

## Training (5 months / February – June 2014)

Technical unit home: IFSTTAR Marne la Vallée (east of Paris)

Geotechnical engineering, environment, natural hazard and earth sciences department (GERS)  
Soils, rocks and geotechnical structures group (SRO)

<http://www.ifsttar.fr>

### Microstructural approach of the Soil-Mixing material

The Soil-Mixing consists in mixing clayey soils with a hydraulic binder in place in order to improve its mechanical properties. Its economic attractiveness and its low environmental impact have made of this method (used until recently only to improve compressible soils or soils with a high content of organic matter) competitive alternative to traditional methods of soil reinforcement, retaining structures (temporary or final), foundations and waterproofing works.

The training focuses on the link between the nature of the soil (in this case some clays) and the mechanical properties of the soil-mixing material evolving with time during hardening. The understanding of the interaction between clays and hydraulic binder (cement CEM III or CEM II) is needed. Two PhD theses and a master thesis last year produced previous results and we want to focus now on the analysis of these results and on microstructural aspects that have to be collected on manufactured samples to understand why some clay produce good compressive strength while some others can't produce a real stiffening of the soil. When it happens for two clays belonging to the same family, the determination of the clay characteristic that induce such variation of behavior can help to understand the various behavior in natural soil. The methodology involves microstructural measurements with porosimetry by mercury intrusion, microscopies, XRD and thermal analysis, zetametry/ titrimetry and test of dissolution.... At the end, we would like to identify the characteristics of soil or a test or a methodology to predict if the soil mixing material will reach the fixed performance or not.

The candidate student must be autonomous and highly motivated by this work. He will be able to manage the research and propose some ideas without a permanent supervising. He will have a good experimental skill and will like working on material, asking questions and proposing ideas to solve the problem considering his knowledge from previous studies. Considering the French bibliography, the candidate should be able to understand written documents in French.

**Compensation for training** : yes

**Contact** :

Physico-chemical part

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Mechanical part

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