

FINAL MASTER PROJECT PROPOSAL



Title

Development of layered semiconductor-carbon composites for energy storage devices (supercapacitors and rechargeable batteries)

Supervisor(s)

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Summary of the project

Graphite is the traditional material employed in standard rechargeable batteries or supercapacitors, but it shows limitations because of its limited intrinsic capacity, lithium-ion insertion capacity, and specific capacitance. Moreover, graphite, but also lithium and cobalt, all standard materials for supercapacitors and lithium-ion batteries, are limited resources that increase the final price of these devices.

To solve these shortcomings, layered semiconductor-carbon composites could be an attractive alternative offering improved performance, low price, high material availability, and environmentally friendly properties. Therefore, the MAIN OBJECTIVE of this project is the development of carbons decorated with layered semiconductor nanoparticles.

MAIN TASKS of the project:

- Literature review to understand the concept and scope of the project
- Synthesis and characterisation of layered semiconductor nanoparticles
- Production of layered semiconductor-carbon composites. Development of strategies to assure a good incorporation and interaction between the two materials.
- Characterisation of composites. Pre-evaluation of their behaviour as batteries or supercapacitor electrodes.

This project combines synthesis and characterisation of nanomaterials and hybrid composites. For that reason, it will be supervised by two researchers with complementary background.