

Nano in Chemistry & Materials

A game changer in photovoltaics: Perovskite solar cell

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Abstract

Since the ground-breaking report of the 9.7% efficient and 500 h-stable solid-state perovskite solar cell (PSC) in 2012 based on methylammonium lead iodide, perovskite photovoltaics have been surged swiftly due to high power conversion efficiency (PCE) obtainable via facile fabrication procedure. As a result, a PCE of 25.7% was recorded in 2022. According to Web of Science, number of publications on PSCs increases exponentially since 2012, leading to the accumulated publications of more than 28,000 as of January, 2022. PSC is regarded as a game changer in photovoltaics because of low-cost and high efficiency surpassing the conventional high efficiency thin film technologies. High photovoltaic performance was realized by compositional engineering, device architecture and fabrication methodologies for the past 10 years. Toward theoretical efficiency over 30% and commercialization of PSCs, further studies on recombination and scalable technologies are required for next 10 years. In this talk, scientific and technological approaches for high efficiency and large-area coating are discussed. For high efficiency, not only perovskite materials and coatings but also interfacial engineering via additive and post-treatment is of importance. For upscaling PSCs, precursor formulation and coating methods are critical in determining photovoltaic performance. Stability issue will be also discussed and methodologies to improve stability are suggested.

Introductory talk by Dr Sonia Ruiz Raga

Senior Researcher at Nanostructured Materials for Photovoltaic Energy group at ICN2

Revealing the spiro-OMeTAD photodoping process in a perovskite solar cell with in-situ impedance spectroscopy and photoluminescence measurements

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