

The ISTERre & Institut Neel (CNRS, Univ. Grenoble Alpes, France), in collaboration with the University of Huelva and the University of Granada, are searching for a candidate to jointly build a Marie Skłodowska-Curie Postdoctoral Fellowship application, to work on the

Structure and reactivity of nanominerals from acid mine drainage



The weathering of iron sulfide minerals and the subsequent production of **Acid Mine Drainage (AMD) is a widespread important environmental problem** due to the mobilization of toxic metals adsorbed to or incorporated into colloidal mineral phases. Both the hydrochemistry and mineralogy of AMD are controlled by the SO_4^{2-} — Fe^{3+} —Al systems at acid pH values. The oxidation of leached Fe^{2+} and the subsequent hydrolysis of Fe^{3+} , and the mobilization of Al^{3+} in the acid waters, lead to the hydrolysis of Fe and Al when the pH of AMD increases by mixing either with pristine water courses or with alkaline additives in treatment systems. This results in the formation of **schwertmannite and basaluminite, which are poorly crystalline oxy-hydroxysulphates that play an important role in the removal of trace elements from AMD-affected streams.**

Part of our research efforts during the last ten years have been devoted to the understanding of the structure and reactivity of these poorly Fe and Al sulfate bearing phases, schwertmannite and basaluminite. The small size of their coherent domains, the high level of disorder and the complex stoichiometry, with strong variations in their hydration level and sulfate content, pose important challenges. **Here, we propose a research project to investigate further the structural characteristics of these colloidal nanominerals during their formation, during aging and when in contact with contaminants.** A combination of Pair Distribution Function (PDF) analyses of in situ high-energy X-ray scattering (HEXS) data, Small-Angle X-ray Scattering (SAXS) and X-ray absorption spectroscopy (XAS) techniques will be used to determine the formation pathways of these solids and to determine their structural characteristics. These studies will be combined with field campaigns to collect and study natural samples. Laboratory studies will be performed to determine the solubilities of these minerals (Dr. Manuel Caraballo, Univ. Huelva). All the results will be combined with thermodynamical modeling (Dr. Maria Pilar Asta, Univ. Granada).

We are looking for a motivated early-stage researcher to apply for a Marie Skłodowska-Curie Postdoctoral Fellowship for the September 2022 deadline. The research fellow will be located in Grenoble (France), in close collaboration with the Spanish collaborators from Univ. Huelva and Univ. Granada. The work will be performed within the 'Geochemistry' team at ISTERre, and the 'Materials, Radiation and Structure' team of the Inst. Neel.

Applicants should have a Ph.D. in a relevant physics, (geo)chemistry or materials science discipline. Academic knowledge of environmental mineralogy and synchrotron techniques will be appreciated. The application file should contain a detailed CV, a motivation letter and the names and contact information of at least two referees. **Answers awaited by July 10th 2022.**

Contact information:

Alejandro Fernandez-Martinez, (+33) 4 76 63 51 97, alex.fernandez-martinez@univ-grenoble-alpes.fr
Jean-Louis Hazemann, (+33) 4 76 88 74 07, jean-louis.hazemann@neel.cnrs.fr