

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)
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Clay-rich sands used in bituminous pavement before or after lime treatment

The student will study different sands coming from quarries in France. He will identify from geological map (and by contacting union as UNPG, UNICEM...) the area in France where quarry may produce some clay-rich sands. We would like to contact quarry men and evaluate which amount of sand have to be considered as waste because they can't be used in bituminous asphalt and then what happens for these sands : storage, treatment, washing, ...

After collecting conformed or non conformed sands from several quarries, mineralogical analysis by XRD will be done (test how the parameters of preparation impact on XRD measurements: sampling, grinding (particles size), the way of material deposit on a support, diffractograms acquisition...). From the identification of the mineralogical phases, we want to evaluate the variability of clay nature in sands and the variability within a clay family.

Furthermore, after a bibliography on the different methods available in literature to quantify the clays in mixture (as natural sand), we propose to work on XRD (Reitvelt or other methods combining different tests) to apply and compare the different methods of quantification and discuss their accuracy. Some inter-laboratory tests to compare the different methods should be planned.

As application, we propose to study the change of clay behaviour after lime treatment. Different types of lime treatment (for earthwork, asphalt pavement...) can be found in literature and the result of the treatment depends on the conditioning of lime, the water content of clay, the degree of compaction, the capacity of CO₂ to reach clay surface.... XRD will be used to estimate the reactivity between clay and lime (dissolution, precipitation of new phases, change of clay structure) and environmental chamber coupled with XRD will be used to test the change in swelling properties of clay. Other techniques will be used to characterize the dispersion/aggregation of clay particles and to understand what happen on clay surface (surface charge, Ca-exchange) when sands are treated with lime. Such results will be useful to understand why lime treatment is used to reduce the stripping phenomenon when clay-rich sands are mixed with asphalt (hot method).

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