

Post-doctoral project 18 months, starting February 2021**Functionalized polysaccharides as Polymer binders in negative electrodes of Li-ion batteries**The topic

Li-ion batteries are essential elements of our daily life, especially through our phones and laptops. To improve the capacities of these batteries, substitute part of the carbon graphite by silicon in the negative electrode is a promising way to improve their performance. The polymer binder constitutes here then, one of the essential constituents of this composite electrode: It helps to retain anodic silicon electrochemical capacity by controlling the volume expansion during charge/discharge cycles. Various macromolecular parameters allow to obtain a stable electrode with good electrochemical performances. If the reference polymer remains carboxymethylcellulose, other polysaccharides have since been tested and showed very attractive binding properties. Unfortunately, these different studies did not lead to a sufficiently precise structure/property relationship to create the ideal polysaccharide for this application.

The objective of the post-doctoral project is to modify cellulose by simple chemo-enzymatic reactions which is a really original method in the field of batteries. The idea is to modulate their physico-chemical properties, hydrophilic/hydrophobic character in particular, and thus the interactions with the surface oxides of electrochemically active silicon. The contribution of enzymatic chemistry is relevant here with regard to the usual chemical reactions by being a much more specific, greener synthesis method, but also much less harmful to the macromolecular skeleton. One objective will thus be to determine the structural parameters conferring optimal binding properties to the polysaccharide. This will allow us to synthesize a cellulose based binder, not only bio-sourced by an innovative method but also inducing an excellent preservation of the cohesion of the silicon anode in the Li-ion battery.

The candidate

The candidate must hold a PhD degree in organic chemistry, chemistry of polymers or materials science. Experience in the modification of polysaccharides will be considered as a priority. Additional experience in enzyme catalysis and/or Li-ion batteries would also be particularly appreciated.

Additional information

The project involves a 18-months full-time contract with forecast starting date in February 2021. The project will take place at the Laboratoire de Glycochimie, des Antimicrobiens et des Agroressources LG2A UMR CNRS 7378 and Laboratoire de réactivité et chimie des solides UMR CNRS 7314 Université de Picardie Jules Verne (Amiens, France). Gross salary is 2400 €/month.

For more information, please contact:

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