

Course unit : MICROSTRUCTURE AND PHYSICAL PROPERTIES OF HYDRATED CLAYS (56h – 6 ECTS – compulsory)

Content

Introduction to the microstructure of clays : particles, aggregates and porosity ; hydration, porosity and mechanical properties.

Observation of texture and quantitative analysis of spatial heterogeneities : microscopy ; tomography ; autoradiography ; mapping and quantitative analysis.

Bulk textural analysis : gas adsorption and mercury porosimetry ; the special case of water.

Microstructure and hydromechanical properties : swelling ; homogenisation.

Learning outcomes

The objective of this course is to provide the students with:

i) a theoretical background to understand the physical-chemical processes controlling hydration and organization of clays at different scales in the unsaturated state

ii) a solid knowledge of the physical and imaging techniques able to analyse the organization (texture, microstructure) of clay materials, the geometry of crystals-particles and their reactive surfaces

iii) an updated view of the recent advances on water, pore and solid distribution balances along hydration

iv) an introduction to the measurement of macroscopic hydro-mechanical properties and to the theory of up-scaling theoretical models

Horary

Lecture : **21 h**

Supervised works : **15 h**

Practical works : **20 h**

Evaluation

Evaluation during the teaching period, reports : 100% of the mark.

Teaching staff

Frédéric VILLIERAS (CNRS, Nancy)

Dimitri PRET (University of Poitiers)

Philippe COSENZA (University of Poitiers)

Patrick DUDOIGNON (University of Poitiers)

Stephen HEDAN (University of Poitiers)