CYCLE DE CONFÉRENCES DE CHIMIE

Avec le concours de : ***Manufacture Française des Pneumatiques MICHELIN***
SIGMA Clermont
Institut de Chimie de Clermont-Ferrand (ICCF UMR 6296)
U.F.R. de Chimie

Jeudi 25 octobre à 16 h

Amphi Rémi (site des Cézeaux)

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Des nouveaux matériaux pour batteries Li-ion et Na-ion

Our group at ICMCB applies solid-state chemistry to the development of new or optimized materials for batteries and supercapacitors. We have developed a strong expertise in layered transition metal oxides, hydroxides and oxi-hydroxides as well as polyanionic compounds, especially for positive electrode materials, conductive additives and solid electrolytes for alkaline batteries, Li and Na-ion batteries, microbatteries and hybrid supercapacitors. Our research activities are mainly focused on the synthesis of new materials and composites, and on the better understanding of mechanisms involved upon cycling and aging of the electrochemical systems: structural modifications, redox processes, etc. Our goal is always to prepare ever better materials in terms of electrochemical energy storage, with the help of an in-depth understanding of the materials up to the chemical bonds, alkali - charge distributions, and presence of defects.

After a rapid overview of the research activities of the group, I will focus on three families of compounds to discuss the challenges of their development for Li-ion and Na-ion batteries:
- Li-rich layered oxides $\mathbf{Li_{1+x}M_{1-x}O_2}$ (M = Mn mainly, Ni, Co) as positive electrode materials for Li-ion batteries. They imply anionic redox whose stabilization is crucial for increased reversible capacity and energy density.
- Li and Na vanadium fluorophosphates $\mathbf{LiVPO_4F_{1-y}O_y}$ and $\mathbf{Na_3V_{2-y}(VO)_y(PO_4)_2F_{3-y}}$ as positive electrode materials for Li-ion and Na-ion batteries, respectively. The presence of oxygen defects implies the formation of vanadyle-type environments for charge compensation, which have a huge impact on their electrochemical behavior in batteries (potential, reversible capacity, cyclability, structural and redox processes involved …).

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