Solar cell material is self-healing

January 4, 2017

Perovskite is capable of reversing degraded photovoltaic behavior

Converting sunlight into energy has long been a goal of mankind. Until now, the challenge has been to develop the means to directly convert sunlight into electricity economically. Initially, the production of solar cells required more energy than they would generate over their lifetime. As the process became more efficient, the cost of the cells decreased and their use increased. The new challenge was how to maximize the efficiency of energy conversion. There is a limit to how efficient this generation of solar cells can be.

Scientists at Los Alamos National Laboratory have been exploring a different material for constructing solar cells. The materials are called perovskites. These inorganic materials were first examined as a photovoltaic in 2009. At that time, the efficiency was measured at 3 percent. In 2016, the efficiency had increased to 22 percent with a predicted ceiling over 30 percent. Added to this efficiency is a relatively low cost of production using abundant materials.

The perovskite is not without problems. One is that the performance degrades over time. This is caused by a charge buildup in the materials that inhibits the ability to conduct the electricity generated. This problem builds up over time. Fortunately, this is not due to a change in the chemical structure of the material. So a solution to the problem will extend the lifetime and function of the solar cell.

The investigators found that by putting the photovoltaic in the dark, it has the ability to reverse the blockage and return to full function. This self-healing characteristic results as the trapped charges dissipate. An additional finding of this research was that the process of degradation and the healing of that damage is temperature dependent. By lowering the temperature from 25 C to 0 C, the degradation process stops.

The team is now focusing on improvements in the perovskites and to maintain the technological viability of the material.

The DOE Office of Basic Energy Sciences and the Los Alamos Laboratory Directed Research and Development (LDRD) program funded the Los Alamos portion of the work, performed in part at the Center for Integrated Nanotechnologies (CINT), a DOE Office of Science User Facility. Computational and DFT (density functional theory) calculations used resources provided by the Los Alamos Institutional Computing Program, supported by the DOE NNSA. This work supports the Lab’s Energy Security

mission areas and the Materials for the Future science pillar through the development of materials for clean energy.

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