Marie Curie PhD Topic at LRCS (Amiens), ICMCB (Bordeaux, ILL (Grenoble) and UMICORE (Belgium)

Topic Title	***In situ synthesis of high performance electrodes for Li-Ion Batteries : $Li(Mn,Ni)_2O_{4-\delta}$ spinels***
Principal Advisors	MASQUELIER Christian (LRCS) & CROGUENNEC Laurence (ICMCB)
Co-advisors	SUARD Emmanuelle (ILL), HANSEN Thomas (ILL)
Collaborations	CABELGUEN Pierre-Etienne (UMICORE)
Funding Source, Name of project	PhD COFUND Marie Curie, InnovaXN
Web Site of Advisor (if applicable)	**Apply at** : https://esrf.gestmax.eu/1481/1/phd-position-in-situ-synthesis-of-high-performance-electrodes-for-li-ion-batteries/en_US
Date of publication of the offer	March 15th, 2021
Deadline for application	March 31st, 2021
Date of start of the Project	October 1st, 2021
Description of the Topic	The PhD project is a **joint work** between ILL Grenoble, LRCS Amiens, ICMCB Bordeaux and the Company UMICORE. We wish to establish close relationships between stoichiometry, morphology, structure and electrochemical properties of fully characterized positive electrode powders for Li-Ion batteries. An exhaustive approach (precursors, thermal treatments under various p_{O2}, substitution, …) will be used to tune the synthesis of high-performance $Li(Ni,Mn)_2O_{4-\delta}$ spinels. Phase equilibria during synthesis will be explored in situ using T-controlled X-Ray or Neutron diffraction under various atmospheres. Structural characterizations of powders and/or materials prepared at large scale at UMICORE will be done, using high-resolution neutron diffraction @ ILL. Electrochemical studies will be performed on laboratory and industry-like cells to understand what governs the voltage-composition profiles, the reversibility, the contributions of Ni or Mn. Operando investigations during battery cycling will be conducted with neutron diffraction, synchrotron XRD, X-Ray Absorption, at various T, thanks to several cells already developed, jointly.
Techniques to be used	Solid state synthesis, NMR, X-Ray and Neutron diffraction, Thermal Analysis, Raman spectroscopy, XAS, electrochemistry, microscopy
Skills of the Applicant	Passionate, efficient, hard-working, friendly, curious, ambitioous
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List of documents to provide	See ESRF website for applying