

# Institut de Chimie de Clermont-Ferrand

## ICCF - UMR 6296



**Title of the master project :** Deep characterization of natural Velay Green Clay: from mineralogical composition to physico-chemical properties

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### Summary :

Velay Green Clay is extracted from the rich volcanic earth of the Auvergne region in France. It is made up of an impressive list of properties originating from the gradual erosion and breakdown of pre-existing rock, particularly those containing feldspar. These rich mineral sediments were deposited during the tertiary period. Velay Green Clay contains more than 80% of a illite and smectite natural mixture.. Due to its remarkable properties, the Green Clay from Auvergne are commercialized for cosmetics, animal food and care, agriculture. Very few papers report about the study of green clay of the Velay. So, there is a great need to better understand the relation between chemical composition, structure and morphology and their physico-chemical properties.

The main goal of this project is to deeply characterize the Velay green clay and get better insight on their physico-chemical properties. The mineralogical composition for both bulk and fraction will be determined by X-ray powder diffraction and spectroscopy (FTIR and Raman). The bulk chemical composition will be analyzed by X-ray fluorescence spectrometry, ICP-AES and EDX mapping, with particular focus to the trace elements to assess the possible risk for health. Thanks to thermogravimetric analysis and PXRD in temperature (HTK), at different humidity levels, thermal behavior and swelling properties will be followed. To gain a better insight into textural properties of this material, scanning electron microscopy (SEM), transmission electron microscopy (TEM), N<sub>2</sub> adsorption/desorption analysis will be performed. In parallel, clay surface properties will also be investigated by zeta potential measurement at different pH and ionic strength, and adsorption properties will be studied for various inorganic and organic species.

All the collected results will provide to the Velay Clay Company a complete knowledge of their clay product and help them to open up new markets.

The candidate will have scientific skills in clay science and characterization. During this project he/her will develop knowledge and experience in different fields such as structural characterization using powder X-ray diffraction, spectroscopy techniques and microscopy. A special attention will also be paid to the physical chemical properties of natural the natural Velay green clay.

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