

Evaluation of Oligocene-Miocene Clay from the Northern Part of Palmyra Region (Syria) for Industrial Ceramic Applications

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Abstract : Clay of the northern Palmyra region is one of the most important raw materials used in the Syrian ceramics industry. This study is focused on the evaluation of various laboratory analyses such as chemical analysis (XRF), mineral X-ray diffraction analysis (XRD), differential thermal analysis (DTA), and semi-industrial tests carried out on samples collected on two representative locations of the upper Oligocene in AlMkamen valley (MK) and lower Miocene in AlZukara valley (ZR) of the northern part of Palmyra, Syria. Chemical results classify the (MK) and (ZR) clays as semi-plastic red clay slightly carbonate and (eliminate probable) illite-chlorite clays with a very fine particle size distribution. Content of SiO₂ between 46.28-57.66%, Al₂O₃ 13.81-25.2%, Fe₂O₃ 3.47-11.58%, CaO 1.15-7.19%, Na₂O+K₂O varied between 3.34-3.71%. Based on clay chemical composition and iron and carbonate content, these deposits can be considered as red firing clays. Their mineralogical composition is mainly represented by illite, kaolinite and quartz, and accessories minerals such as calcite, feldspar, phillipsite, and goethite. The results of the DTA test confirm the presence of gypsum and quartz phases in (MK) clay. Ceramic testing shows good green and dry bending strength values, which varied between 9-14 kg/cm², at 1160°C to 1180°C. Water absorption moves from 14.6 % at 1120°C to 2.2% at 1180°C to 1.6% at 1200°C. Breaking load after firing changes from 400 to 590 kg/cm². At 1200°C (MK), clay reaches perfect vitrification. After firing, the color of the clay changes from orange-hazel to red-brown at 1180°C. Technological results confirmed the suitability of the studied clays to produce floor and wall ceramic tiles. Using one of the two types of clay into the ceramic body or both types together gave satisfactory industrial results.

Keywords : ceramic, clay, industry , Palmyra

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