



UNIVERSITÀ DI PARMA

Deposition and Laser scribing of CIGS Thin Film Solar Cells

Stefano Selleri

Department of Engineering and Architecture
and IMEM-CNR

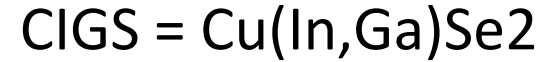
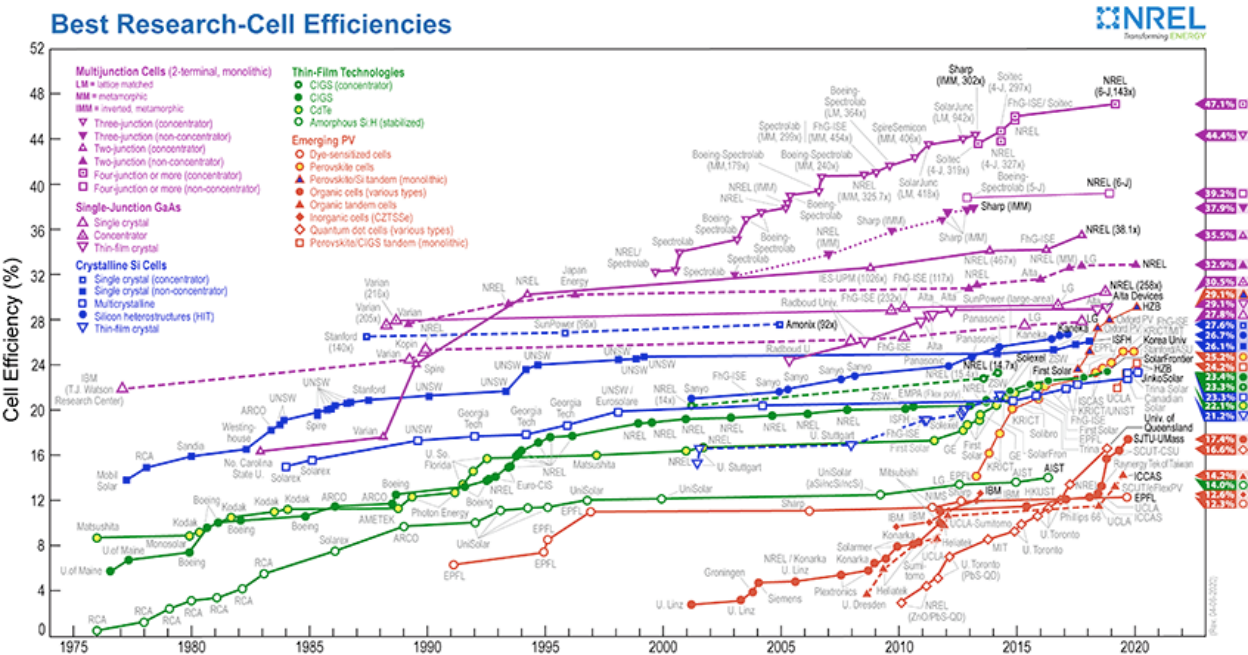
Institute of Materials for Electronics and Magnetism
of the National Research Council

June 26, 2020,

EPIC Online Technology Meeting on Photonics for Solar Energy Systems

CIGS-based TFSC (Thin Film Solar Cells)

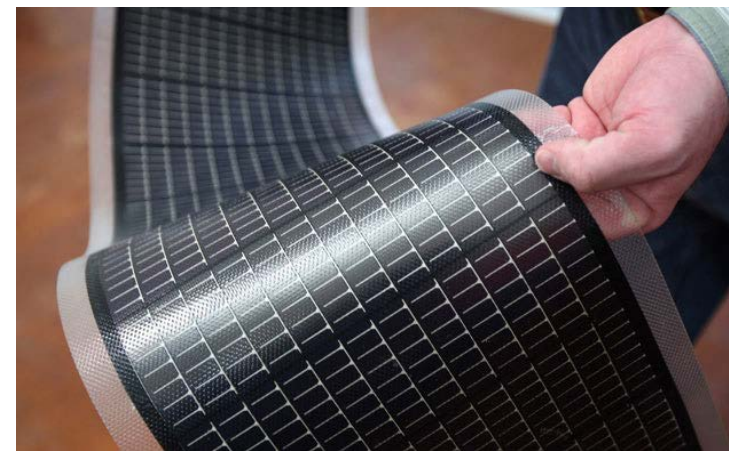
Best Research-Cell Efficiencies



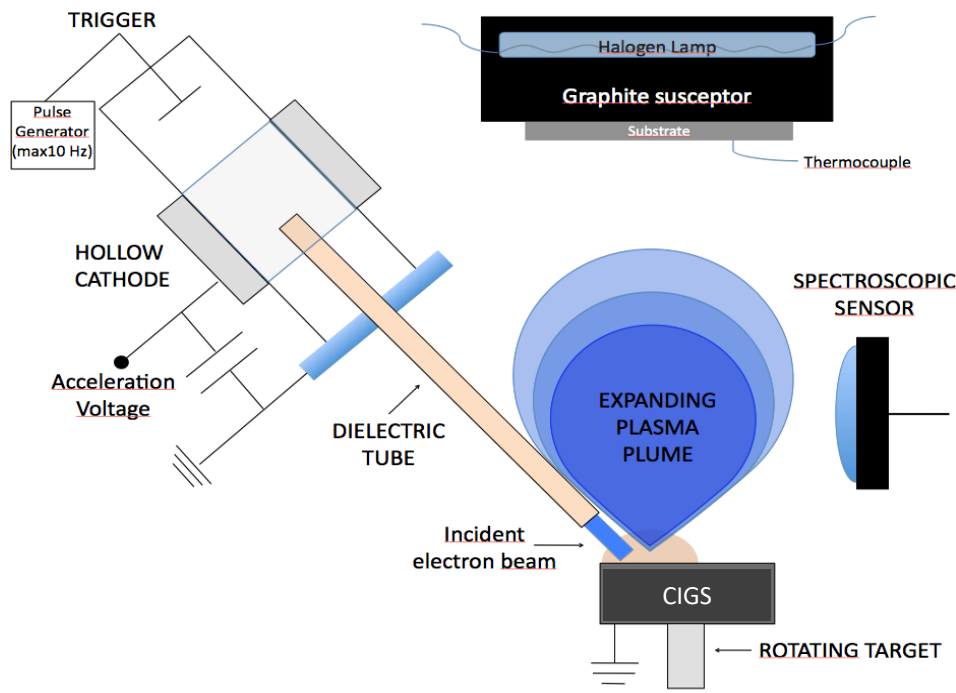
Among TFSC (a-Si, CIGS, CdTe, CZTS, hybrid/organic), CIGS is the material with the highest conversion efficiency, 23.4%*

(* Solar Frontier, Nov. 2028)

In TFSC the thickness of the absorber layer is about 100 times smaller than in a standard Si cell: > flexible substrates (BIPV)

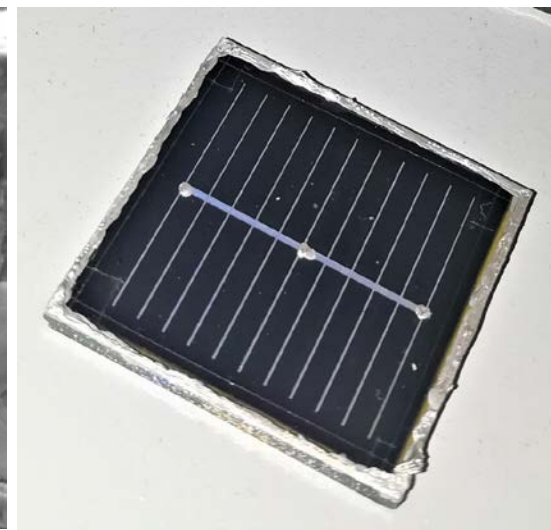
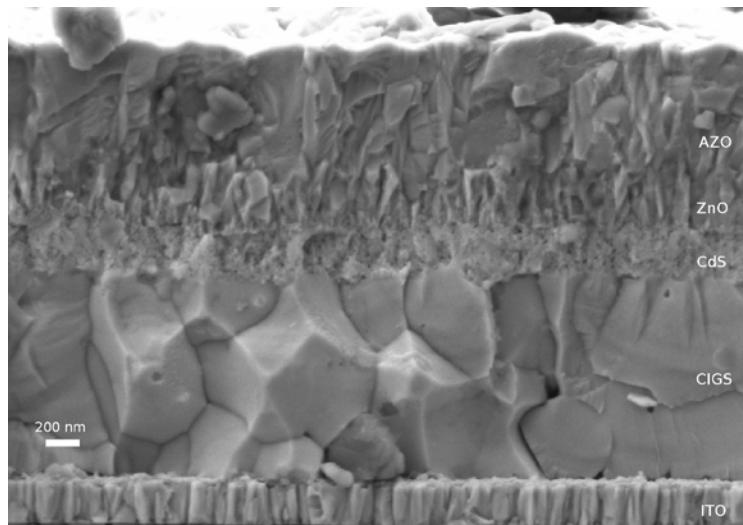
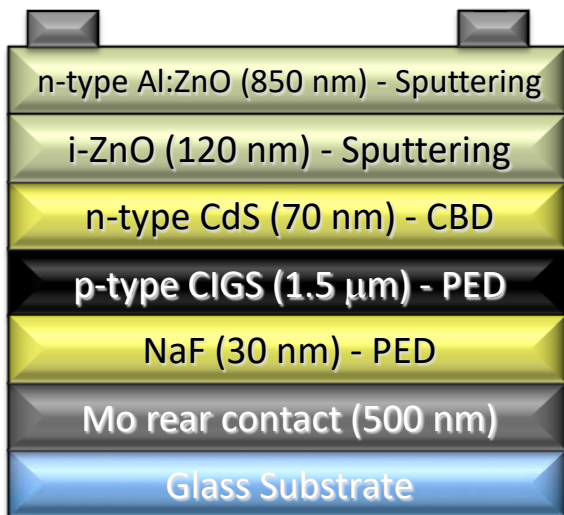


LTPED Low Temperature Pulsed Electron Deposition technique

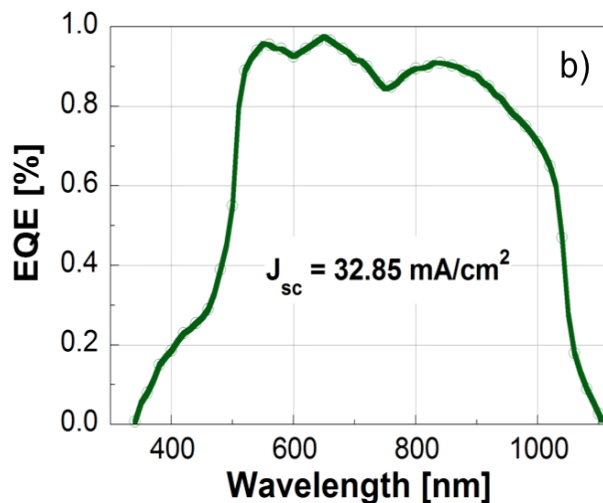


- Easy, cheap and single stage (no selenization) technique for multi-components targets
- Low T deposition (unconventional substrates i.e. flexible, polymeric, transparent, etc)

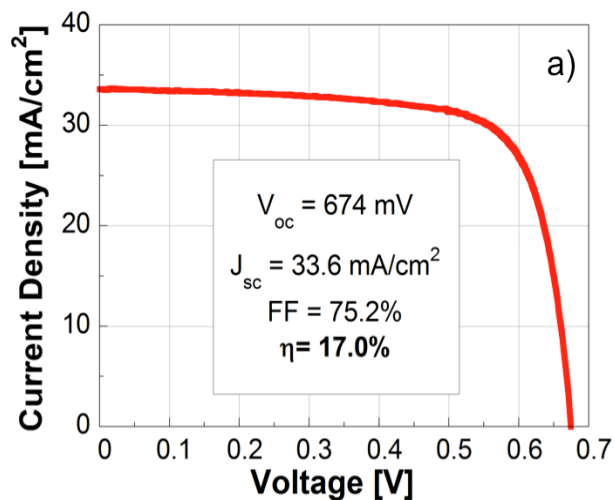
17% efficiency CIGS solar cell @ CNR-IMEM



Cell architecture



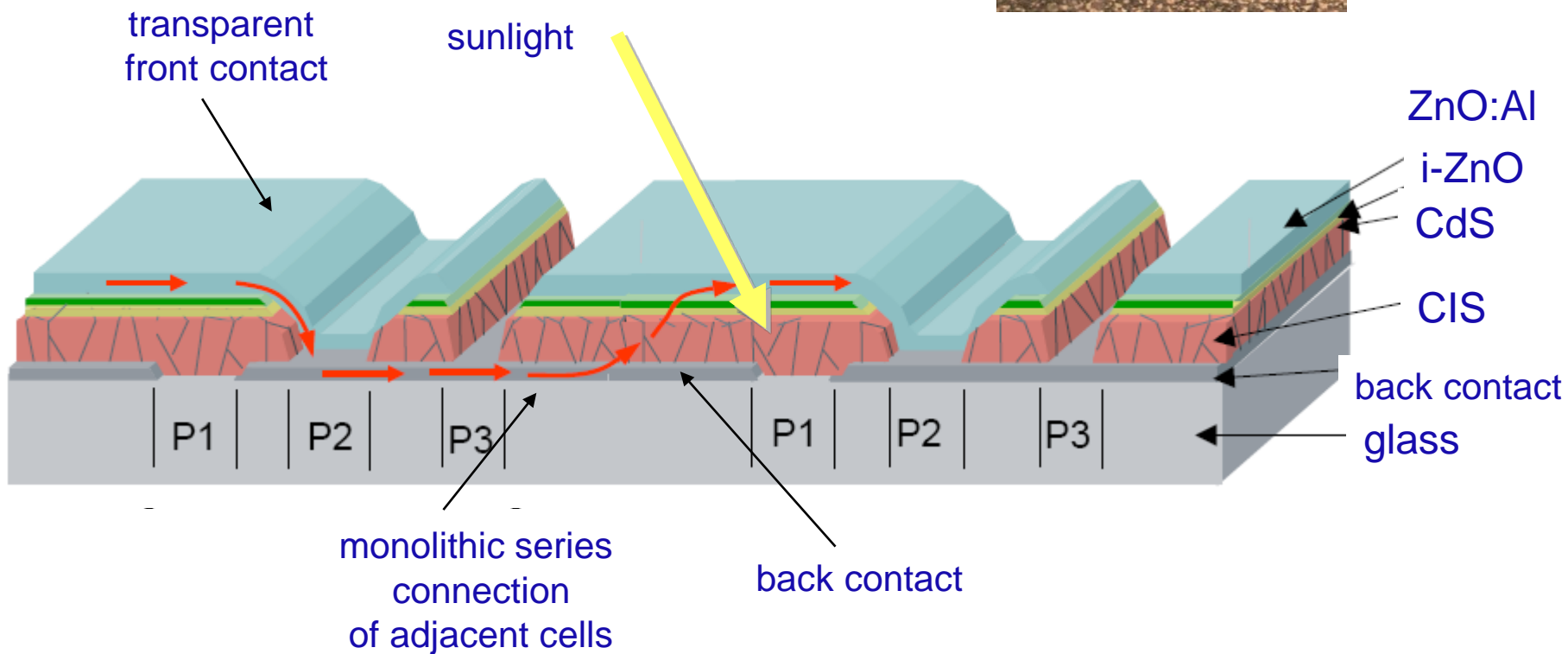
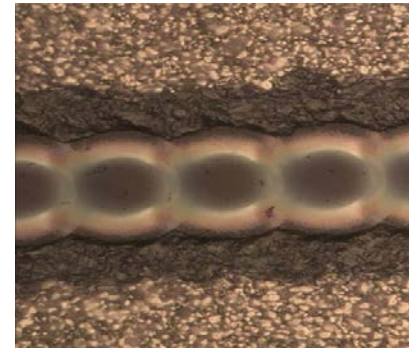
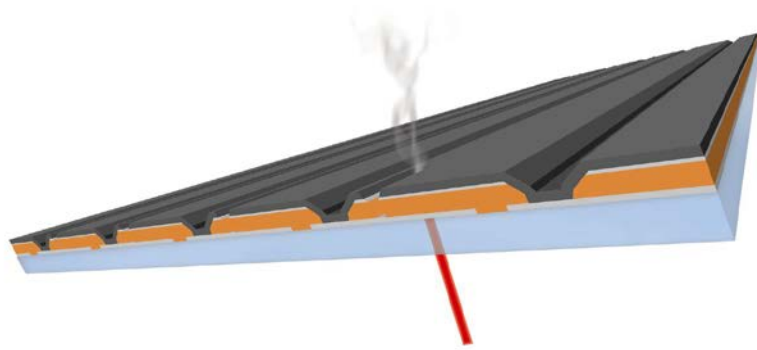
SEM cross section



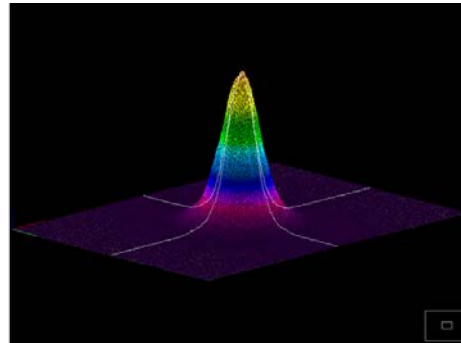
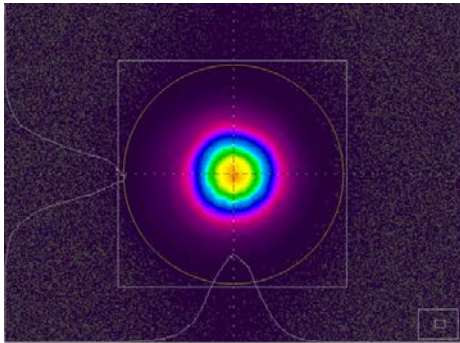
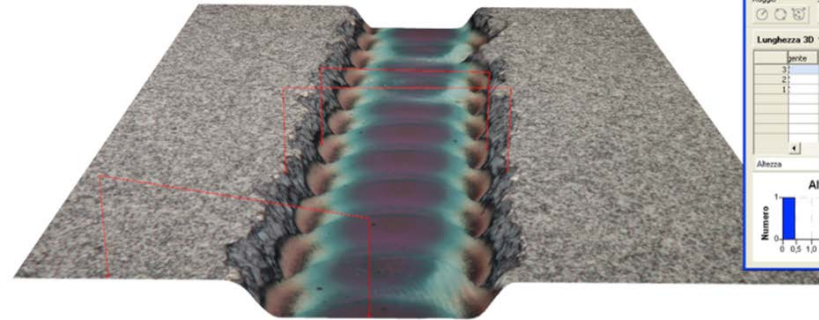
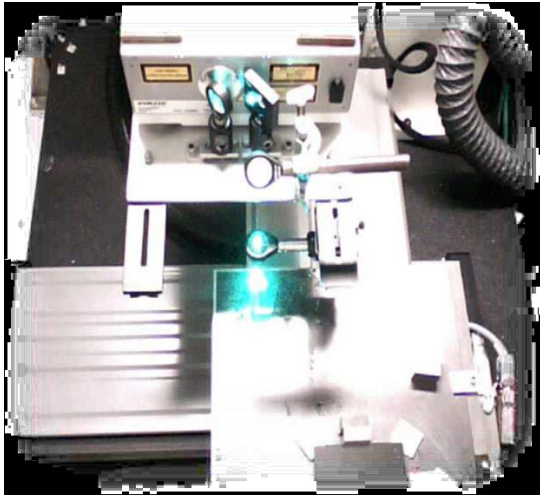
1" x 1" solar cell



Laser Scribing



Fiber Laser



Specs:

- ✓ IR and Green radiation
- ✓ ns, ps and fs pulses
- ✓ few to tens of Watts
- ✓ RR
- ✓ beam quality



UNIVERSITÀ DI PARMA



Thanks for your attention