest possible temperature difference at its ends. In solid materials it is very difficult to achieve this combination of properties, as they are all interrelated. For example, in general, if the Seebeck coefficient increases, the electrical conductivity decreases and vice versa. Moreover, if the electrical conductivity is increased, the thermal conductivity also tends to increase. On the other hand, in devices based on electrolytes made up of redox species, which allow the collection and release of electrons, the conduction of electrical current is worse even though they have Seebeck coefficient values higher than those of solid materials.

The new patented device is able to give any electrically conductive material the high Seebeck coefficient of an electrolyte without changing the electrical conductivity of the conductive material, i.e. the present invention makes it possible to inhibit the correlation between these two properties and thus obtain the highest known values of the Seebeck coefficient with metallic materials, which are the materials that best conduct electricity.

SECTORS FOR COMMERCIAL APPLICATION

- Technology sector
    - Internet of Things: power supply for low-power sensors/devices.
- Industrial sector
    - Heat recovery from industrial processes (metallurgy, ceramics, food industry, etc.).
- Energy sector
    - Conversion of solar energy (solar heat) into electricity.

TECHNICAL ADVANTAGES AND COMMERCIAL BENEFITS

- Advantages
    - Abundance of heat sources.
    - Use of metallic materials, the best conductors of electricity.

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- Benefits
    - Reuse of residual energy (circular economy).
    - Increasing the energy autonomy of small electrical devices.
    - Cost savings.

STAGE OF DEVELOPMENT OF TECHNOLOGY

Validated at the experimental level in the laboratory.

INDUSTRIAL AND INTELLECTUAL PROPERTY RIGHTS

This invention is protected by means of an application for a Spanish patent with reference number P202130691 and filing date 20/07/2021.

COLLABORATION SOUGHT

Development and adaptation of the technology to particular applications through specific agreements and a subsequent licensing agreement with companies.

RELATED IMAGES

CONTACT DETAILS

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