



MinesGRADS

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Development of Next-Generation High-Efficiency Silicon Solar Cells

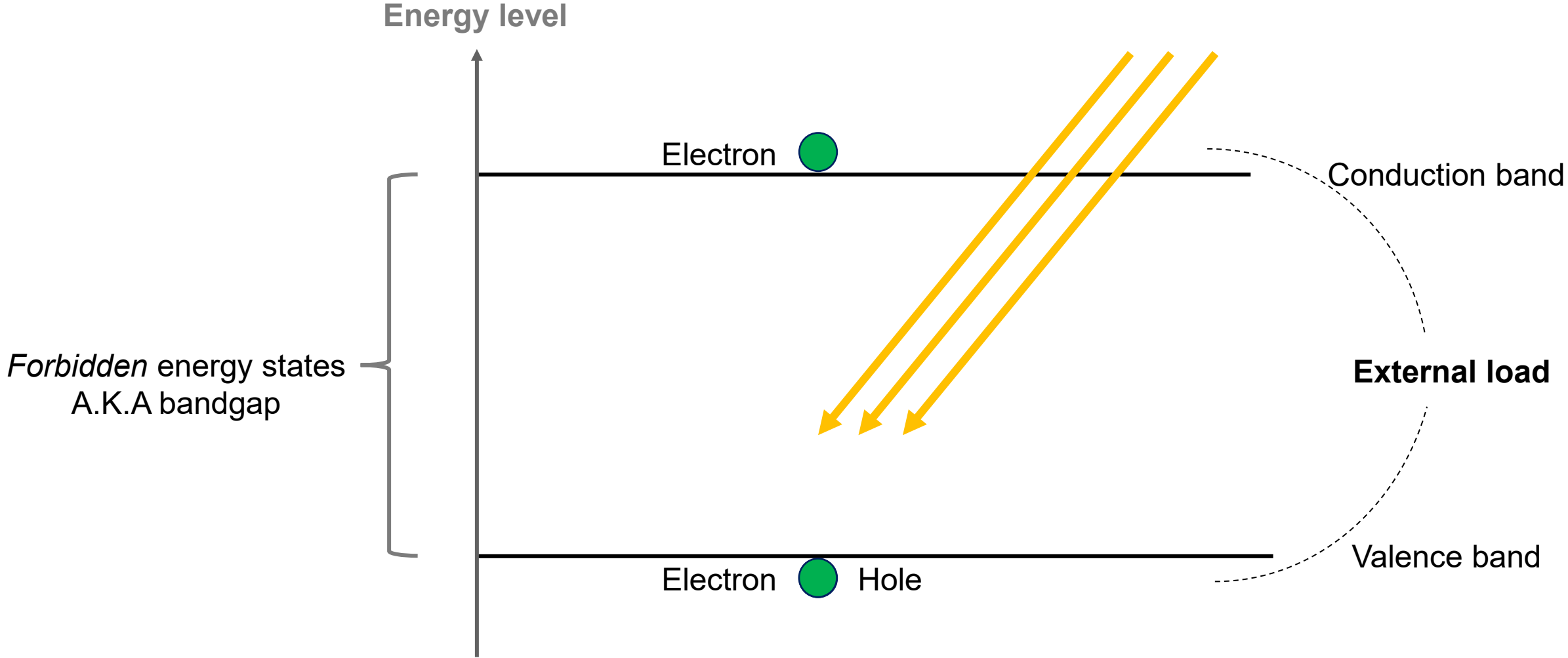
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V. LaSalvia², W. Nemeth², M. Page², S. Agarwal¹, P. Stradins²

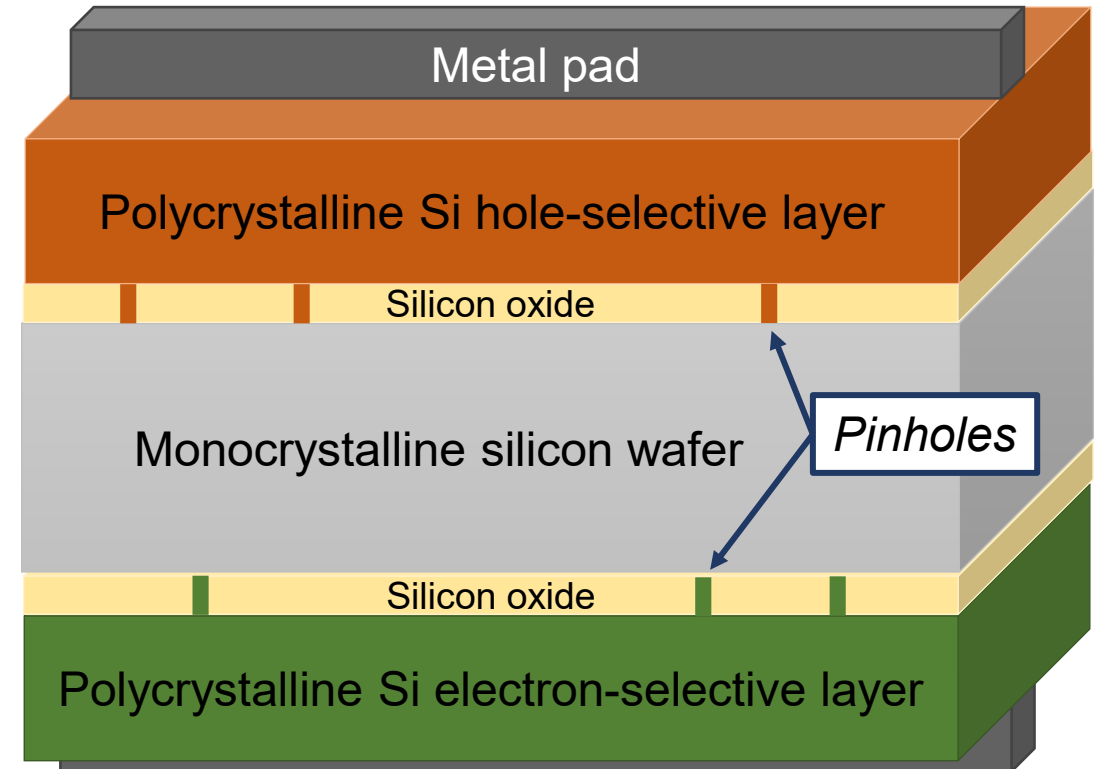
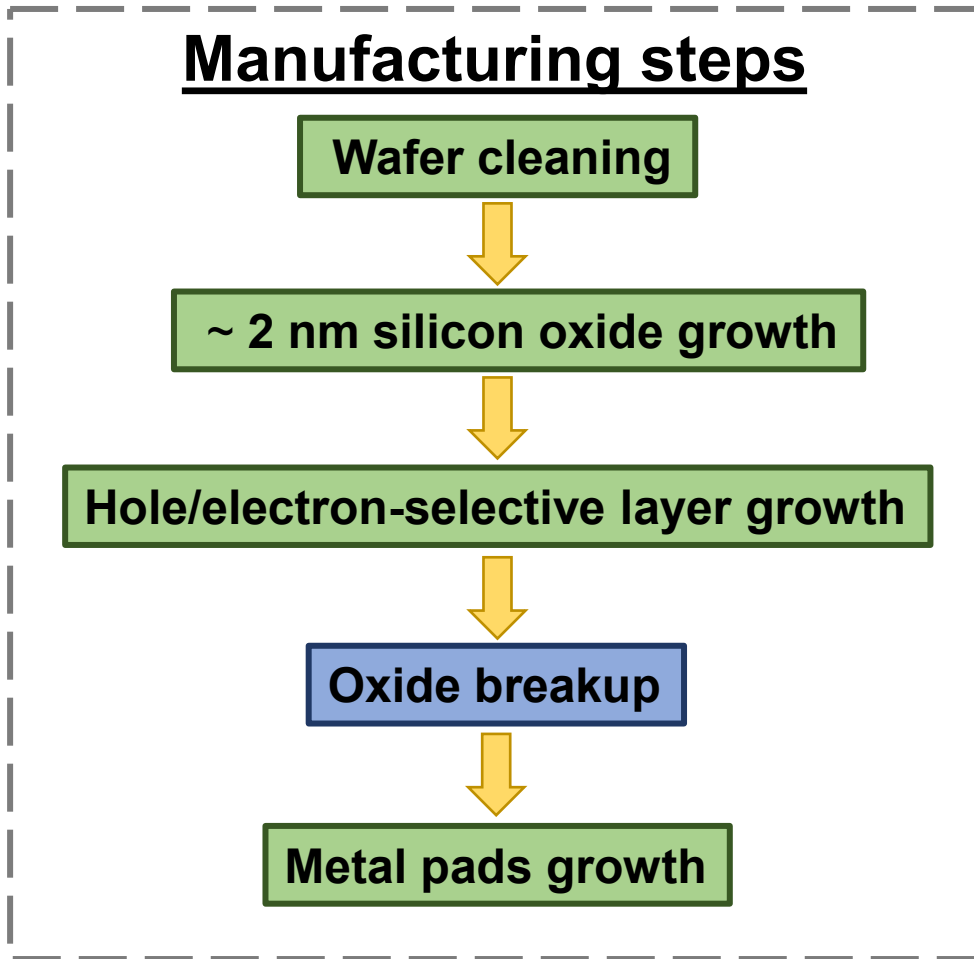
Chemical & Biological Engineering Department of Colorado School of Mines¹, National Renewable Energy Lab²

April 22-23, 2021

Solar Cells 101

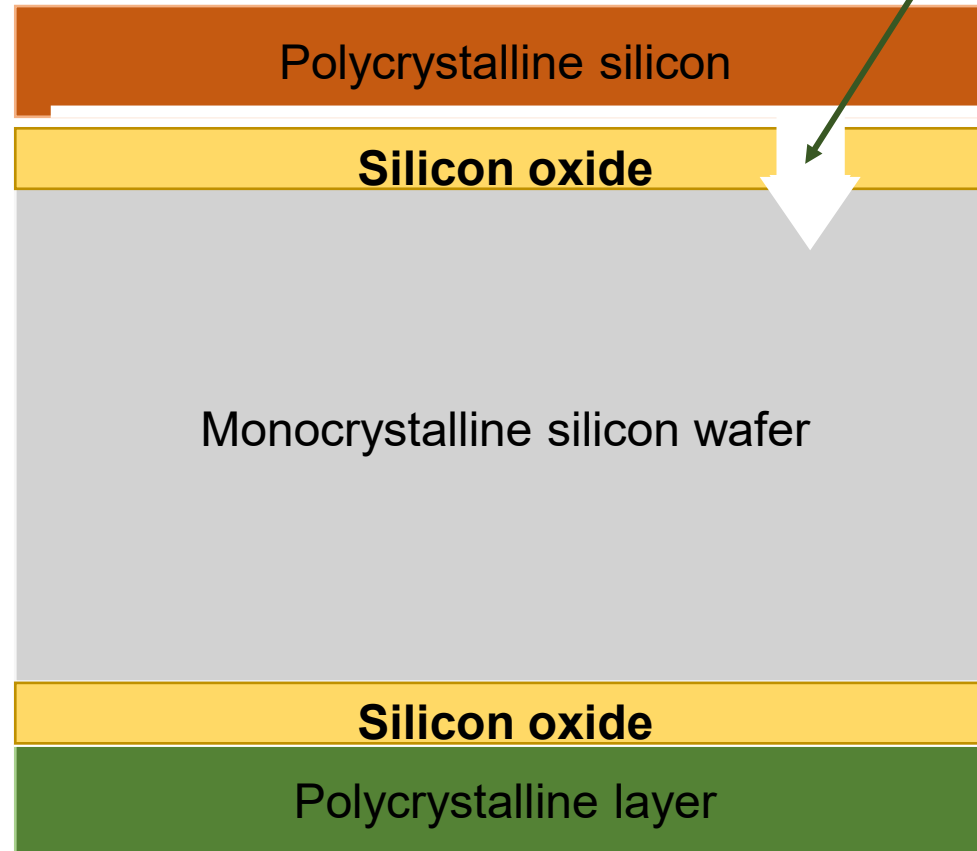


Next-generation High-Efficiency Si Solar Cell



Chemical Etching to Expose Nano-pinholes

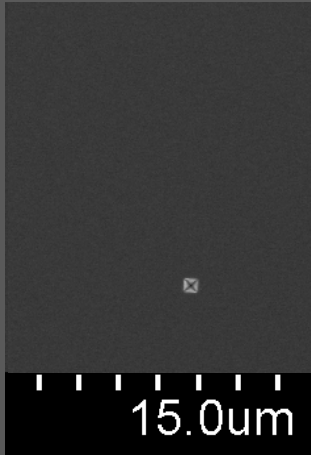
“Magnified” pinhole



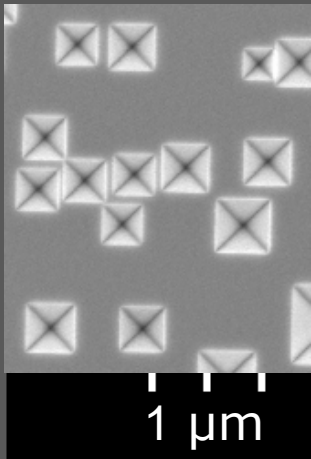
Nano-pinholes are not observable even with high-resolution electron microscopy.

“Magnified” pinholes

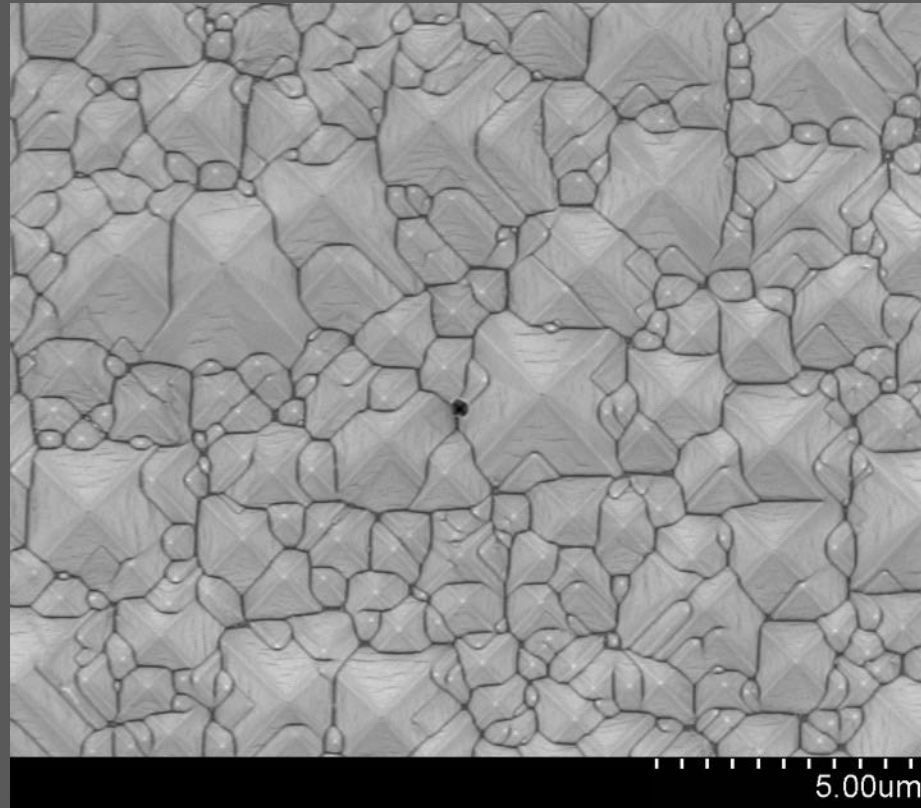
1050°C



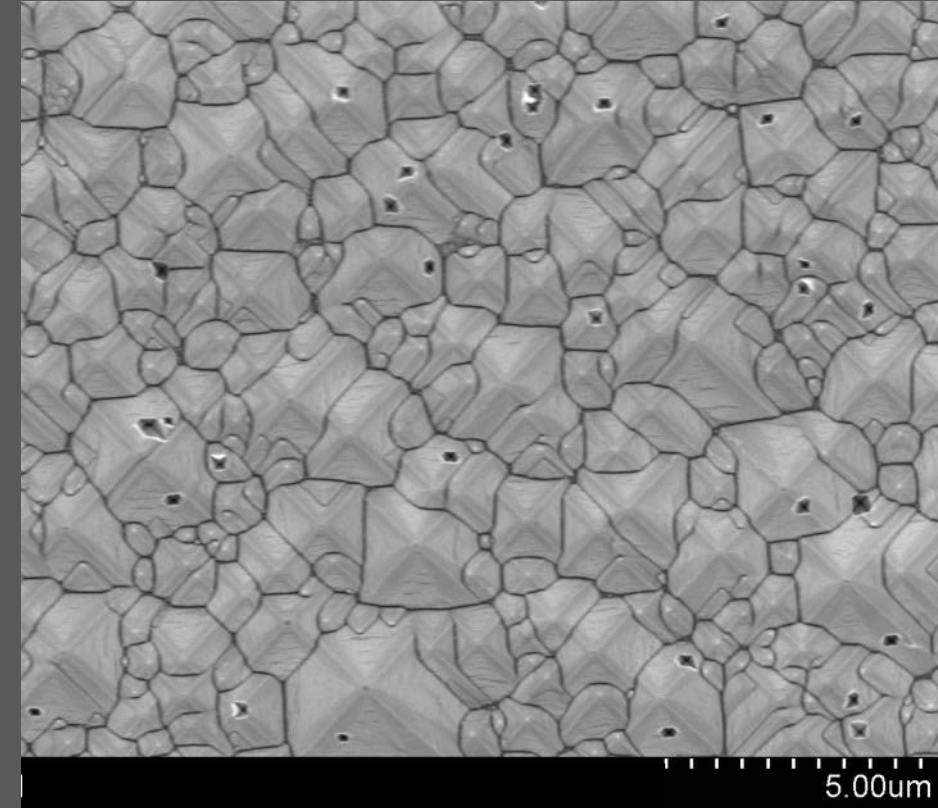
1100°C



1050°C



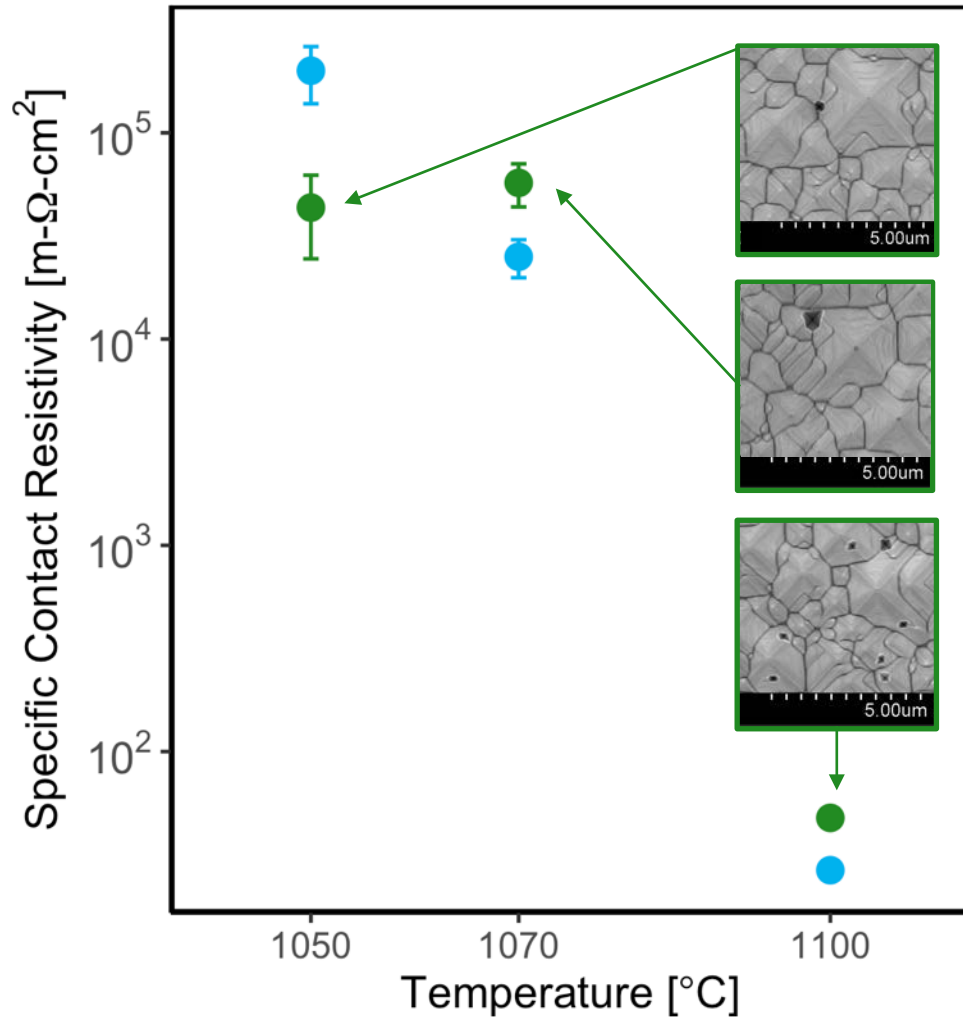
1100°C



“Magnified” pinholes on planar samples

“Magnified” pinholes on textured samples processed at different temperatures

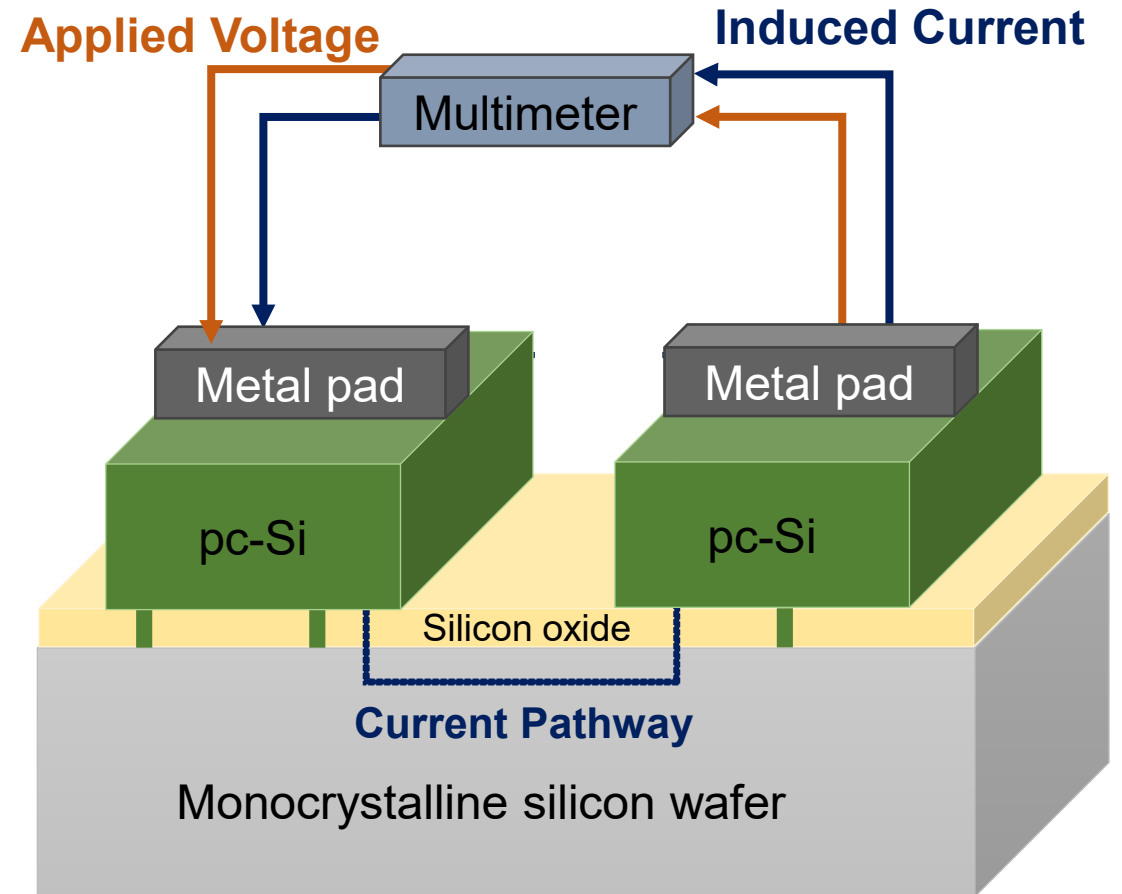
Conductivity measurements



Surface type

● Planar

● Textured



Summary

1. Nano-pinholes enable electrical conduction across the insulating silicon oxide layer.
2. Chemical etching is utilized to visualize nano-pinhole formation in planar and textured samples.
3. We developed a fabrication process for high-efficiency silicon solar cells, providing a platform to develop controlled pinhole formation methods.



Acknowledgements

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