
PhD Thesis Offer – October 2022

Evidencing and characterising the antibacterial properties of clays

Place: CEREGE, Aix en Provence, Group Sustainable Environment

Period: October 2022 - October 2025

Funding support: Industrial partnership with IPSEN

Doctoral School: Sciences de l'Environnement ED 251, Aix-Marseille Université

The thesis will be carried out for the most part at CEREGE (Aix-en-Provence Arbois) under the supervision of the two partners CEREGE and IPSEN.

Thesis Director: Jérôme Labille (CEREGE)

Thesis Co-director: Arnaud Schneider (IPSEN)

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Context and objectives:

This thesis will be realized in partnership between CEREGE and the pharmaceutical company IPSEN. It deals with the characterization and evaluation of the antiseptic potential of geo-sourced materials containing clay. The objective of this work will be to highlight the reaction mechanisms involved in these materials with respect to certain organic molecules in order to valorize them in industrial pharmaceutical applications. These reaction mechanisms are currently poorly known and might be related to the presence of minerals associated with clays containing iron or manganese.

Methodology:

In a first step, an exhaustive state of the art of the different existing works related to the antibacterial effects of clays will be carried out. This will allow to orientate the thesis towards a selection of minerals of interest, according to their coupled composition and their oxidative potential. The antibacterial potential of these natural or modified materials will be studied and characterized using different physicochemical and/or microbiological techniques.

The aim of this thesis will be to optimize the developed materials to answer targeted applications: antiseptic pharmaceutical products, water treatment or phytosanitary treatments, etc.

At the end of this work, one or more of these applications could be the subject of a patent application.

The analytical methods used will be in particular:

- X-ray diffraction ;
- Chemical analysis by ICP-MS, colorimetry ;
- Electron microscopy coupled to EDS ;



- X-ray microfluorescence ;
- Mössbauer spectrometry ;
- Mineral synthesis ;
- X-ray absorption spectroscopy
- In-vitro culture ;

Candidate profile:

Required profile: knowledge in mineralogy, inorganic chemistry, physical chemistry of interfaces, acquired for example through a cursus in environmental geosciences, geochemistry, or material sciences. The candidate must have a Master 2 or engineering degree and show a real interest in R&D associated with the subject, with the ability to quickly take control of experiments, interpret results, and take the initiative necessary for any research work.

Candidature:

Curriculum Vitae, cover letter, transcripts, and contact information of referees (former internship supervisor for example) should be sent by email to the two supervisors J. Labille and A. Schneider.

Deadline for candidature reception: May 22nd 2022