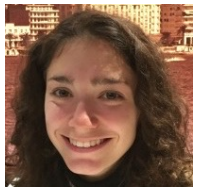


Julie LUNEAU

Ph.D. thesis (2023-2026)
LGP2 (R. Passas; C. Martin)

Influence of the drying conditions on the surface properties of end-products during Roll to Roll surface functionalisation : comparison between copper and fiber-based strips

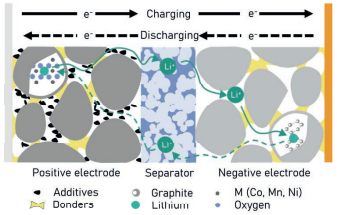
Influence des conditions de séchage sur les propriétés de surface des produits finis lors de la fonctionnalisation de surface Roll to Roll : comparaison entre les bandes à base de cuivre et de fibres

BioChip MatBio

Context / Objectives

Context : Lithium-ion battery

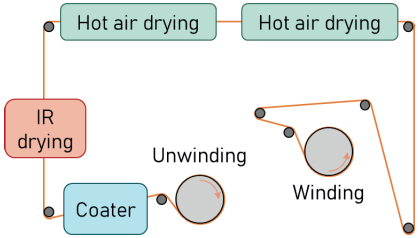
- Need to store energy produced
- production increasing of electrical cars
- Need to improve the manufacturing process



Schematic drawing of the components and operation of a lithium-ion battery cell – Marcel Schmitt

The electrodes are manufactured by coating an active material on the current collector, copper, for the negative one.

Objectives : Adaptation of a paper functionalization driver for lithium ion battery negative electrode manufacturing.



Schematic drawing of the functionalization driver

Funded by:
AMI – CMA, L'école de la batterie, Grenoble-INP UGA

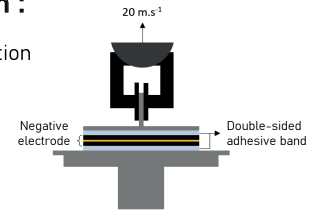
Methods

Slurry characterisation :

- 2 slurries formulations
- Rheological characterisation
- Surface tension measurement

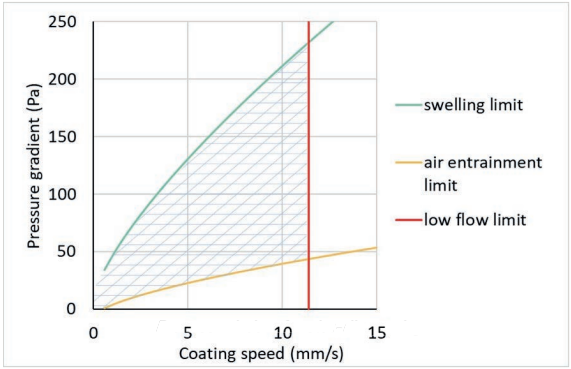
Copper film characterisation with and without functionalisation :

- Electrical characterisation
- Electrochemical characterisation
- Surface characterisation
- Thermal characterisation
- Mechanical characterisation
- Adhesion to the substrate



Tensile adhesion test

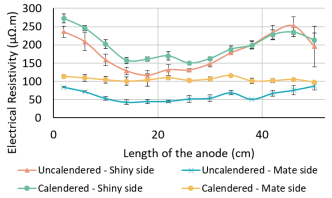
Slot die coating :



Copper temperature simulation on the driver.

Results

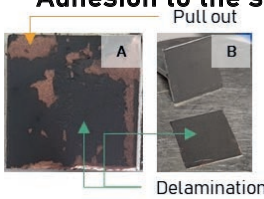
Electrical resistivity :



Electrical resistance along the entire length of a negative electrode (cross direction of production)

- The glossy side is less conductive than the matte side.
- Calendering does not improve the conductivity of the layer.
- Presence of edge effect for the glossy side.

Adhesion to the substrate :

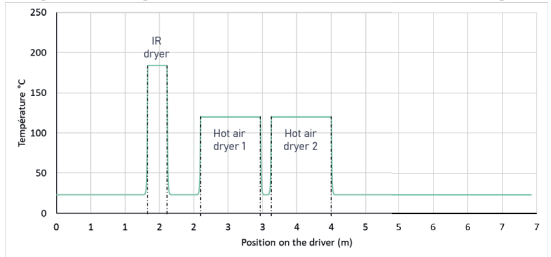


Electrode delamination after tensile adhesion test on A) uncalendered and B) calendered electrode

	Pull-out	Delamination
Uncalendered	→	→
Calendered	X	→

- Uncalendered electrodes : shiny side is more adhesive.

Copper temperature simulation on the pilote



Modeling the evolution of copper temperature in a steady-state condition throughout the driver.