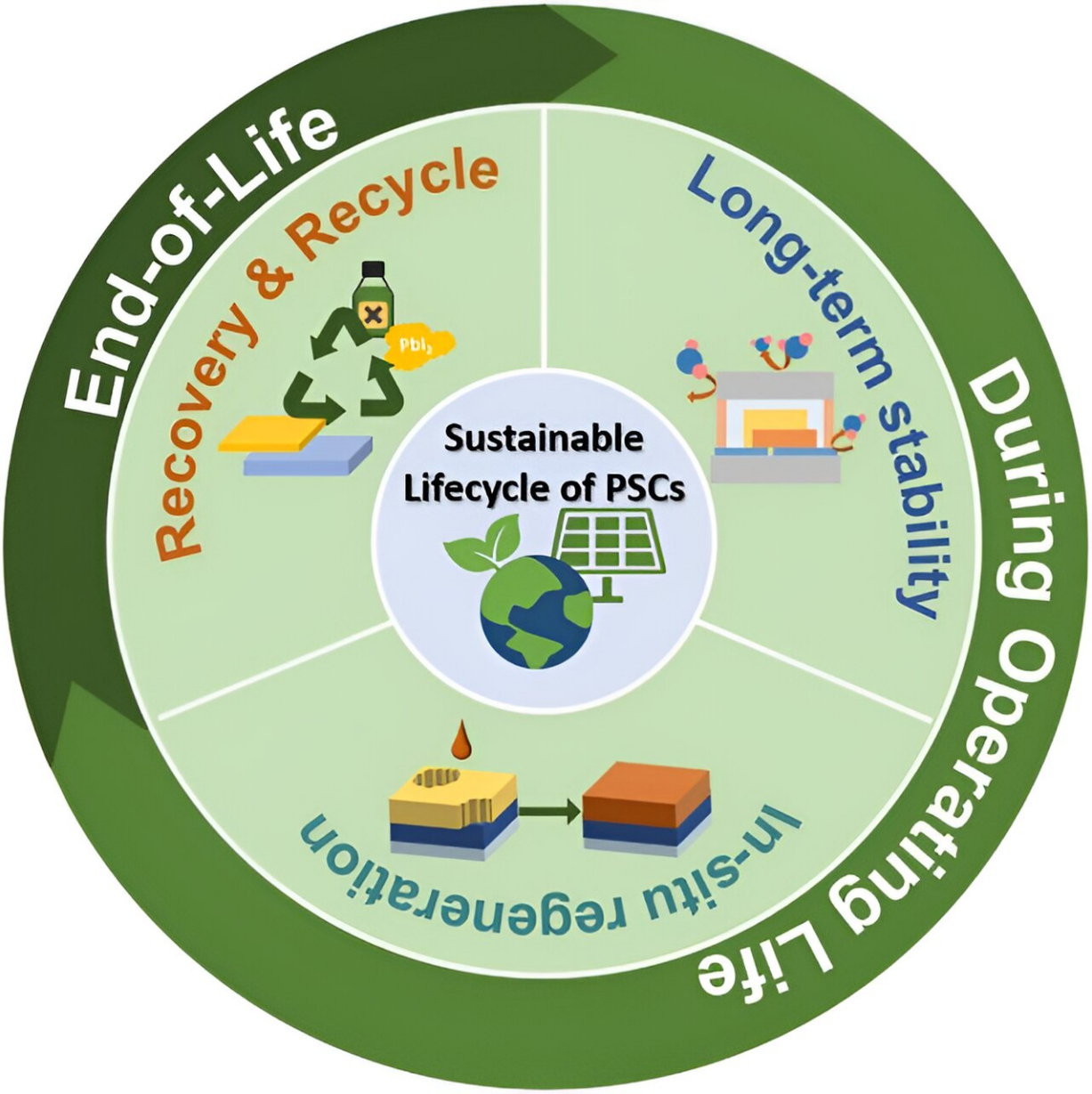
Perovskite solar cells: Tackling stability and environmental impacts for a greener future

July 17 2024



Credit: *eScience* (2024). DOI: 10.1016/j.esci.2024.100243

Perovskite solar cells have captured much attention due to their high efficiency and low production costs. However, their susceptibility to environmental factors and potential toxic lead release during degradation pose significant hurdles.

Given the pressing need for sustainable and safe solar technologies, extensive research is devoted to overcoming these challenges through innovative engineering and material solutions. Based on these challenges, in-depth studies are essential to realize the full potential of perovskite solar cells (PSCs) in the solar industry.

In a review, researchers from Sungkyunkwan University and Korea Research Institute of Chemical Technology delve into the life cycle management of PSCs, addressing key stability strategies and recycling methods. Published in *eScience*, the study offers insights into extending PSCs' operational life and mitigating environmental risks.

The review investigates essential strategies for enhancing the stability and sustainability of PSCs. Key methods include advanced interfacial layers and encapsulation techniques to protect PSCs from environmental factors such as moisture, oxygen, and mechanical stress. These improvements are crucial for prolonging PSCs' operational life.

Additionally, the study highlights innovative recycling approaches that recover valuable materials like silver and lead from discarded PSCs, reducing environmental impact and fostering a circular economy. These strategies aim to create a sustainable and eco-friendly PSC industry, ensuring high efficiency and longevity while meeting global environmental standards.

The proposed advancements could significantly boost the commercial viability and environmental safety of PSCs, paving the way for broader adoption in various solar energy applications.

Dr. Gill Sang Han, co-author and researcher, emphasizes, "The future of solar energy depends significantly on our ability to integrate environmental safety and sustainability into every stage of solar cell production and disposal. Our research provides a blueprint for making perovskite solar cells a viable and responsible choice for global energy needs."

The advancements in PSC technology could revolutionize the solar power industry by making solar cells more durable, cost-effective, and environmentally benign. The implementation of these research findings could lead to broader adoption of PSCs in various applications, from residential to industrial scales, significantly impacting energy sustainability and reducing the ecological footprint of solar energy production.

More information: Hee Jung Kim et al, Managing the lifecycle of perovskite solar cells: Addressing stability and environmental concerns from utilization to end-of-life, *eScience* (2024). DOI: 10.1016/j.esci.2024.100243

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