The aim of this study is to characterize these raw materials and explore the possible manufacturing of ceramic floor tiles or bricks. Seven Meknes yellow clay samples selected in Saiss basin deposits, which are located at about 15 km of Meknes (center northern of Morocco) and twenty Cretaceous clay samples are taken from Tetouan area (northern end of Morocco).

In the present investigations, the clay samples were characterized by a wide range of techniques with respect to their mineralogical, chemical, thermal and fired properties. These clays were used in manufacture of the floor tile and bricks, in which the Meknes clays used for ceramic tile production and traditionally for pottery manufacture. On the other side, Tetouan clays are used for ceramic tiles and bricks. However, manufacturers have claimed some problems such as breakage and deformation of their products.

**Materials and methods**

The characterization of Tetouan and Meknes clays was determined by mineralogy determination and measuring their properties related such as grain size distribution, Atterberg limits, cation exchange capacity, calorimetry and specific surface area in order to evaluate viability of the clay deposit for ceramic uses. At the end of this study, one can affirm those clays have qualities necessary for the manufacture of ceramic floor tiles and/or bricks. It is expected that the present investigation will help to improve the knowledge on the Tetouan clay and Meknes clay as well as to contribute to a sound exploration of the Moroccan northern deposit.

**Results and discussion**

In conclusion, the clay characterization of north center of Morocco (Tetouan and Meknes area) is suitable for ceramic manufacture. In this prospect, characterization tests have been designed, hoping they could contribute to the actual exploitation of these mining-products by the ceramic industry. As concluding remarks, the following aspects related to the characterization and industrial application of these clays can be summarized:

- The outstanding phase present in Meknes clays were illite, kaolinite, smectite and chlorite and containing a substantial amount of quartz and carbonate and others impurities such as feldspar, muscovite and pyroxene. The clay materials from Tetouan region can be defined as mixture of kaolinite, illite and chlorite with mixed layers clay, quartz and feldspar, only eight samples clay content calcite.

- For Meknes samples, the fraction below 2 μm is mainly high (49% for M2, around 25% for M6, M5 and M1). The silt fraction (particles with sizes between 2 and 20 μm) are about 33% for M3, 26% for M4 and 15% round for M1 and M6.

- For Tetouan samples, the percentage of clay minerals (particles with sizes 0.1 μm) is mainly moderate, except for T2 (12%), T2 (12%) and T2 (12%) they have similar plasticity (PI 10%).

- Meknes clay presents similar values of plasticity. In fact, the elevated values of PI for Meknes clay are considered as highly plastic.

- Tetouan clay shows mostly low plasticity (PI 10%), expect TEL2 to highly plastic and samples TES, TES, TES, TES, TES and TES they have medium plasticity (PI 10%).

- The samples are basically consisted of a finely grained material. Higher proportions of finer particles especially for Meknes clay. The both clay regions containing quartz favoured vitrification due to good compaction of samples during firing. Also the most samples content calcite favouring the development of lighter colours and promoting a higher degree of vitrification and higher compressive strength at lower temperatures.

- Meknes clay reveals a medium cation exchange capacity and specific surface area values; due to they smectite content.

- Tetouan clay has medium to low CEC and medium SSA values, indicating the expandable minerals and higher kaolinite content for samples with medium CEC values.

**CONCLUSION**

In conclusion, the clay characterization of north center of Morocco (Tetouan and Meknes area) is suitable for ceramic manufacture. In this prospect, characterization tests have been designed, hoping they could contribute to the actual exploitation of these mining-products by the ceramic industry. As concluding remarks, the following aspects related to the characterization and industrial application of these clays can be summarized:

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- Meknes clay reveals a medium cation exchange capacity and specific surface area values. Though, Tetouan clay has medium to low CEC and medium SSA values, indicating the expandable minerals and higher kaolinite content for samples with medium CEC values. This agrees with mineralogical analysis and is favorable for uses in ceramic.

- The studied raw materials are classified as silty clays and be used as ceramic bodies. Meknes and Tetouan clay show optimal plasticity.