



<b>Title of the research topic</b>	<i>Toward the development of thick electrodes for Li-ion batteries using Binder Jetting and Sintering</i>
<b>Laboratory or Company</b>	Laboratoire de Réactivité et Chimie des Solides LRCS
<b>Laboratory Director</b>	Mathieu Morcrette
<b>Address, Country</b>	15 rue Beaudelocque, 80039 Amiens Cedex
<b>www Link</b>	<a href="https://www.lrcs.u-picardie.fr/">https://www.lrcs.u-picardie.fr/</a> ; <a href="https://www.energie-rs2e.com/en">https://www.energie-rs2e.com/en</a>
<b>Master thesis Advisor(s)</b>	Vincent Seznec & Stéphane Panier
<b>Phone</b>	0322825331
<b>e-mail(s)</b>	<a href="mailto:Vincent.seznec@u-picardie">Vincent.seznec@u-picardie</a> ; <a href="mailto:stephane.panier@u-picardie">stephane.panier@u-picardie</a> .fr

### **Scientific Project:**

The improvement of the energy density of Li-ion batteries requires a significant increase of the surface and volume energy density. For this, one approach which can be considered is the increase of the **thickness of the electrodes** in order to increase the ratio of active material to dead material (i.e. inactive materials). The objective of the selected master student will be to develop a new solution to achieve efficient batteries with thick electrodes through an innovative process, i.e the Binder Jetting. The prepared electrodes will be characterized by various techniques to determine the microstructure, porosity and physical properties of the samples and will be tested in Li-ion batteries.

The LRCS offers an exciting research environment consisting of internationally recognized researchers as well as young scientists with team spirit, an international cooperation with top universities and institutes worldwide as well as state of the art instrumentation for materials research and characterization.

### **The main missions of the master student will be:**

- **The setting of the Binder Jetting** machine.
- **The realization of thick electrodes using Binder jetting and Sintering.**
- **The electrodes formulation**, i.e. study of the ratio between active material, electronic conductor and binder.
- The **electrochemical characterization**
- Study the architecture of the fabricated electrodes (porosity, active material distribution)

### **Techniques used:**

- Binder jetting
- X-ray diffraction
- Thermal analysis
- Scanning Electron Microscopy
- Spark Plasma Sintering
- Galvanostatic electrochemical cycling

### **Recent publications related to the topic:**

R. Elango et al., Advanced Energy Materials, DOI:10.1002/aenm.201703031, 1703031, 2018  
R. Elango et al., Journal of Power Sources, 2021, 488, 229402  
A. Maurel et al., Chemistry of Materials, 2018, 30, 7484-7493  
A. Maurel et al., Scientific Reports, 2019, 9, 18031  
A. Maurel et al., ECS Transactions, 2020, 98, 13  
A. Maurel et al., Additive Manufacturing, 2021, 37, 101651