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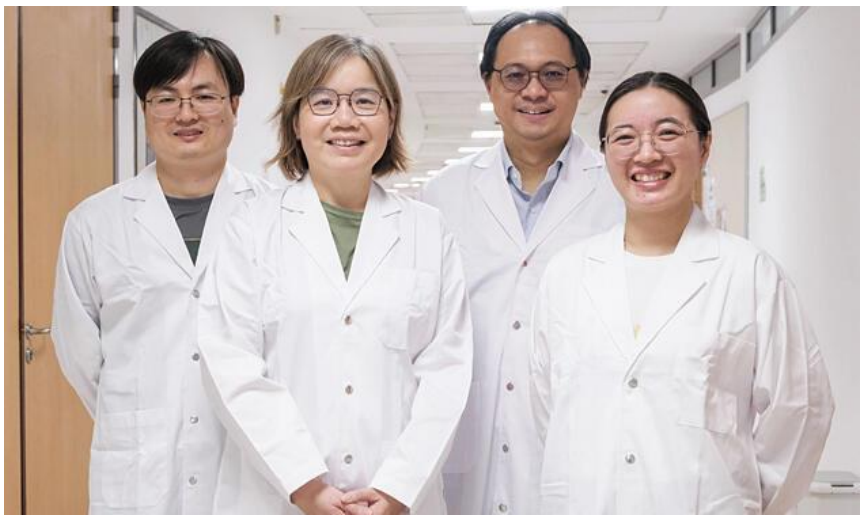
Inert materials improve efficiency and stability of perovskite solar cells

Nanyang Technological University (NTU) in Singapore announced on August 29 that researchers at NTU have used an innovative method to improve the stability and efficiency of perovskite solar cells, making them suitable for practical use. The research results were published in the academic journal *Nature Energy*.



Professor Sum Tze Chien (second from the right), who led this research, and other members of the research team

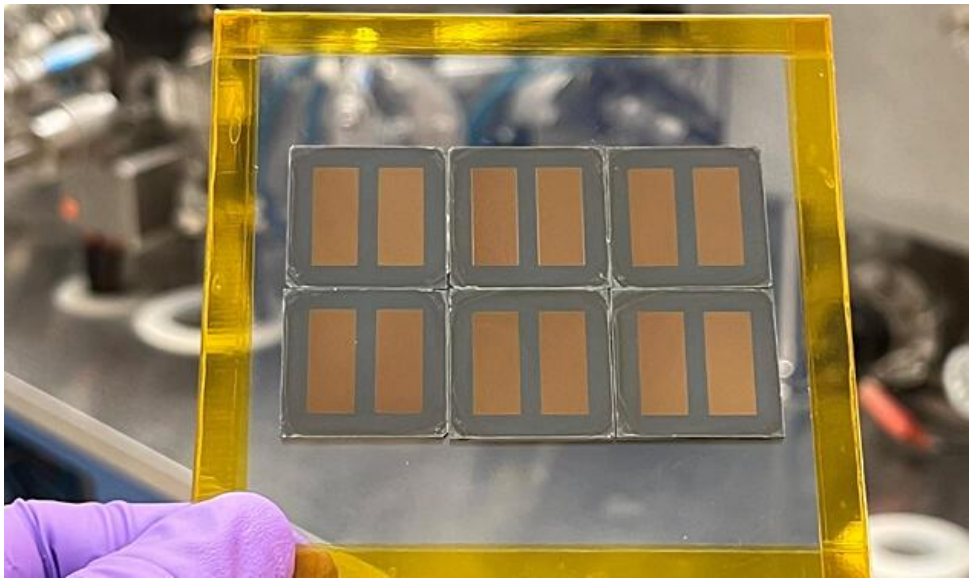
Perovskite solar cells are a promising alternative to silicon-based solar cells, but stability has been key to their widespread adoption, as perovskite materials easily degrade when exposed to oxygen, moisture, heat, and light.

To protect perovskite solar cells from environmental degradation, an extremely thin interfacial layer of highly reactive bulk cations is typically applied to the perovskite film. These cations readily react with the perovskite to form highly conductive coatings. However, their high reactivity makes the interfacial layer less stable.

On the other hand, the incorporation of chemically inert bulk cations into the interfacial layer produces protective coatings that combine high stability with good electrical conductivity, but this incorporation is limited by the low reactivity of the cations.

To overcome these challenges, the research team developed a strategy called selective template growth (STG) to create a chemically inert interfacial layer that combines high stability with good electrical conductivity.

Using this strategy, the researchers fabricated a prototype 1cm^2 perovskite solar cell that achieved a power conversion efficiency of 25.1%, one of the highest reported for a perovskite solar cell of this size. The device maintained over 93% of its initial efficiency after 1,000 hours of operation at 85°C, and 98% after 1,100 hours.



A 1cm^2 prototype perovskite solar cell (brown rectangle) fabricated using the STG strategy

Professor Sum Tze Chien, Director of the Institute for Advanced Studies at NTU and Associate Dean (Research) in NTU's College of Science, and one of the leaders of the research, said: "Our strategy gives us access to chemically inert interface materials that were previously unavailable due to reactivity or solubility limitations. This opens up new avenues for interface design in perovskite devices."

https://spap.jst.go.jp/asean/news/251001/topic_na_01.html