

ITI HiFunMat Master Internship Proposal

M 1

M 2

Title : Natural Polymer Based Hydrogel for Supercapacitor Applications

Internship supervisor

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Laboratory	Institut Charles Sadron
Collaboration with a HiFunMat member (<i>please indicate their name</i>)	<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes :

Student profile looked for

Master program (<i>more than one box can be ticked</i>)	<input checked="" type="checkbox"/> Material science and engineering <input checked="" type="checkbox"/> Chemistry <input type="checkbox"/> Physics
Other indications if necessary	

Internship description

Supercapacitors have gained attention recently due to their high power density and their potential for numerous applications. [1] Nevertheless, the challenge is to increase their energy density, in order to compete with other energy storage materials. For this, a comprehension of the different supercapacitor components is crucial. One of the strategies is to develop hydrogel electrolytes that have better contact with the electrode material. The idea is to propose safe and easily-prepared hydrogel electrolytes with good mechanical and electrochemical properties for use in supercapacitor applications.

Hydrogel electrolytes present a potential alternative for conventionally used liquid electrolytes. [2] Their mechanical strength permits a limited degradation during ageing, and hence a longer lifetime prediction of the device. Moreover, their high water uptake enables a high ionic conductivity. The hydrogel electrolyte will be prepared using natural polymers such as gelatine or cellulose. Then, the preparation conditions will be adjusted to have the optimal self-standing hydrogels. The reticulation can be observed by IR spectroscopy while thermal stability can be assessed by TGA. The electrochemical performances will be tested using a two-electrode cell by cyclic voltammetry and galvanostatic charge discharge.

References:

- [1]: Simon, P., Gogotsi, Y. Materials for electrochemical capacitors. Nature Mater 7, 2008, 845–854.
[2]: Menzel, J., Frackowiak, E., Fic, K., Electrochimica Acta, volume 332, 2020, 135435.

Requirements:

We are looking for a motivated candidate willing to work in multidisciplinary environment, with a good background in materials science. Please address your application by e-mail.