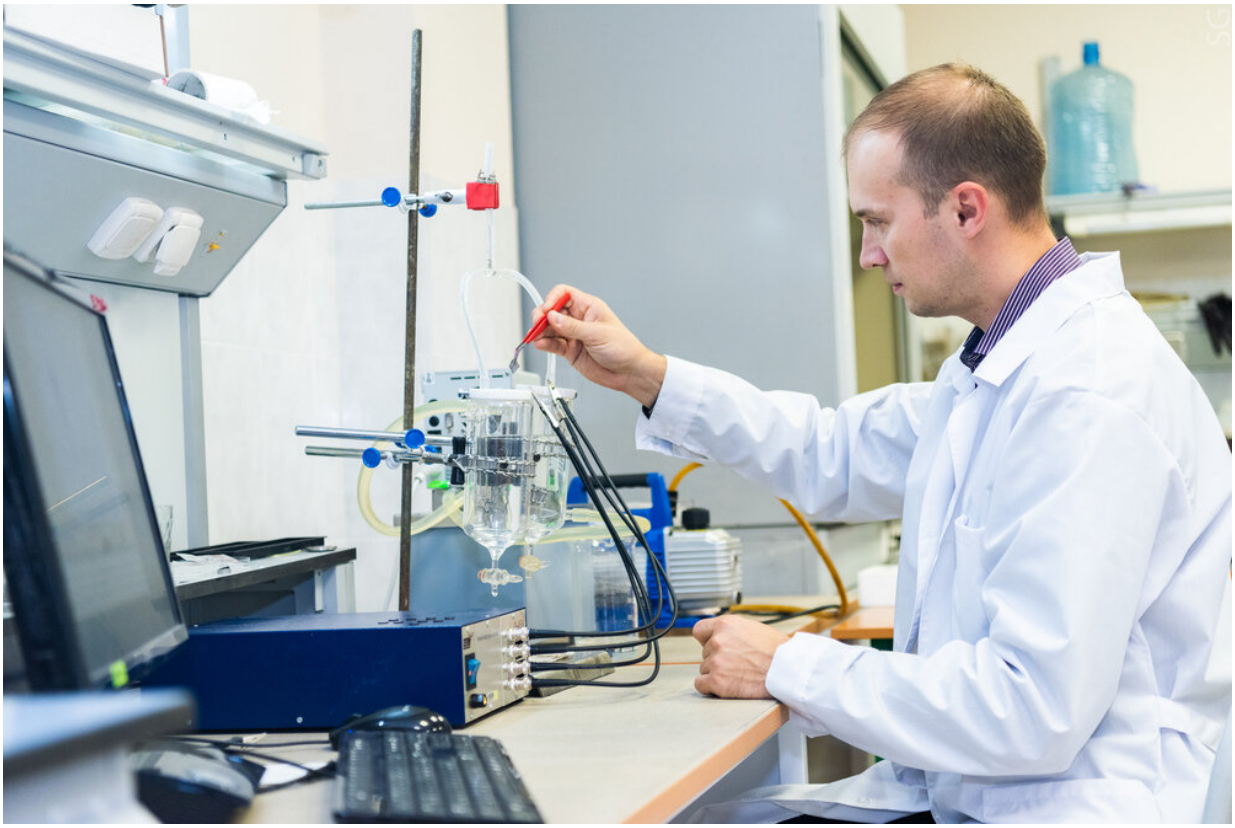
Body heat into electricity: Scientists develop a new way to charge gadgets

September 4 2020



Credit: The National University of Science and Technology MISIS

Scientists from NUST MISIS have developed a new type of energy-efficient devices: thermocells that convert heat into energy. This will make possible creation of portable batteries that can be applied to

virtually any surface, including clothing, to generate electricity directly from the surface of the body. The results are presented in *Renewable Energy*.

Thermoelectricity—electricity obtained from heat due to temperature potential differences—is one of the most promising areas of "green energy." This potential difference (the so-called temperature gradients) surrounds us everywhere—a building heated in the sun, a working transport, even the heat of the human body. The problem is that the modern thermoelectrochemical cells (thermocells) have a rather low output power.

Scientists from NUST MISIS have found solutions to this problem by developing a new type of thermocell consisting of metal oxide electrodes and an aqueous electrolyte. This combination will increase the current, while simultaneously reducing the internal resistance of the element. Due to the use of water, it will give the output an increase in power by 10 to 20 times compared to analogs—up to 0.2 V at an electrode temperature of up to 85° C.

"We have shown the possibility of using a nickel oxide electrode based on hollow nickel microspheres in a thermocell. A record for aqueous electrolytes hypothetical Seebeck coefficient has been reached. In addition, we have found a nonlinear change in current-voltage characteristics, which is not typical for thermocells, which ensures an increase in the device's efficiency," commented Igor Burmistrov, one of the authors of the work, a scientist from NUST MISIS.

The high Seebeck coefficient will allow even the heat of the human body to be used as an energy source. There is another significant advantage of the new structure—the use of an aqueous electrolyte reduces the cost of production and increases the safety of the system.

Further, the scientists intend to achieve an increase in the output power by optimizing the composition of the electrode material and improving the design of the thermocell. In the future, it is possible to create a supercapacitor that would retain its charge for a long time.

More information: Igor Burmistrov et al. High seebeck coefficient thermo-electrochemical cell using nickel hollow microspheres electrodes, *Renewable Energy* (2020). DOI: 10.1016/j.renene.2020.04.001

Provided by The National University of Science and Technology MISIS