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Ph.D. thesis (2019-2022)
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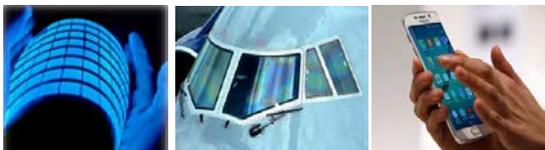
Transparent Electrodes based on Silver Nanowires : Physics and Applications

*Electrodes transparentes à base de nanofils d'argent :
de la physique fondamentale aux applications*

Context

Transparent Electrodes (TE)

- Most efficient and widely used technology : transparent conductive oxide (TCO) such as ITO or FTO
- TCO issues : scarcity, brittle and expensive
- Applications : solar cells, transparent heaters, touch screens...



Silver nanowires (AgNW) network: a promising alternative to TCO

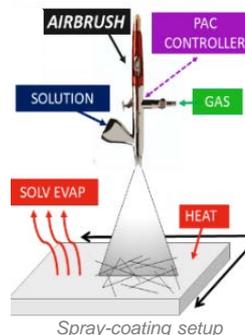
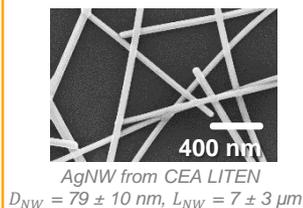
- Excellent optical, electrical and mechanical properties
- AgNW network issues : electrical, thermal and ageing stability

Objective of the PhD

- Development of efficient ($T_r \approx 90\%$ and $R_{sh} = 10 \Omega/sq$), stable and low-cost TE to be integrated within devices

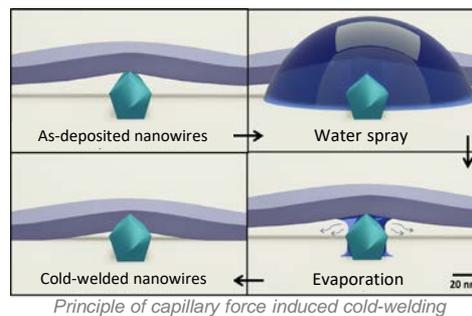
Methods

Deposition of AgNW by spray-coating

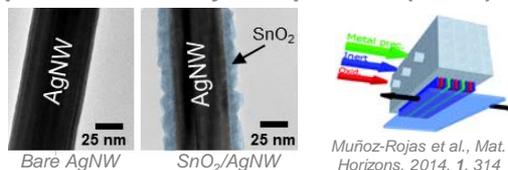


Post-deposition treatment

- Capillary force induced cold-welding treatment (comparison with thermal annealing)

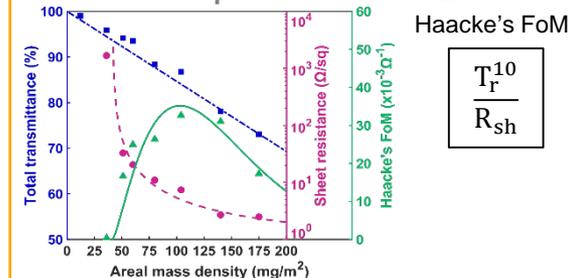


Coating AgNW with oxide (ZnO, SnO₂...) by Spatial Atomic Layer Deposition (SALD)

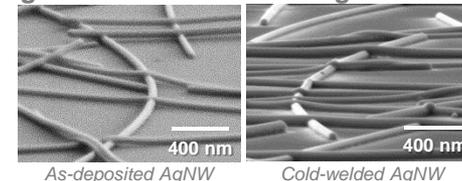


Results

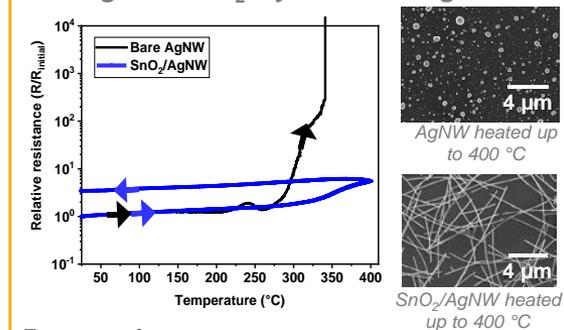
How to assess performances of TE ?



Better adhesion, lower resistance and roughness after cold-welding treatment



Enhancement of thermal stability by coating thin SnO₂ layer around AgNW



Future conferences:

E-MRS. June 2021. France
CIMTEC. June 2021 (postponed to 2022). Italy

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