

Copper Printed Contacts for Silicon Solar Cells



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Module Materials Solutions

**Awarded FY23
Core Modelling Call**

Contributing to DuraMAT Consortium Goals

As the Industry pushes towards lower costs using more abundant materials it is imperative that the impact on durability, especially for >25 year operation, be addressed. The industry has been very interested in replacing silver (Ag) with lower cost and abundant copper (Cu) but has resisted primarily on the potential for accelerated degradation; including Cu diffusion into Si, oxidation and EVA reaction.

This project aims to develop accelerated aging tests that explore the impact of diffusion, oxidation and encapsulant degradation mechanisms.

**Period of Performance: 4/23-3/24
Funding: \$500k**

Project Overview

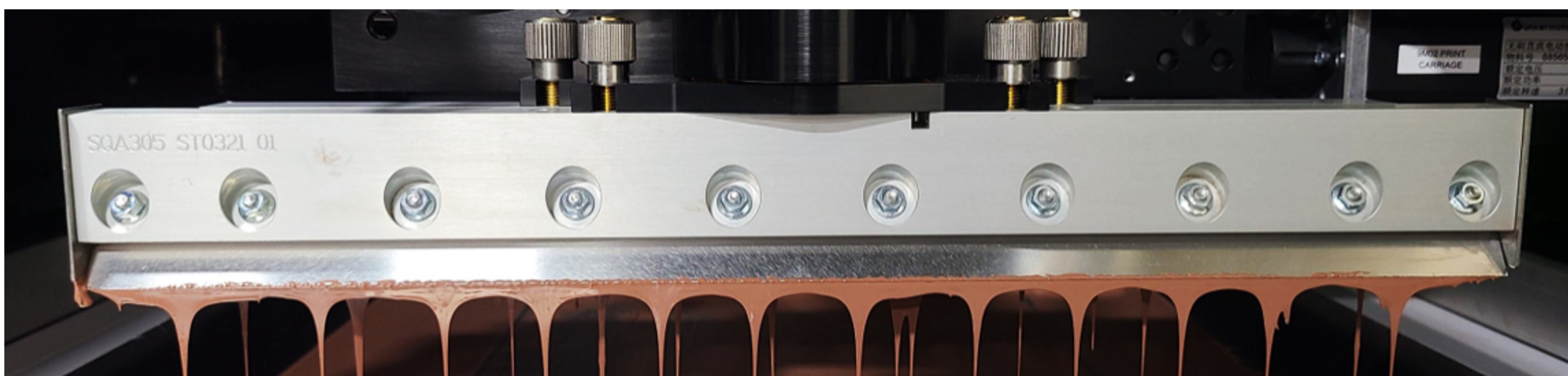
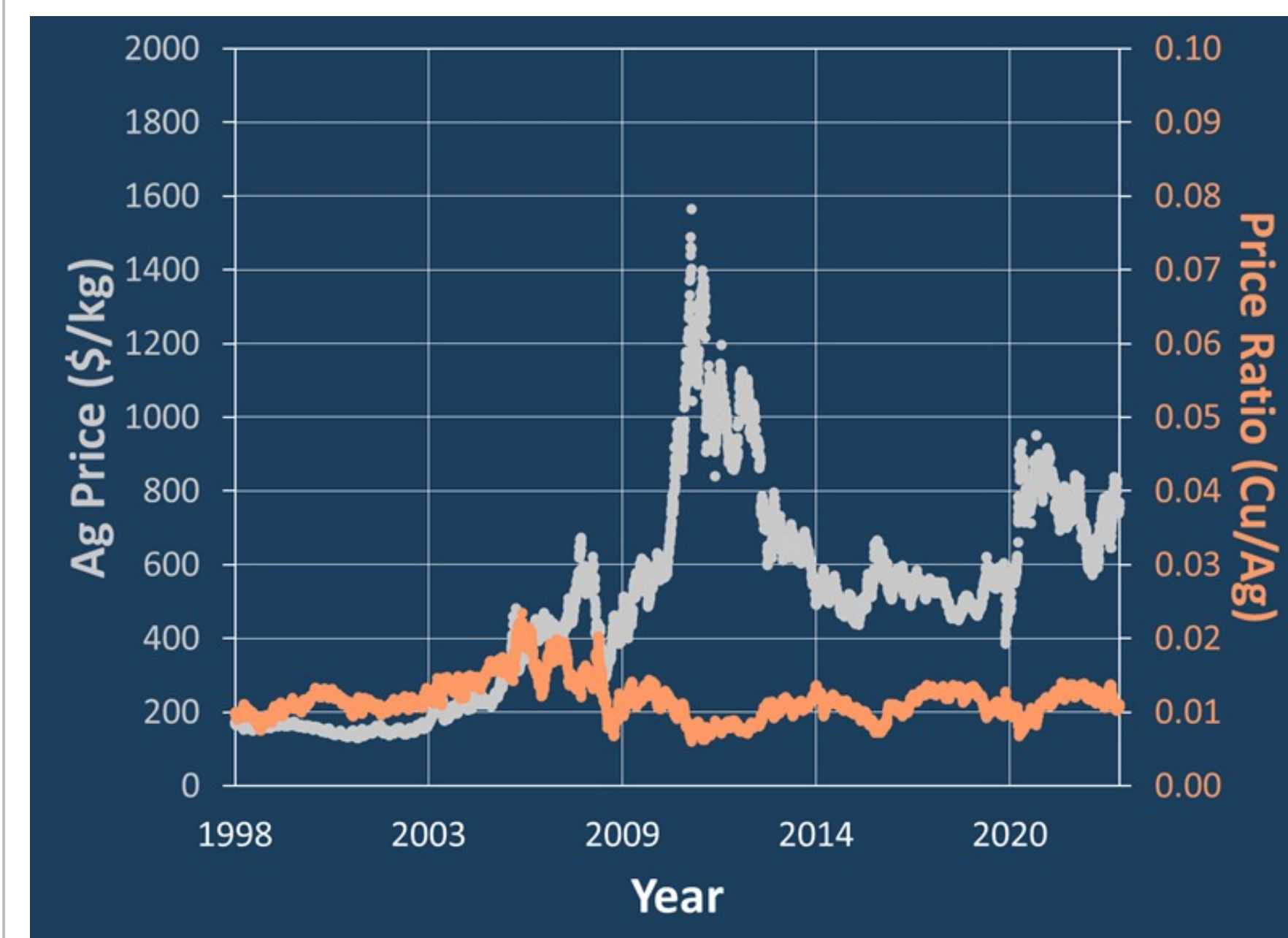
Demonstrate that COPPER PASTES are a VIABLE ALTERNATIVE to SILVER.

- Largest non-silicon cost is silver.
- Copper screen-printed air fired pastes.
- Copper can oxidize and diffuse reducing the performance of a solar cell.
- Quantify the stability of the copper in a module.



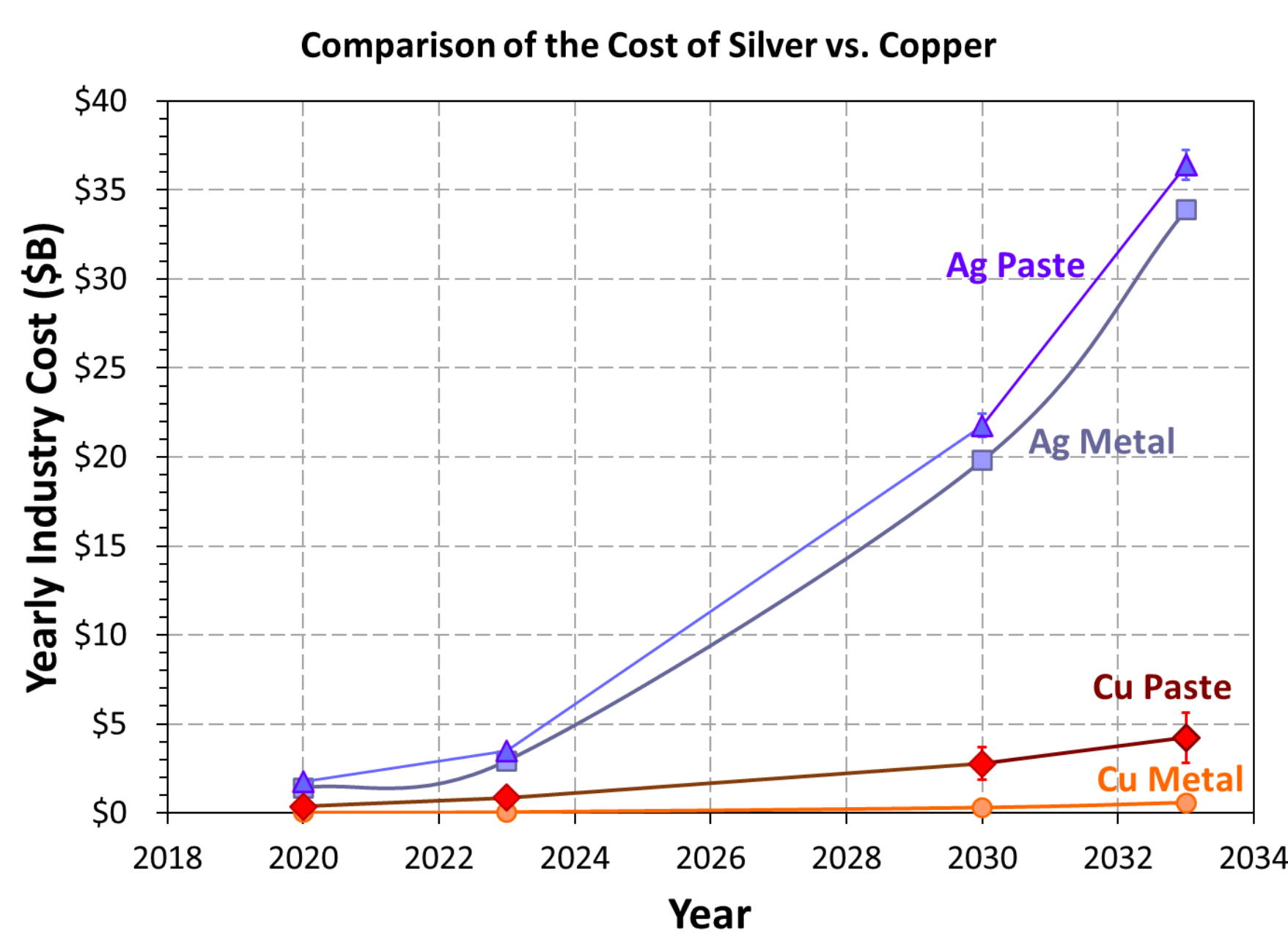
Silver Volatility

Copper 1/100th the cost.

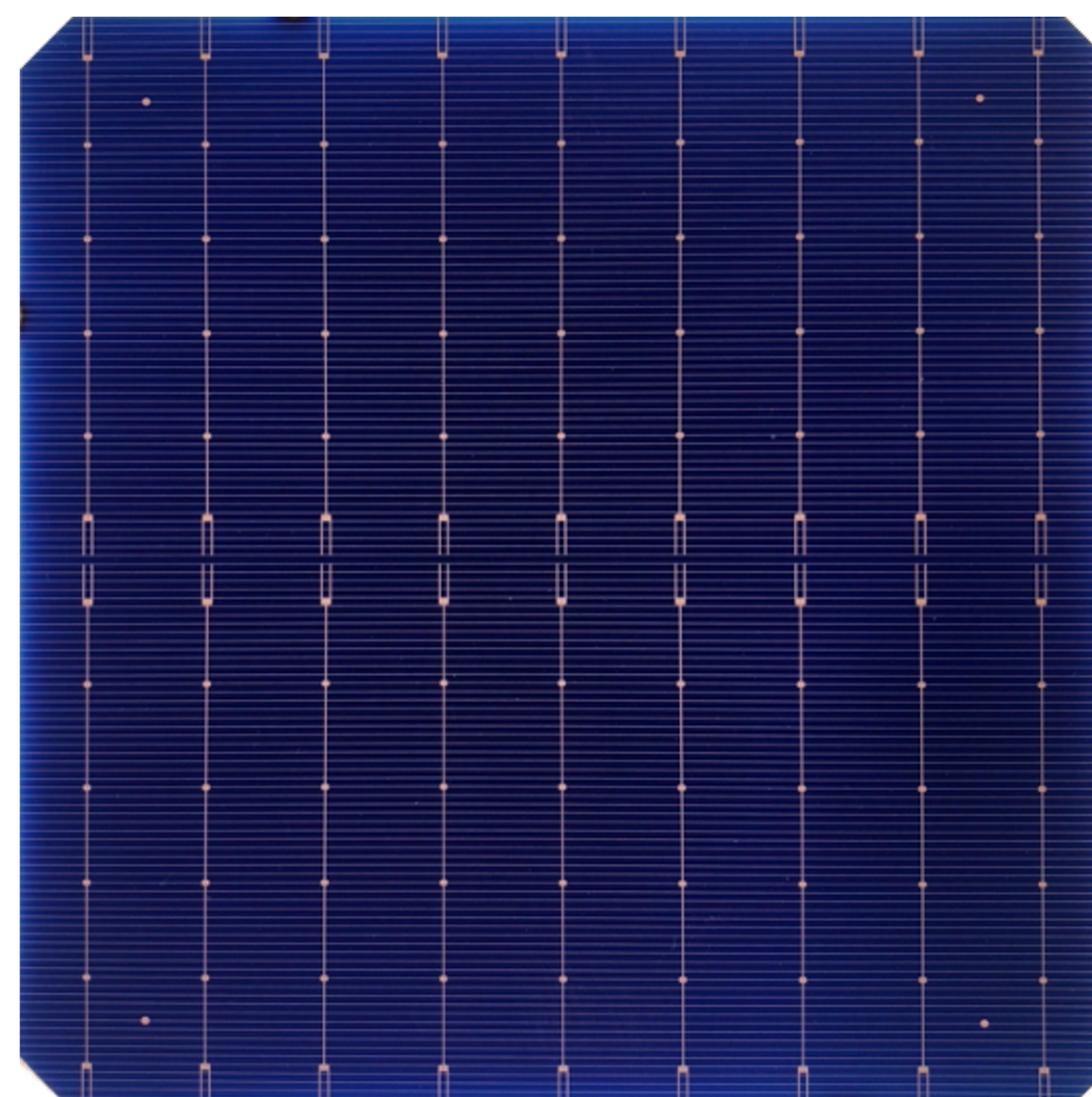


Copper Paste Advantage

Cost projections and sustainability.

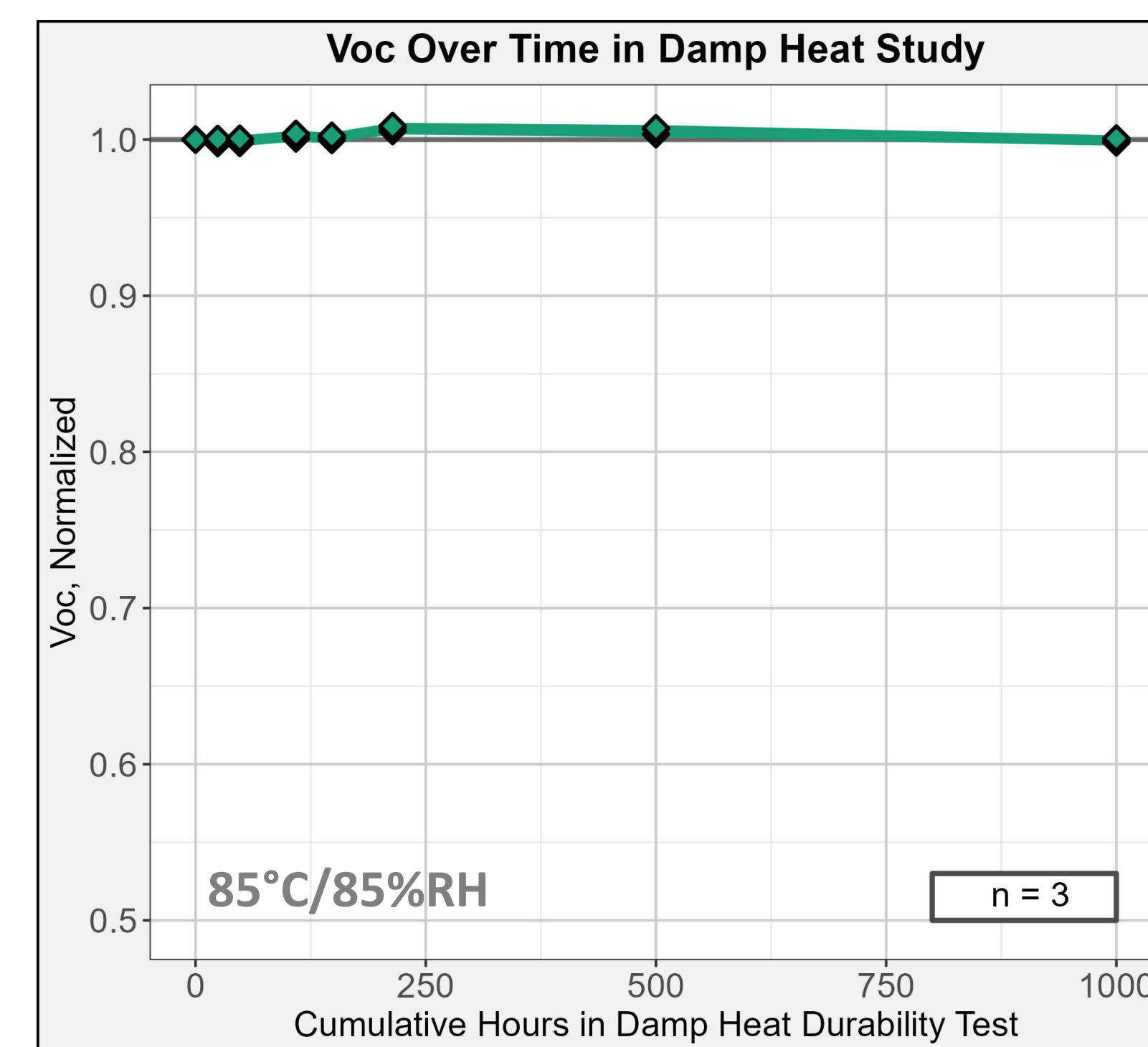


Printed Cell



Damp Heat

Mini-mini module (16 cm² PERC).



Accomplishments & Publications

- ❖ Potential for modules containing copper metallized PERC cells demonstrated on the miniature scale.
- ❖ Performance and characterization of the potential degradation pathways in-progress.

Presentations:

- T. Druffel, A. Rohatgi, P. Stradins, Copper Screen Printed Pastes Fired in Belt Furnace, DuraMAT Webinar, 12th February 2024.
- Druffel, T. Copper printed metallization - progress. in DuraMAT. 2023. Albuquerque, NM.

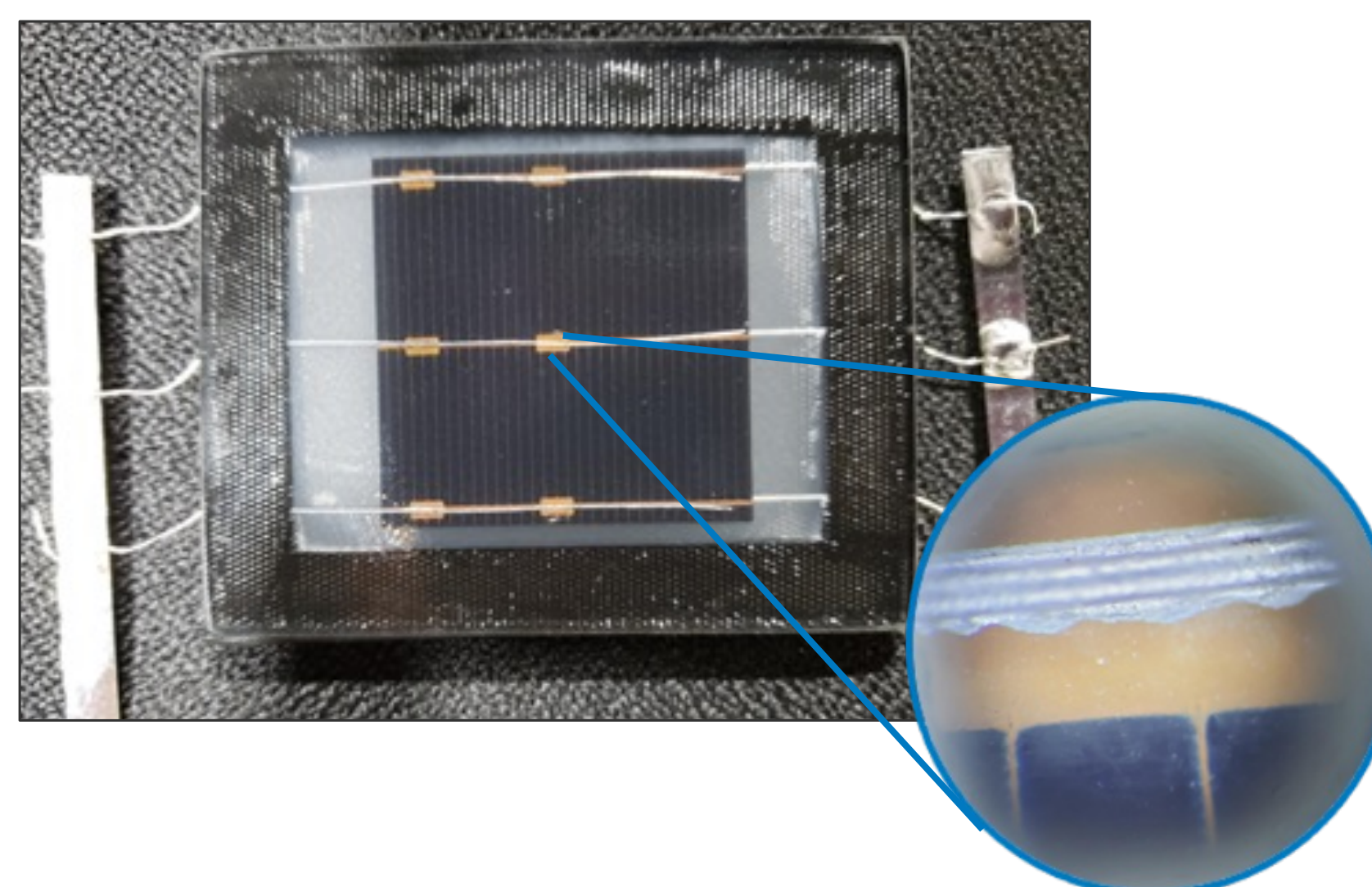


Georgia Institute of Technology



Soldering

Paste development for IR and manual soldering.



Performance

Firing improved, but non-uniformities remain.

