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HIGH ASPECT RATIO TRIANGULAR FRONT CONTACTS FOR SOLAR CELLS FABRICATED BY STRING-PRINTING

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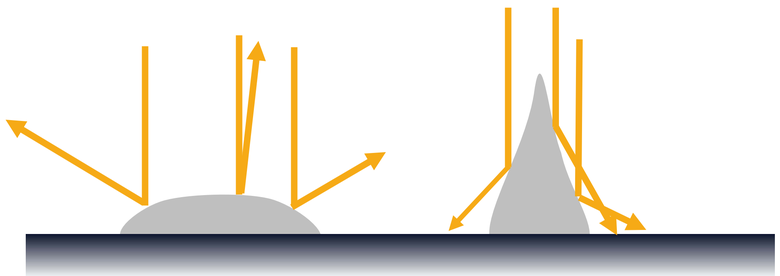
MOTIVATION

As much as **10% of light that hits a solar cell is reflected by the contacts**[1]. By making them triangular, most of that light gets **redirected towards the active area of the cell**[2]. We propose a **scalable method** for fabricating high aspect ratio triangular contacts.

CONTACT GEOMETRIES



FLAT TRIANGULAR

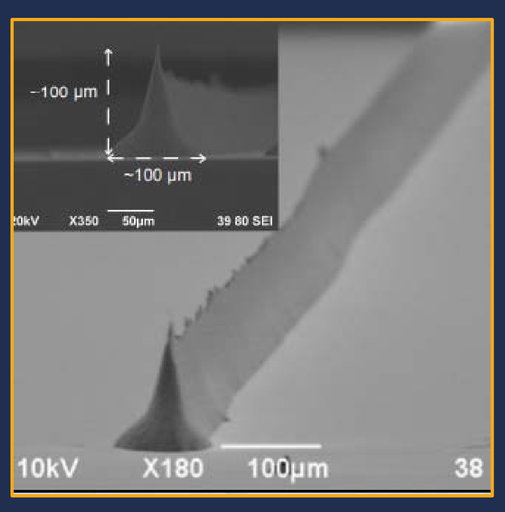
PROCESS

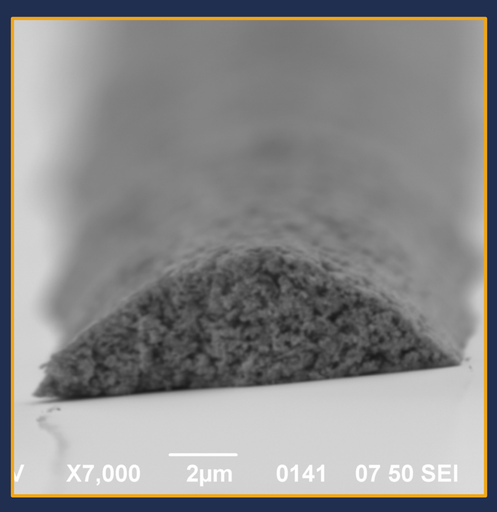
The substrate is wetted with a fine string, precisely coated with silver paste. The viscous paste is then stretched to a triangular shape as it's curing. A high aspect ratio is achieved by controlling the process parameters – temperatures, speeds and string tension.

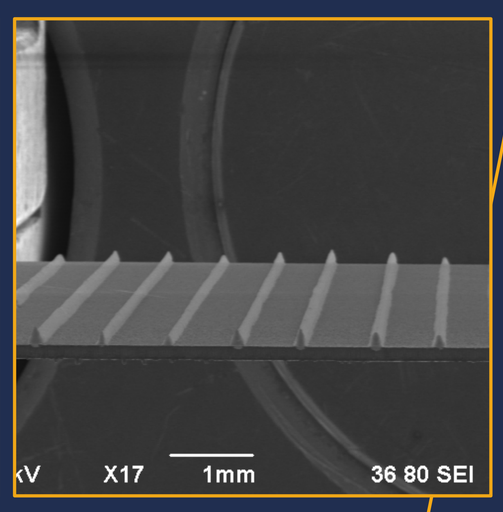
Coated string **Wetting** **Withdrawal** **Snap-off**

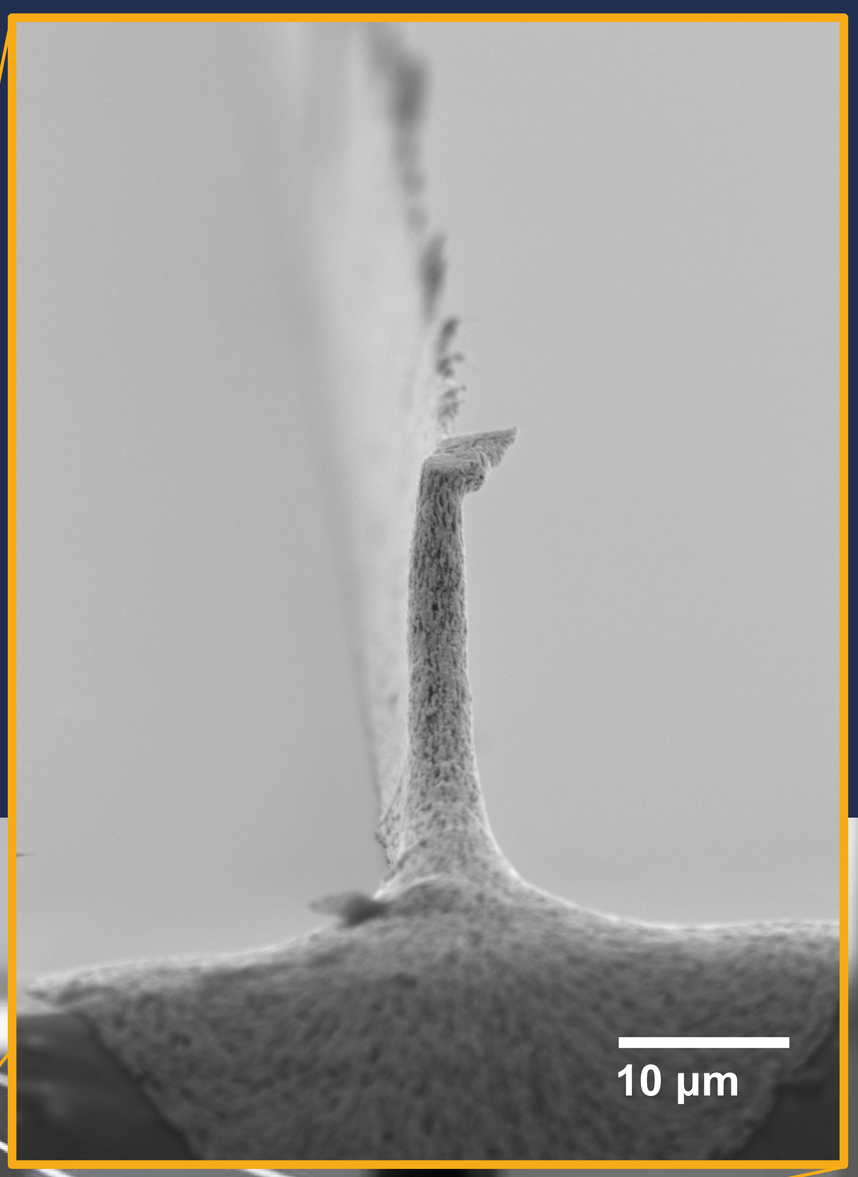
RESULTS

We optimized string printing to yield contacts with an aspect ratio larger than 1 and a **light redirection efficiency or effective transparency of up to 70%**, thereby mitigating most of the optical losses inherent to flat metallic front grids.[3]









[1]Blakers, A. W. Shading losses of solar-cell metal grids. *Journal of Applied Physics*, 1992; *71*(10), 5237–5241.

[2]Saive, R., Atwater, H. A. Mesoscale trumps nanoscale: metallic mesoscale contact morphology for improved light trapping, optical absorption and grid conductance in silicon solar cells. *Optics Express*, 2018; *26*(6), A275.

[3]Van de Voorde, M, Andersons, J, Saive, R. High aspect ratio triangular front contacts for solar cells fabricated by string-printing. *Prog Photovolt Res Appl.* 2023; 1- 9.