Transferred Metal Contacts for Ultrathin Solar Cells

C. M. Went, J. Wong, P. R. Jahelka, M. Kelzenberg, S. Biswas, M. S. Hunt, A. Carbone, H. A. Atwater. (2019) *A New Metal Transfer Process for Van der Waals Contacts to Vertical Schottky-junction Transition Metal Dichalcogenide Photovoltaics.* Sci. Adv. 5, 12, eaax6061. DOI: https://doi.org/10.1126/sciadv.aax6061

Scientific Achievement

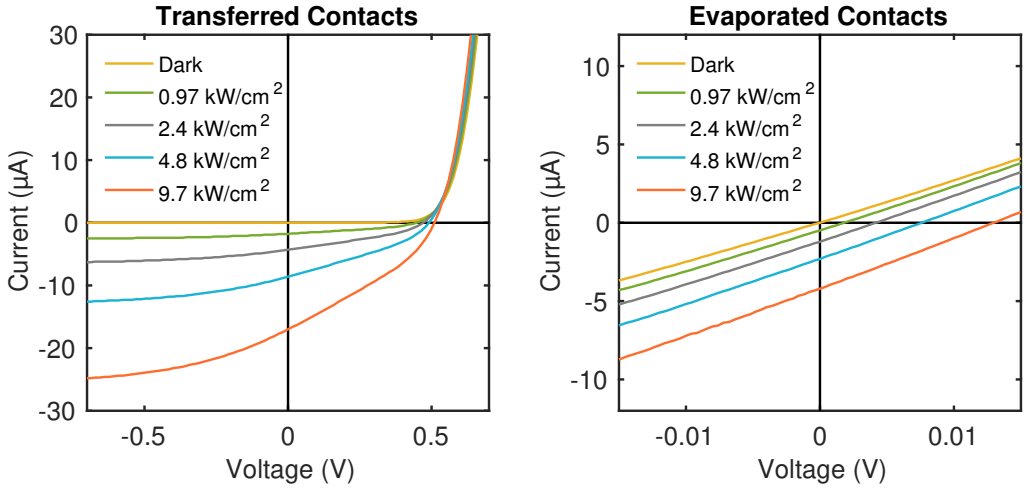
- We developed a simple method for transferring metal contacts onto 2D materials and used this technique to make ultrathin solar cells.

Significance and Impact

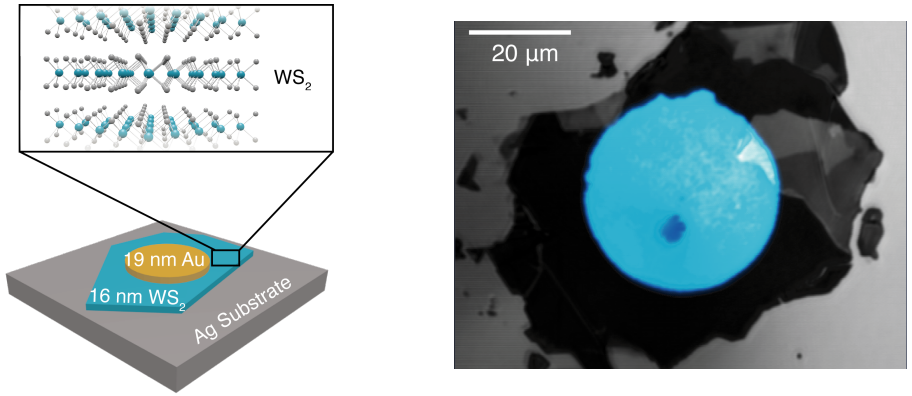
- We performed one of the first characterizations of 2D solar cells under one-sun illumination and created a useful technique for 2D researchers.

Technical Details

- Transferring metal contacts creates metal-2D semiconductor interfaces free of Fermi level pinning.
- We measured active-layer internal quantum efficiency >90%, demonstrating efficient carrier collection.
- We measured a power conversion efficiency of 0.5%, comparable to other ultrathin 2D photovoltaics.



Transferred-contact devices show diode-like IV curves and open-circuit voltage > 500 mV. Evaporated-contact devices show resistive IV curves and open-circuit voltage below 15 mV.



Ultrathin (<150 nm) solar cells made from 2D semiconductors with transferred contacts. Left, schematic. Right, photogenerated current mapping.

Caltech | RESNICK INSTITUTE science + energy + sustainability