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Refrigeration from Graphene-based Nanoemitters

A novel solar-powered refrigeration device utilizes electron movement for heat transfer, offering an inexpensive and reliable alternative to traditional fluid-based cooling systems.

Evaporation is an effective way of inducing cooling on an object's surface such as sweat cooling the human body. The water or working fluid that is evaporating is absorbing heat from the object and transferring it into the surrounding air.

Purdue University researchers have developed a refrigerator using this concept except instead of using a fluid, the device uses electrons to transfer heat. When the device is exposed to a light source, such as the sun or LEDs, electrons in the substrate evaporate to a collector. The movement of the electrons transfers thermal energy from the substrate to the collector, which results in the collector heating up while the substrate experiences refrigeration. Using the sun as the source of light allows this device to provide refrigeration using only solar power. In addition, it can be coupled with a solid-state thermoelectric generator to produce low-cost solar power. Because the materials for this device are inexpensive and the need for complex refrigeration or fluid-flow elements is eliminated, it is possible to make solar panels for refrigeration that are inexpensive and reliable.

Advantages:

-Inexpensive materials

-Uses solar energy

Potential Applications:

-Solar industry

-Solar panel manufacturers

-Refrigeration industry

Technology ID

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Category

Energy & Power Systems/Power Generation
Infrastructure & Construction/Demand-Responsive Heating & Cooling Systems
Materials Science & Nanotechnology/Thermal Management Materials & Solutions

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Intellectual Property:

Provisional-Patent, 2011-11-04, United States | NATL-Patent, 2012-11-04, European Patent | NATL-Patent, 2012-11-04, Republic of Korea | NATL-Patent, 2012-11-04, Canada | PCT-Patent, 2012-11-04, WO | NATL-Patent, 2014-05-05, United States

Keywords: Solar refrigeration, electron evaporation, solar-powered cooling, inexpensive solar panels, solid-state thermoelectric generator, heat transfer, low-cost solar power, refrigeration industry, solar panel manufacturers, thermal energy transfer, Cooling, Electrons, Graphene, Heat Transfer, LEDs, Mechanical Engineering, Refrigeration, Solar, Substrate, Thermal, Thermoelectric

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