

# Wafer-level Integration and Packaging of Micro-Concentrating Photovoltaics

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## Abstract

Here we present a novel approach for integration and packaging of micro-scale concentrating photovoltaics (CPV) modules on a wafer-level platform. The Wafer Integrated Micro-scale PV approach (WPV) seamlessly integrates multijunction micro-cells with a multi-functional silicon platform that provides optical micro-concentration, hybrid photovoltaic, and mechanical micro-assembly. A >100% improvement on the concentration-acceptance-angle product is demonstrated using the wafer-embedded micro-concentrating elements, leading to dramatically reduced module materials and fabrication costs, sufficient angular tolerance for low-cost trackers, and an ultra-compact optical architecture, which makes the WPV module fully compatible with commercial flat panel infrastructures. Leveraging low-cost micro-fabrication and high-level integration techniques, the micro-scale PV approach effectively combines the high performance of multijunction solar cells and the low costs of flat-plate Si PV systems.

## Biography

Juejun (JJ) Hu is currently the Merton C. Flemings Career Development Associate Professor at MIT's Department of Materials Science and Engineering. His primary research interest is micro-optics and integrated photonics with applications spanning infrared spectroscopy, photovoltaics, flexible photonics, and data communications. He holds a Ph.D. degree (2009) from MIT and a B.S. degree (2004) from Tsinghua University, China, both on Materials Science and Engineering. Prior to joining MIT, Hu was an Assistant Professor at the University of Delaware from 2010 to 2014. Hu has authored and coauthored over 70 refereed journal publications since 2006 and has been awarded 6 U.S. patents. He has been recognized with the National Science Foundation Faculty Early Career Development (CAREER) award, Gerard J. Mangone Young Scholars Award, University of Delaware College of Engineering Outstanding Junior Faculty Member, University of Delaware Excellence in Teaching Award, among others.