SiliconPV 2025, 15th International Conference on Crystalline Silicon Photovoltaics

Preface

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SiliconPV Conference 2025

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2025 marked the 15th edition of the International Conference on Crystalline Silicon Photovoltaics (SiliconPV), hosted in the historic and academically vibrant city of Oxford, UK. Held at the Mathematical Institute (Andrew Wiles Building) at the University of Oxford, this year's conference brought together over 180 scientists, engineers, and industry experts from more than 30 countries, reaffirming the global relevance and vitality of silicon-based photovoltaic research. A total of 169 abstracts were accepted following rigorous peer review, with 83 oral presentations and 86 posters delivered in onsite. The event was held in conjunction with the nPV Workshop, extending the technical dialogue to the industry section, enhancing collaboration throughout the week.

The journey of silicon photovoltaics continues to defy expectations. Once considered a niche energy source, solar power has become a cornerstone of global energy strategies, driven by relentless technological progress, cost reductions, and manufacturing expansion. Single-junction silicon cells and modules now routinely approach their theoretical efficiency limits. Breakthroughs in heterojunction and TOPCon device architectures continue to set new performance records, while perovskite-on-silicon tandem solar cells are now nearing 35% efficiency—a milestone unimaginable just a few years ago.

As we push toward the terawatt scale, this rapid innovation brings both opportunities and challenges. The conference theme, "Silicon PV Vision 2/5/10", encouraged participants to explore what the next 2, 5, and 10 years will bring. Conversations centred not only on cell-level breakthroughs but also on the urgent need for sustainable, circular manufacturing and the development of robust industrial infrastructure capable of supporting exponential deployment.

The technical program was organised into five key topic areas:

- Advances in Industrial Silicon Solar Cells, including novel passivating contacts, back-contact and heterojunction cells, defect engineering, and ultra-thin device architectures;
- Silicon-Based Tandem Solar Cells, with strong emphasis on perovskite-on-silicon integration, interconnection schemes, and transparent conductive materials;
- Sustainable Manufacturing, addressing critical issues in silver and indium reduction, kerf-free wafering, circularity, and low-impact materials processing;
- Characterisation, Modelling, and Simulation, with new insights into interface physics, tandem device behavior, and machine learning-enabled diagnostics;
- Modules and PV Systems, covering novel interconnection designs, applications in building-integrated and agrivoltaic systems, and reliability under diverse environmental conditions.

Throughout the week, Oxford's historic setting provided an inspiring backdrop for scientific exchange and community-building. In addition to technical sessions, participants enjoyed a vibrant cultural program, including a conference dinner among fossils and dinosaurs with a lively treasure hunt, and informal networking opportunities that sparked new collaborations.

We are deeply grateful to the scientific committee, abstract reviewers, session chairs, and all contributors whose work is represented in these proceedings. These proceedings document the state-of-the-art in silicon PV and serve as a valuable reference for the community working to advance solar technology.

We hope the innovations and insights captured here will inspire further breakthroughs, helping drive the transformation toward a sustainable, carbon-neutral energy future.