

2nd year ENSCL

Academic year 2009-2010

SUBJECT N° 7

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Study of clays

1 – Introduction [1][2]

Clay is a naturally occurring material composed primarily of fine-grained minerals, which show plasticity through a variable range of water content, and which can be hardened when dried and/or fired. Clay deposits are mostly composed of clay minerals (phyllosilicate minerals), minerals which impart plasticity and harden when fired and/or dried, and variable amounts of water trapped in the mineral structure by polar attraction. Organic materials which do not impart plasticity may also be a part of clay deposits.

2 – Definition

Clays are distinguished from other fine-grained soils by various differences in composition. Silts, which are fine-grained soils which do not include clay minerals, tend to have larger particle sizes than clays, but there is some overlap in both particle size and other physical properties, and there are many naturally occurring deposits which include both silts and clays. The distinction between silt and clay varies by discipline. Geologists and soil scientists usually consider the separation to occur at a particle size of 2 μm (clays being finer than silts), sedimentologists often use 4-5 μm , and colloid chemists use 1 μm . Geotechnical engineers distinguish between silts and clays based on the plasticity properties of the soil, as measured by the soils' Atterberg Limits. Primary clays, also known as kaolins are located at the site of formation. Secondary clay deposits have been moved by erosion and water from its primary location.

3 – Uses

Clays exhibit plasticity when mixed with water in certain proportions. When dry, clay becomes firm and when fired in a kiln, permanent physical and chemical reactions occur which, amongst other changes, causes the clay to be converted into a ceramic material. It is because of these properties that clay is used for making pottery items, both practical and decorative. Clays sintered in fire were the first form of ceramic. Bricks, cooking pots, art objects, dishware and even musical instruments such as the ocarina can all be shaped from

clay before being fired. Clay is also used in many industrial processes, such as paper making, cement production and chemical filtering. Clay is also often used in the manufacture of pipes for smoking tobacco and marijuana.

4 – Study

Starting with a general research and on work made last year [3][4][5], you will make a more precise idea of the topic. Look for a definition of words you do not understand. **You will have to limit your topic of particular interest to one of its aspects, which you choose, this project is yours.** The literature search will be focused on:

- the origins of discoveries and studies of clays
- the methods of synthesis
- possible studies to achieve (physical and chemical analysis)
- possible and potential applications, etc.

5 – References

[1] <http://en.wikipedia.org/wiki/Clay> (21/07/2009)

[2] <http://fr.wikipedia.org/wiki/Argile> (21/07/2009)

[3] « les argiles », MELIET Célia *et al.* , rapport bibliographique théorique, ENSCL, 2008-2009

[4] « mesure de la CEC et des fixations préférentielles de cations pour la bentonite commerciale », MELIET Célia *et al.* , rapport pratique, ENSCL, semaine du 19 au 23/01/09, 2008-2009

[5] « mesure de la CEC et des fixations préférentielles de cations pour la bentonite commerciale », MELIET Célia *et al.* , rapport pratique, ENSCL, semaine du 26 au 30/01/09, 2008-2009