High-throughput Manufacturing of Rollable Perovskite Solar Arrays for Space Applications

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Abstract:

Printed thin-film solar cells represent a transformative advancement in photovoltaic (PV) technology, offering lightweight, flexible, and cost-effective energy solutions enabled by high-throughput manufacturing techniques. With the rapid development of perovskite-based solar cell technologies, which exhibit high power conversion efficiencies, competition over commercialisation pathways has intensified. The potential for substantial improvements in key performance parameters—such as specific power (W g^{-1}) and stowed power density (W m^{-3})—makes lightweight, rollable printed solar panel technologies particularly attractive for future aerospace PV applications and space missions.

Despite their promising potential, perovskite solar cell technologies face several critical challenges on the path to commercialisation. These include reliable production of large-area devices with high intrinsic stability and development of low-cost, scalable manufacturing processes that support efficient, high-volume production.

CSIRO has been at the forefront of printed solar cell research for more than a decade, pioneering advanced printing capabilities that are compatible with conventional large-scale industrial printing and coating processes. In this presentation, we will discuss recent progress in roll-to-roll printed perovskite solar modules, along with current challenges and future directions in this rapidly evolving field.

Conflicts of Interest

We declare that there is no conflict of interest.

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References

[1] Angmo, D; Yan, S.; Liang, D.; Scully, A. D.; Chesman, A. S. R.; Kellam, M.; Duffy, N.W.; Carter, N.; Chantler, R.; Chen, C.; Gao, M. *ACS Appl. Energy Mater.* **2024**, *7*, 1777−1791.