National Science Foundation
WHERE DISCOVERIES BEGIN

Research News

Discovery sheds light on next-generation solar cell technologies

Scientists find new way to engineer solar cells

Halide perovskite solar cells hold promise as next-generation technologies.

Credit and Larger Version (/discoveries/disc_images.jsp?cntn_id=298712&org=NSF)

June 11, 2019

Halide perovskite solar cells hold promise as the next generation of solar cell technologies, but while researchers have developed techniques for improving their material characteristics, no one has understood why these techniques worked.

New research sheds light on the science behind these engineering solutions and paves the way for developing more efficient halide perovskite solar cells.

The results, Multi-Cation Synergy Suppresses Phase Segregation in Mixed-Halide Perovskites (/cgi-bin/good-bye?https://www.cell.com/joule/fulltext/S2542-4351(19)30259-4), are published in the journal *Joule*.

"If you want to engineer halide perovskite solar cells that have the desirable characteristics you're looking for, you have to understand not only how the material behaves under different conditions, but why," says Aram Amassian, co-author of a paper on the work and a materials scientist and engineer at North Carolina State University (/cgi-bin/good-bye?https://news.ncsu.edu/2019/06/synthesis-of-hp-solar-cells/).

Adding cesium and rubidium into the synthesis process of mixed halide perovskite compounds makes the resulting solar cell more chemically homogeneous -- which is critical to making the material's characteristics more uniform throughout the cell. But until now, no one knew why.

To investigate, the researchers used X-ray diagnostics to capture and track real-time changes in the crystalline compounds formed during the synthesis process. The studies were performed at CHESS, the Cornell High Energy Synchrotron Source.

"We found that some of the precursors, or ingredients, form compounds other than the one we want, which can cluster key elements irregularly throughout the material," Amassian says.

"We also found that introducing cesium and rubidium into the process at the same time effectively suppresses the formation of these other compounds, facilitating the formation of the desired, homogeneous halide perovskite compound used to make high performance solar cells."

The research was funded by NSF's Division of Electrical, Communications & Cyber Systems <https://www.nsf.gov/awardsearch/showAward?AWD_ID=1542015&HistoricalAwards=false> and partially conducted at CHESS, a high-energy synchrotron source supported jointly by three NSF directorates: Biosciences; Engineering; and

Mathematical and Physical Sciences' Division of Materials Research <https://www.nsf.gov/awardsearch/showAward?AWD_ID=1332208&HistoricalAwards=false> .

-- NSF Public Affairs, (703) 292-8070 media@nsf.gov (mailto:media@nsf.gov)
