PhD Topic for Research between LRCS (Amiens) and ICGM (Montpellier)
and in collaboration with UMICORE
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Topic Title	**Glass, glass-ceramic and ceramic sodium-based Solid Electrolytes for All-Solid-State Batteries**
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Collaborations	LAVANANT Enora, UMICORE
Funding Source	convention between UMICORE & CNRS
Date of publication of the offer	April 11th, 2023
Deadline for application	October 1st, 2023
Date of start of the Project	October 1st, 2023
Description of the Topic	The goal of this collaborative PhD work is to explore the chemistry of inorganic glass, glass-ceramic and ceramic ionic conductors to be used as solid electrolytes for sodium based All-Solid-State Batteries, by exploring different synthesis routes and alternative compositions. A comprehensive study of transport and stability properties will be carried out in liaison with the structural features. Characterization techniques will include state-of-the-art X-ray and neutron diffraction, access to neutron and X-Ray Synchrotron facilities, SEM and TEM electron microscopy and electrical measurements from -35 °C to 500 °C. Temperature-controlled synchrotron X-Ray and neutron diffraction experiments will be used as additional essential techniques in order to probe order-disorder transitions and thermal motion factors. Further analysis of Na environments, local structural features and diffusion will use Raman spectroscopy and solid-state MAS NMR in collaboration with the RS2E NMR Platform. The solid electrolytes will be evaluated in All-Solid-State batteries.
Techniques to be used	✓ Mechano-synthesis, melt-quenching, twin roller quenching, solid state synthesis, spark plasma sintering ✓ X-ray and Neutron diffraction ✓ Scanning Electron Microscopy and Transmission Electron Microscopy ✓ Raman Spectroscopy and solid-state MAS NMR ✓ Electrochemical Impedance spectroscopy ✓ Electrochemistry
Skills of the Applicant	This PhD requires skills in chemistry and/or physical chemistry with, ideally, a 1st experience in battery & electrochemistry research. The candidate will have to show strong motivation and interest in working in a collaborative environment. The candidate must be rigorous, curious and ready for a nice challenge with an industrial partner.
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List of documents to provide	CV + motivation letter + list of references + transcripts for the past two years