Direction de la Recherche Fondamentale
Institut Rayonnement Matière de Saclay
Nanosciences et Innovation pour les Matériaux, la Biomédecine et l'Énergie

THESIS OFFER – STARTING BEGINNING OF 2017

THESIS TITLE
High capacity and innovative magnesium-ion batteries based on nanostructured negative electrodes.

THESIS SUMMARY
The thesis will deal with the exploration of an innovative concept for energy storage: magnesium (Mg)-ion batteries. Magnesium appears as a great alternative to lithium due to its high capacity, low cost, abundance on Earth and largely smaller reactivity and better safety compared to lithium. However, conventional electrolytes used in Li batteries strongly interact with magnesium metal to form a barrier on the surface of the Mg metal, inhibiting reversible electrochemical reactions in the cell. An innovative concept to solve this issue is to replace the negative Mg metal electrode with a material compatible with solvents and electrolyte solutions with wider electrochemical stability windows. Mg alloys compounds possess adequate stability in conventional electrolytes and slightly higher potentials than pure Mg metal. Their capacity is smaller than pure Mg, yet still sufficient to provide a substantial increase of the capacity of the battery. The first objective of the thesis is the synthesis of unexplored nanostructured binary or ternary alloys offering higher cycling performance (capacity, coulombic efficiency) than state-of-art materials. The second objective is the strong understanding of the magnesiation/demagnesiation reaction mechanisms and the reactivity towards electrolytes of the unexplored compounds.

RECOMMANDED EDUCATION
Master degree in Nanosciences - Energy – Inorganic Chemistry, Engineering School

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