Geological and physiochemical characterization of clay materials in the Cristal Cerame quarry (region of Berrechid, Morocco)

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The Cristal Cerame quarry is located in Jemaa de Ryah region at 22 km northeast of Berrechid city (Morocco). Geological study, characterization and valorization of some clay raw materials extracted from Cristal Cerame clay deposit have been a focus of our mission. Clay materials are used mostly in floor tile production. Thus, field investigations show that most of these rocks are mainly argilitic in their composition, gray or purple in color, attributed to shale and sandstone of a folded Paleozoic basement. Infra-Cenomanian and Cenomanian-Turonian sediments unconformably overlie these argillites. Quaternary deposits locally cover all older rocks. Several studies are carried out to characterize this clay formation:

- Particle size analysis shows that the two clay-types (gray and purple) are slightly similar.
- X-ray diffraction (XRD), X-ray fluorescence (XRF) and Infrared spectroscopy (IR) methods revealed that illite, kaolinite and muscovite were the major types of the rock-forming clay minerals.
- Chemical analyses carried out on the two clay-types show a relatively high content of Fe_2O_3, and an amount of alkaline and alkaline-Earth elements reaching approximately 3% for the two clay-types. However, silica and alumina contents are admissible in the ceramics industry.
- Significant technological parameters such as firing shrinkage, mass loss and transverse strength, were defined in order to predict the behavior of the two clay-types during firing processes. In addition, the thermal decomposition on fine fraction of these clays was studied by thermogravimetric analysis (TGA) and differential thermal analysis (DTA). From the TGA curves, both clay samples exhibit a decomposition loss of 50% of weight. In fact, the curves show broad losses of mass in the temperature range of 30-150°C and 450-650°C, normally associated with loss of surface water and dehydroxylation of the clay material, respectively. Moreover, the DTA curves show two sharp endothermic peaks at 60°C and 540°C corresponding to the loss of surface water, and lattice water of the clay material, respectively, besides the decomposition of the calcium magnesium carbonates. In addition, another exothermic peak occurs slightly above the highest temperature (1000°C) and corresponds to crystallization processes.

General view of Cristal Cerame quarry

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