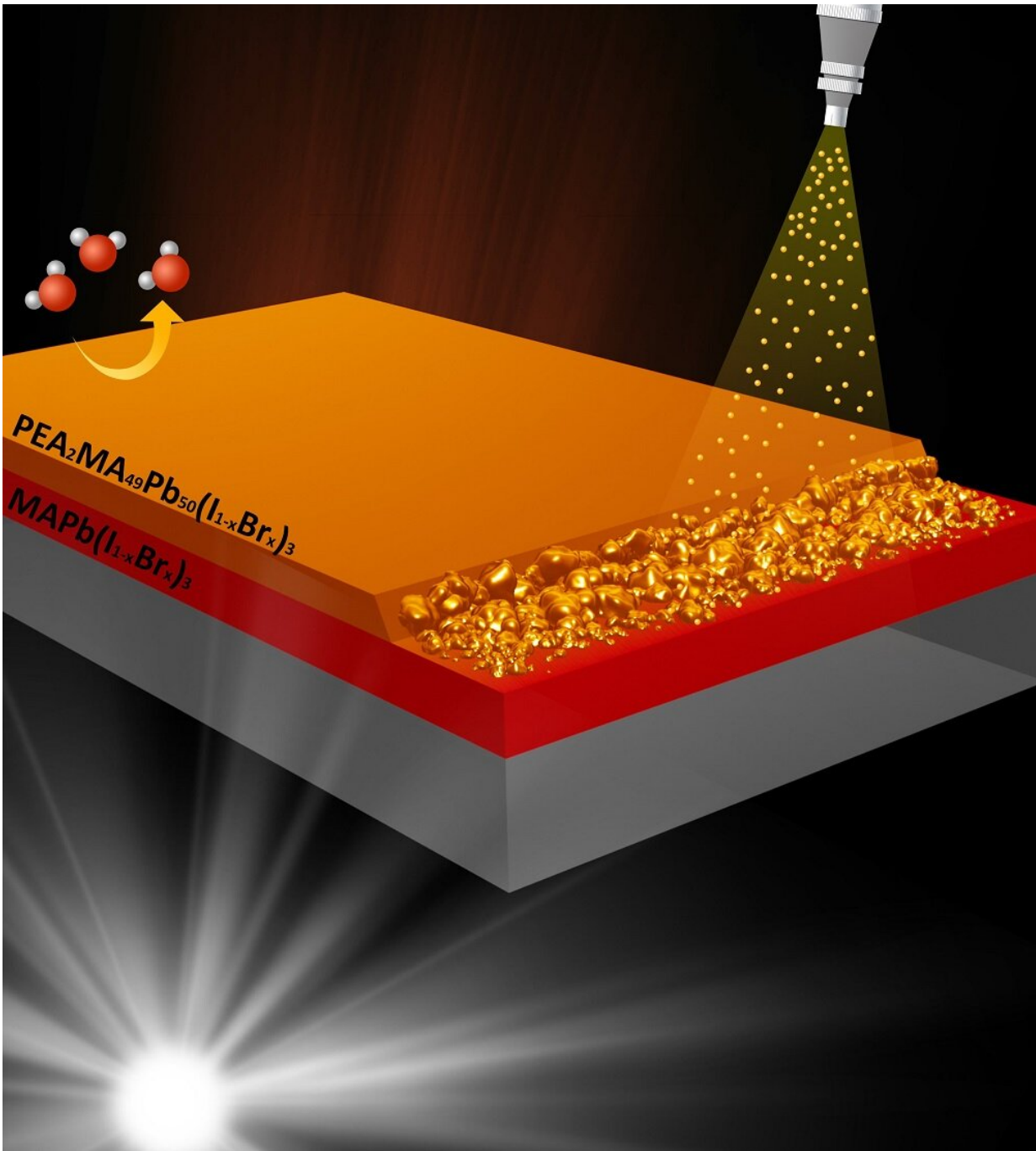


Precision spray coating could enable solar cells with better performance and stability

June 3 2020



Researchers have developed a new precision spray-coating method called sequential spray deposition that enables multilayer perovskite absorber for advanced solar cell designs and could be scaled up for mass production. The technique could be used to create perovskite architectures with any number of layers. Credit: Pongsakorn Kanjanaboos, Mahidol University

Although perovskites are a promising alternative to the silicon used to make most of today's solar cells, new manufacturing processes are needed to make them practical for commercial production. To help fill this gap, researchers have developed a new precision spray-coating method that enables more complex perovskite solar cell designs and could be scaled up for mass production.

Perovskites are promising for next-generation [solar cells](#) because they absorb light and convert it to energy with better efficiency and potentially lower production costs than silicon. Perovskites can even be sprayed onto glass to create energy-producing windows.

"Our work demonstrates a process to deposit [perovskite layer](#) by layer with controllable thicknesses and rates of deposition for each layer," said research team leader Pongsakorn Kanjanaboos from the School of Materials Science and Innovation, Faculty of Science, Mahidol University in Thailand. "This new method enables stacked designs for solar [cells](#) with better performance and stability."

In the Optical Society (OSA) journal *Optical Materials Express*, Kanjanaboos and colleagues describe their new [spray](#) coating method, called sequential spray deposition, and show that it can be used to create a multilayer perovskite design. Applying different perovskite materials in each layer can allow customization of a device's function or the ability to meet specific performance and stability requirements.

A better way to spray

One of the advantages of perovskites are that they are solution processable, meaning that a solar cell is made by drying liquid perovskite into a solid at a low temperature. This fabrication process is much easier and less expensive than making a traditional silicon solar cell, a process that requires very high temperatures and cutting a [solid material](#) into

wafers.

However, the solution process typically used to make perovskites does not allow multilayer designs because the upper layer tends to dissolve the already-dried lower layer. To overcome this challenge, the researchers turned to a process known as sequential spray deposition in which tiny droplets of a material are applied to a surface.

After trying different spray coating methods, they found one that worked at temperatures around 100 °C. They then optimized the spray parameters to ensure that the tiny droplets dried and crystallized into solid perovskite immediately upon contact with the already-dried lower layer.

Building a multi-layer device

"With our spray coating process, the solution of the upper layer doesn't disturb the solid film making up the first layer," said Pongsakorn.

"Endless combinations of stacked perovskite architectures with any number of layers can be designed and created with precise control of thicknesses and rates of deposition for each layer."

The researchers demonstrated the technique by depositing a perovskite material with high stability on different perovskite material with better electrical properties. This double-layer semi-transparent perovskite device showed clearly defined layers and simultaneously achieved high performance and good stability.

The researchers plan to use the new approach to make multilayer perovskite devices with new functions and combinations of performance and stability that were not possible before.

More information: Koth Amratisha et al, Layer-by-layer spray

coating of a stacked perovskite absorber for perovskite solar cells with better performance and stability under a humid environment, *Optical Materials Express* (2020). [DOI: 10.1364/OME.391546](https://doi.org/10.1364/OME.391546)

Provided by The Optical Society

Citation: Precision spray coating could enable solar cells with better performance and stability (2020, June 3) retrieved 26 April 2024 from <https://techxplore.com/news/2020-06-precision-coating-enable-solar-cells.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.