



# **„NovaZOlar“ – All-non-vacuum processed ZnO-based buffer and window layers for CIGS solar cell technology**

Collaborative project within SOLAR-ERA.NET

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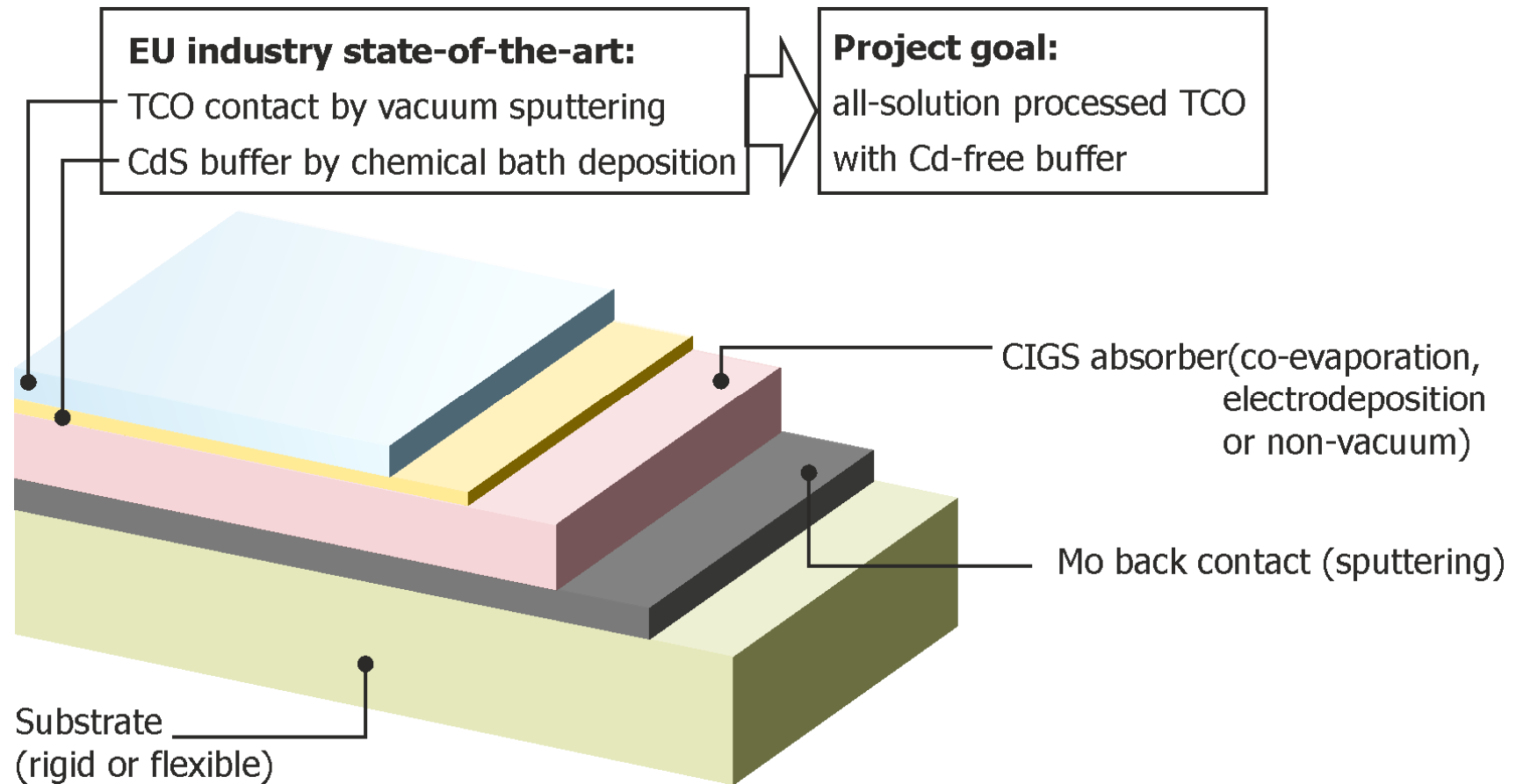
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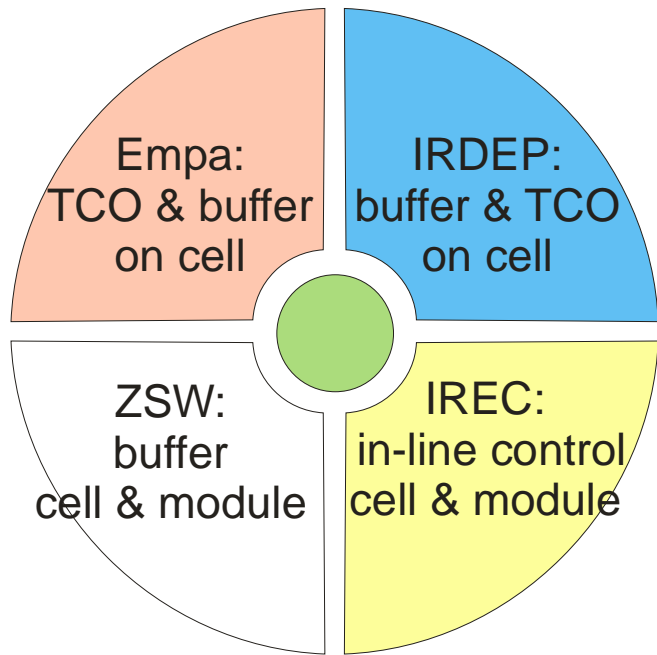
# Project goal

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# Comsortium

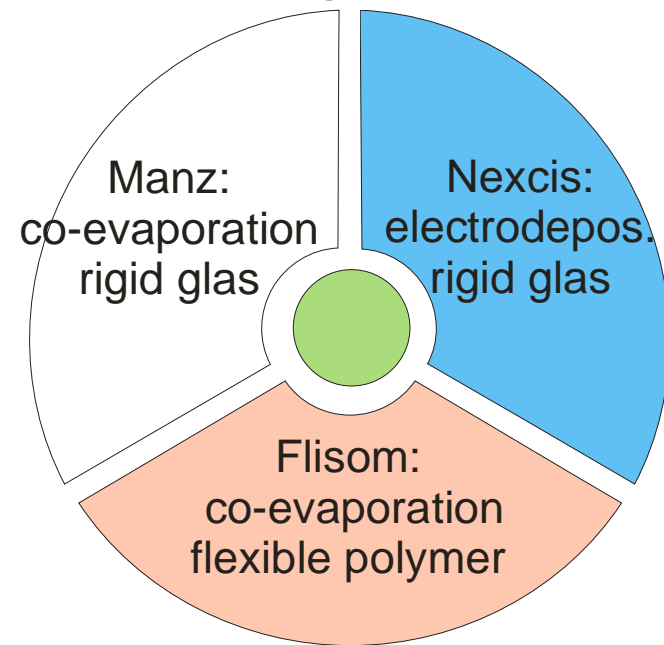
## R&D complimentarity



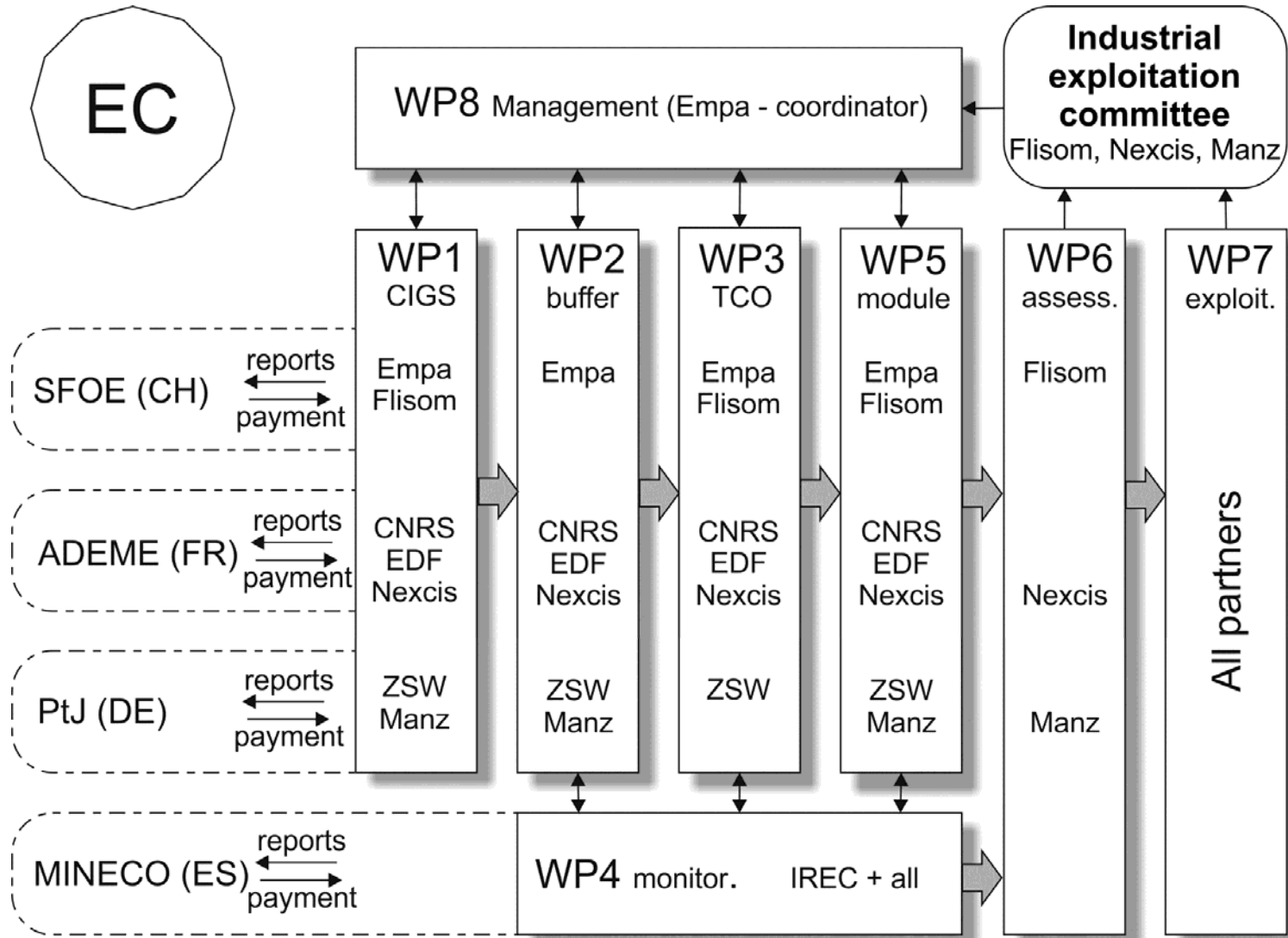
### National subprojects:

- Switzerland
- France
- Germany
- Spain

## Industrial implementation

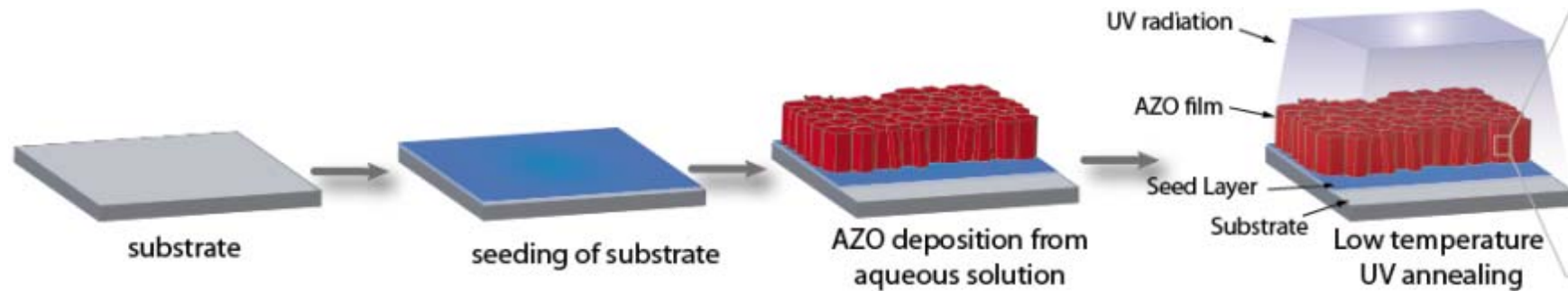


# Project structure

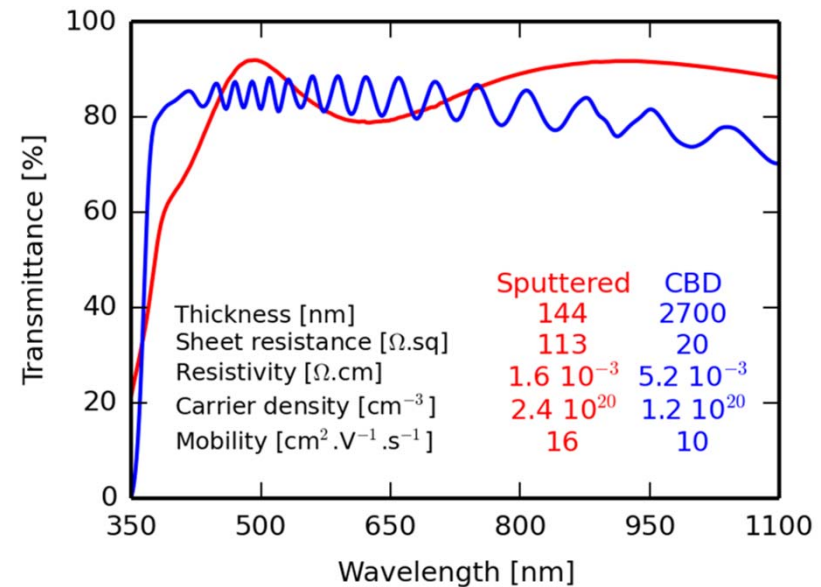
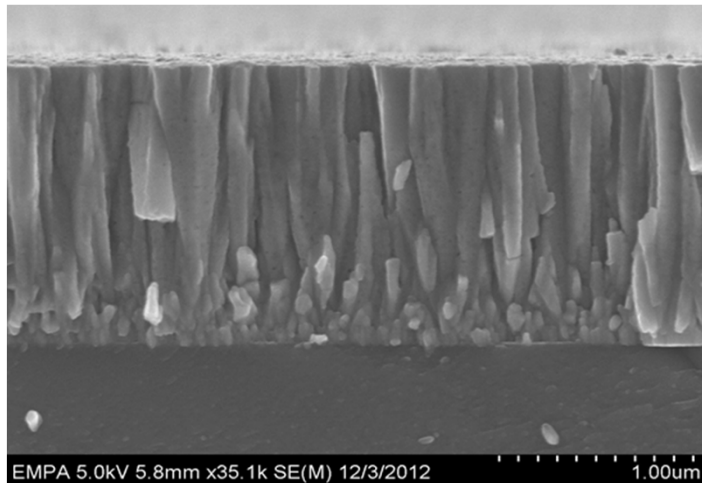


# Methodology: Chemical Bath Deposition (CBD)

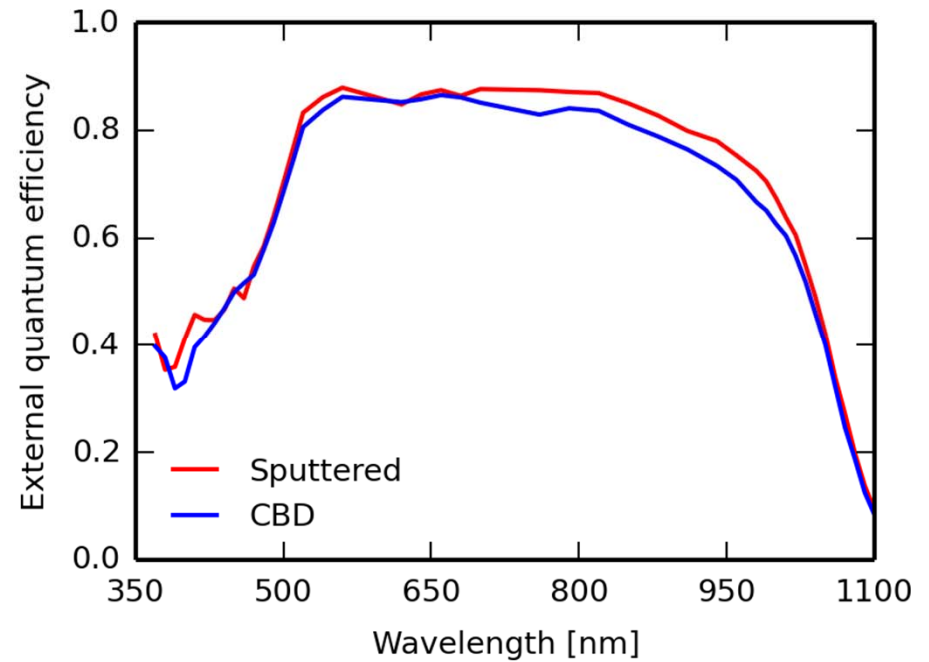
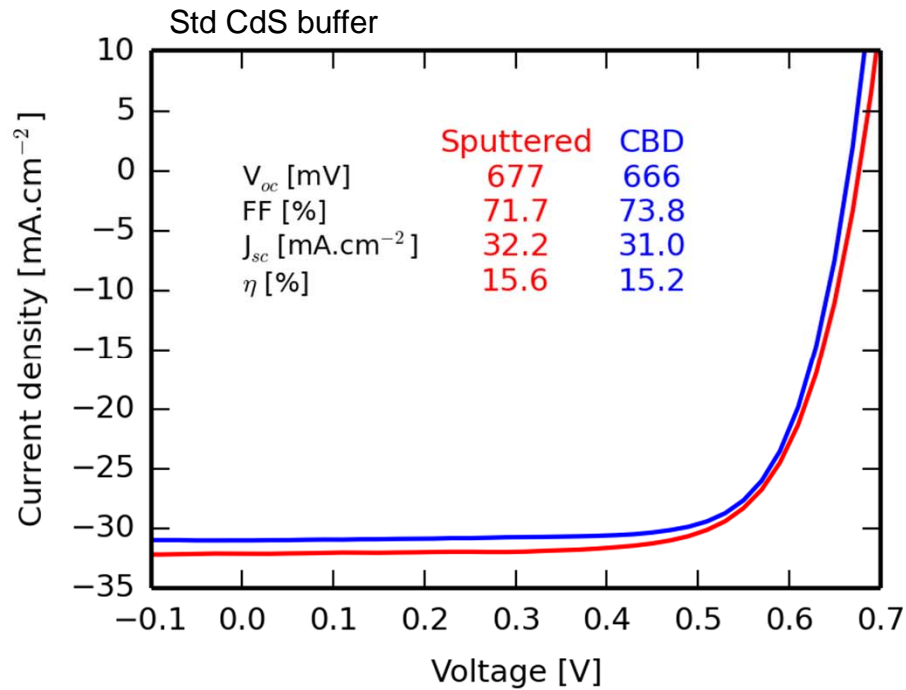
Low-temperature growth of TCO from aqueous solutions



Patent WO2014095347 A4

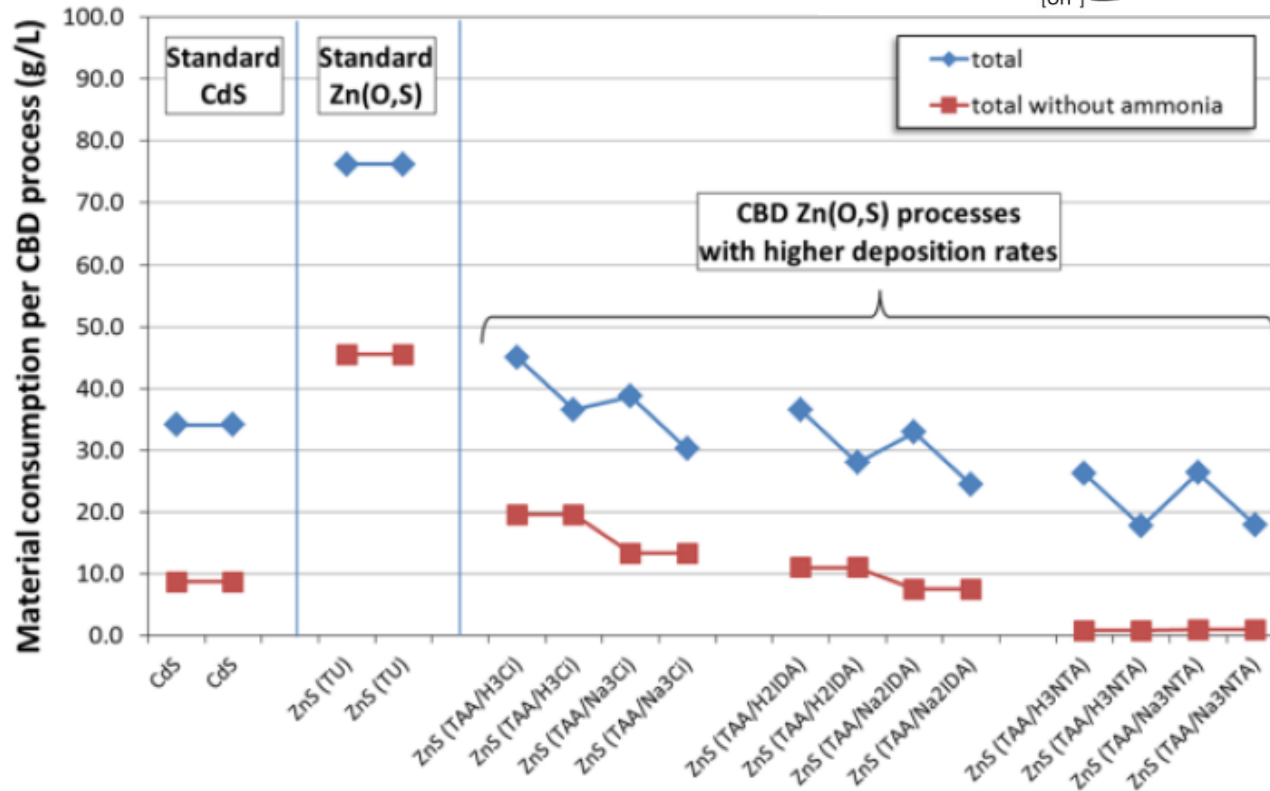
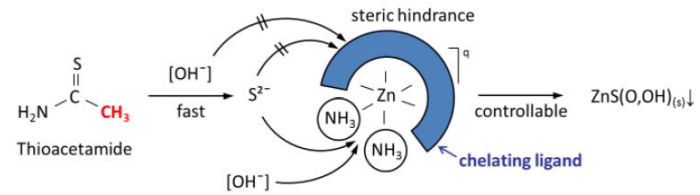
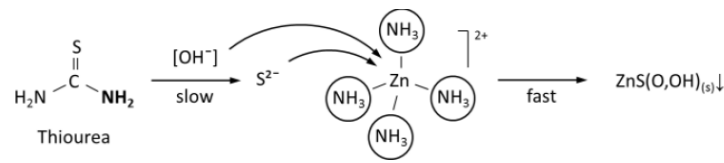


# CBD ZnO in solar cells



**Similar efficiencies** achieved with  
CBD (15.2%) and sputtered (15.6%) TCOs

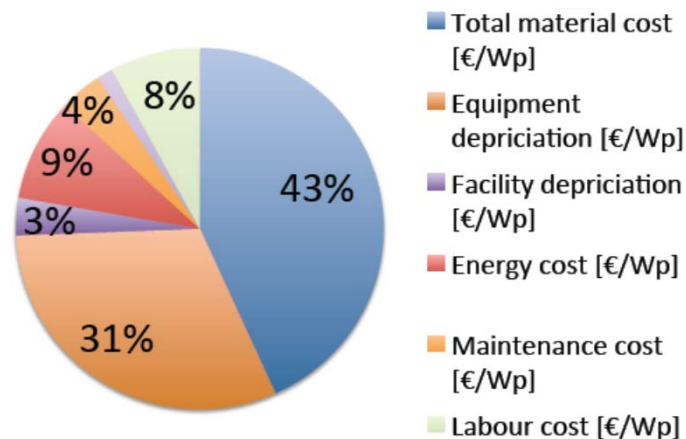
# CBD Zn(O,S) as buffer layer



A fast, low material consumption process for Zn(O,S) buffer

# Expected impact

- Eliminate Cd-containing buffer and associated Cd-solution waste management
- Reduction of material and equipment costs, which account currently for 43% and 31% of the total CIGS module breakdown

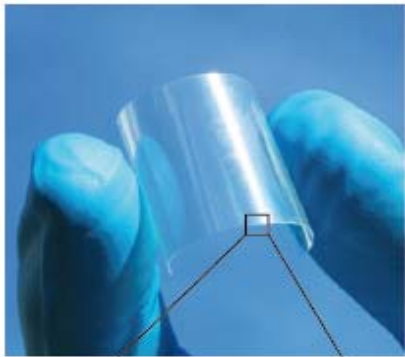


Company	Share in CIGS module cost (CAPEX+OPEX)		
	Current i-ZnO/AZO by sputtering	Current CdS buffer by CBD	Solution-processed Zn(O,S) buffer + Al:ZnO by CBD
Flisom	3 %	7 %	<b>5% (will be verified in the project)</b>
Manz	8 %	4 %	
(Nexcis)	3 % (OPEX only)	3 % (OPEX only)	



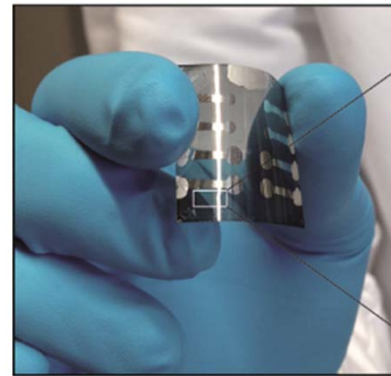
# and beyond CIGS

## On PET foils



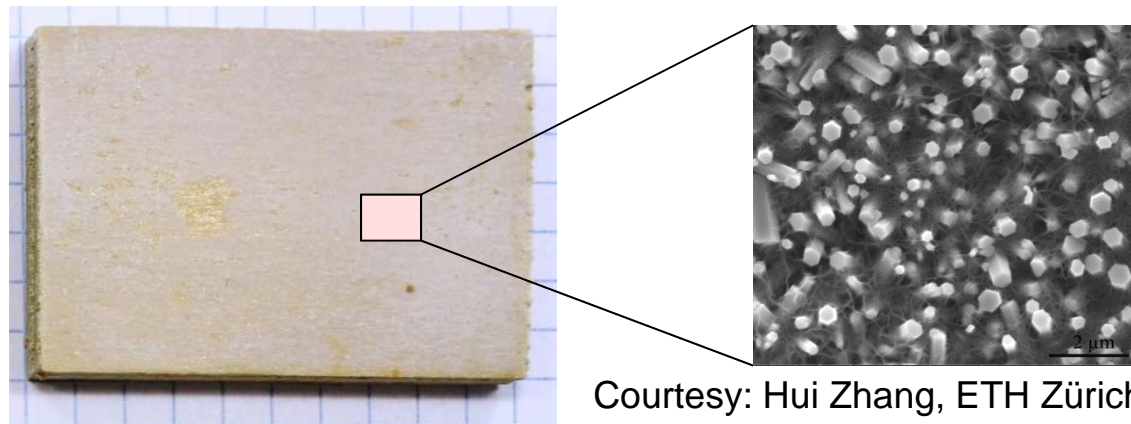
Patent application WO2014095347 (A4)

## Back electrode in organic solar cell



Fuchs et al., Int. J. Photoenergy, accepted (2016)

## UV-protecting coatings on wood



Courtesy: Hui Zhang, ETH Zürich

# Part 2: feedback

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- SOLAR-ERA.NET is a very good instrument:
  - focused
  - clear 2-stage submission process
  - fast decision making
  
- Challenges:
  - to keep a high innovation level together with required participation of industries