

Upscaling Perovskite Solar Cells via Industrial Roll-to-Roll Processes



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Thursday
April 7
3:00 PM
Room 34-401B
OPEN TO ALL

Perovskite solar cells have emerged as the most promising third-generation solar cells with a rapid increase in record efficiencies. However, most of these devices have been made by processes that are not scalable, typically spin coating. The next challenge in this field will be translating lab-scale developments to large-scale production processes, which will preferably include a cost-competitive roll-to-roll printing process. Commonwealth Scientific and Industrial Research Organization (CSIRO), a national science agency of Australia, has built a printing facility for large-scale printed solar cells up to 30 cm wide via a roll-to-roll process. In addition to the manufacturing facility, a 3D printer-based slot-die coater was developed as a lab-to-fab translation tool and used to fabricate printed perovskite solar cells with over 15% power conversion efficiency. The 3D printing platform provides automated control of x,y,z-positioning, coating speed, acceleration and temperature. This degree of control allows us to mimic and develop the printing conditions appropriate for a typical roll-to-roll manufacturing process. The processes developed in a batch process have now been transferred to a roll-to-roll coater. Recent progress on the translation process for perovskite solar cells will be presented.

Dr Doojin Vak received his PhD from GIST in Materials Science and Engineering working in materials chemistry for organic optoelectronic applications. He spent two years on the fabrication of organic photovoltaics and organic light-emitting diodes in the Heeger Center for Advanced Materials at GIST. In 2007, he joined Prof. Andrew Holmes' group at The University of Melbourne as a post-doctoral researcher working on the development of large-scale printed solar cells. He was a key researcher in the Victorian Organic Solar Consortium (VICOSC). Three years later he joined CSIRO where he continued working with printed solar cells; and in 2014, he demonstrated the world-first slot-die coated perovskite solar cell.

This talk is part of the Perovskites Seminar Series organized by Sam Stranks and sponsored by the Center for Excitonics. For more info contact Sam: stranks@mit.edu