



11 Aprile 2024 – ore 10  
Aula Lucchesi

# Mineral colloids in acid mine drainage: from toxic elements to critical elements

**Alejandro Fernandez Martinez**

CNRS Research Scientist – visiting researcher at DST Sapienza



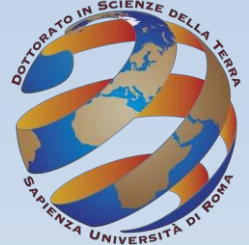
The acid mine drainage present in the Rio Tinto site from the Tartessian times represent a legacy of metal pollution of unprecedented importance due to the large volume and high concentrations of toxic elements mobilized. Here, an overview of the phenomenon, and a detailed analysis using nanoscale techniques of the most important Fe and Al colloids formed in AMD, and their environmental relevance, will be presented. Moreover, the acidity of AMD waters facilitates the mobilization of rare earth elements and valuable metals like copper, potentially paving the path for economically viable site restoration efforts.



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### Lectures for PhD students



**3 Aprile 2024** – ore 14.00 – aula Lucchesi

#### ***Synchrotron nanoscale characterization techniques for the Earth sciences***

The Pair Distribution Function (PDF) technique, classically used to the study of liquids and amorphous materials, has seen a renewed interest due to the ability to collect quickly scattering patterns using 2D detectors at 4th generation synchrotron sources, with enough signal-to-noise ratio to be able to analyse the diffuse scattering coming from the disordered component of a material. This technique will be introduced and several examples in the field of mineral nucleation and growth, and of cement hydration, will be shown.

**10 Aprile 2024** – ore 14.00 – aula Lucchesi

#### ***Mineral nucleation and growth in aqueous systems: unveiling the secrets of crystallization***

In the last decade, the use of advanced characterization techniques at the nanoscale allowing to probe early stages of formation of minerals in supersaturated aqueous solutions has allowed the discovery of non-classical nucleation pathways. Here, an overview of old vs. new paradigms in the field of mineral formation will be given, presenting a state-of-the-art of the current physico-chemical understanding of precipitation phenomena.

**19 Aprile 2024** – ore 14.00 – aula Lucchesi

#### ***Geochemistry and Mineralogy of Acid Mine Drainage (AMD)***

AMD occurs in zones where pyrite formations are oxidized due to rock weathering, a phenomenon that is accelerated in the presence of mining operations. AMD waters are highly acidic, mobilizing metals and metalloids, among which many pollutants. These are present in many parts of the world, presenting important environmental concerns. Here, an overview of the phenomenon, and a detailed analysis using nanoscale techniques of the most important Fe and Al colloids formed in AMD, and their environmental relevance, will be presented.