Title	Recycling and utilization of graphite from spent lithium-ion batteries
PhD Supervisors	Dr. Raphaël Janot (LRCS, CNRS) Dr. Da Huo (LRCS, UPJV) Prof. Philipp Adelhelm (Humboldt-University Berlin, Helmholtz-Zentrum Berlin)
Place of work	Laboratoire de Réactivité et Chimie des Solides (LRCS, UMR CNRS 7314), Université de Picardie Jules Verne, Amiens, France. The candidate will perform several visits to Prof. Adelhelm's group.
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Deadline for application	September 3rd, 2023

Description of the topic :

With the huge increase of spent Lithium-ion batteries (LIBs) in Europe, the development of cost-efficient and low environment impact recycling process is imminent. Up to now, much attention has been paid to recover high-valued metals contained in cathode materials, while the recycling of anode materials has received less attention and is generally directly burned or landfilled during the recycling process, which causes CO_2 emission and the waste of limited resources. The aim of our project is to recover graphite from spent LIBs and explore its potential reuse in emerging energy storage systems.

This thesis project includes several aspects:
- Investigate different graphite separation methods by direct disassembly of spent LIBs or from black mass
- Carry out graphite purification and understand the relationship between treatment conditions and generated structural defects
- Modify the structure of recovered graphite to match different applications (LIBs, NIBs...)

Throughout this project, the PhD will try to explain the failure mode of spent graphite, clarify the mechanism of impurities removal, and establish accurate criteria for judging the quality of regenerated graphite for different reuse scenarios.

Candidate skills :

The candidate should have good knowledge in solid-state chemistry, materials chemistry and electrochemistry and should be fluent in English.