Applied physical sciences research advances solar energy

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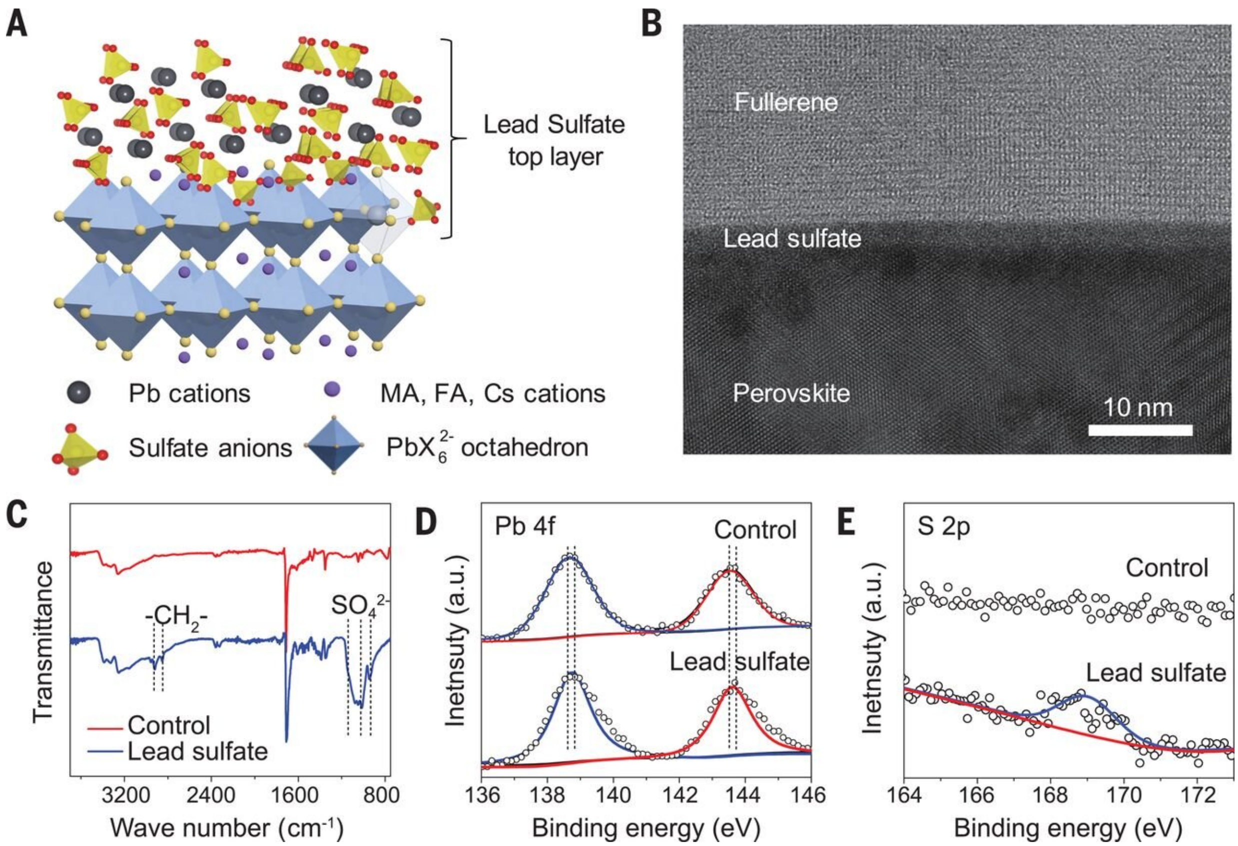

Organohalide lead perovskite stabilized by a lead sulfate surface layer. (A) Schematic illustration of protection of perovskites through in situ formation of a lead sulfate top layer on the perovskite surface. (B) Cross-sectional HR-TEM image of the perovskite/lead sulfate/C60 interface. (C) FT-IR measurement of perovskite powder with or without the lead sulfate layer. (D and E) The XPS spectra of (D) Pb 4f and (E) S 2p for the perovskite films deposited on ITO glass. Credit: *Science* (2019). DOI: 10.1126/science.aax3294

In an article published this month in *Science*, researchers in the Huang Group in the College of Arts & Sciences' department of applied physical sciences at The University of North Carolina at Chapel Hill revealed a new method for stabilizing perovskite solar cells and discussed the implications it has on the future of solar energy and other technologies.

Perovskite solar cells are a new type of solar cell that include a metal halide perovskite structured compound as the light-harvesting active layer. Perovskite solar cells have demonstrated high solar-to-electricity conversion efficiencies at a low production cost, making them increasingly popular subjects of renewable energy research. However, their stability when exposed to moisture and oxygen remains a critical hurdle to overcome before commercialization. The Huang Group addressed this challenge by proposing a new method that would enhance the resistance of the perovskite solar cells under ambient conditions.

"By converting the surface of perovskites into a compact, water-insoluble lead oxysalts layer, we can effectively block the penetration of oxygen and moisture and stabilize the perovskite layer," principal investigator Jinsong Huang said. "It also suppresses the ion migration through the interfaces, another main challenge faced by perovskite solar cells. As a result, our perovskite solar cells exhibit excellent stability under realistic operation conditions."

These findings could help unlock the potential for perovskite solar cells to be commercially produced for use in clean energy and other applications.

"Our study demonstrates a new method that can effectively stabilize the perovskite materials, not only in solar cells, but also in other perovskite-related fields, like photodetector, X-ray detector and LED," Huang said.

More information: Shuang Yang et al. Stabilizing halide perovskite

surfaces for solar cell operation with wide-bandgap lead oxysalts, *Science* (2019). DOI: 10.1126/science.aax3294

Provided by University of North Carolina at Chapel Hill

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