On the use of magnetic measurements as indicator of the equivalent firing temperature of ancient baked clays: New experimental results

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We present here new experimental results on the variation of the magnetic properties of baked clays as a function of the temperature. Such experiments, including continuous monitoring of the magnetic susceptibility and the magnetic moment versus temperature, were applied to a set of natural clays experimentally heated at the laboratory at 200 °C, 400 °C and 600 °C as well as to archaeological baked clays collected in two archaeological sites in Northern Italy (Santhià and Carbonara Scrivia). The aim of this study is to investigate the reliability of the magnetic properties to identify the equivalent firing temperatures of ancient baked clay artefacts based on the reversible behavior of thermomagnetic diagrams (Fig. 1). The results obtained indicate that the magnetic properties do not always succeed to estimate the firing temperature of the baked clays, mainly when clays have been heated only once and at relatively low temperatures e.g. less than 300-400 °C. On the contrary, magnetic properties of ancient clays that have been repeatedly heated in the past at temperatures higher than 400 °C seem to be more stable and representative of the equivalent firing temperature. This study points out that caution should be exercised on the use of the reversibility of thermomagnetic diagrams for the determination of the equivalent firing temperatures of ancient ceramics. Their reliability, in fact, depends on the maximum temperature experienced by the samples in the past as well as on several other parameters such as the initial mineralogy of the clay, the thermal stability obtained during ancient firing, and other features as the reductive/oxidative conditions maintained in the furnace during the heating treatments.

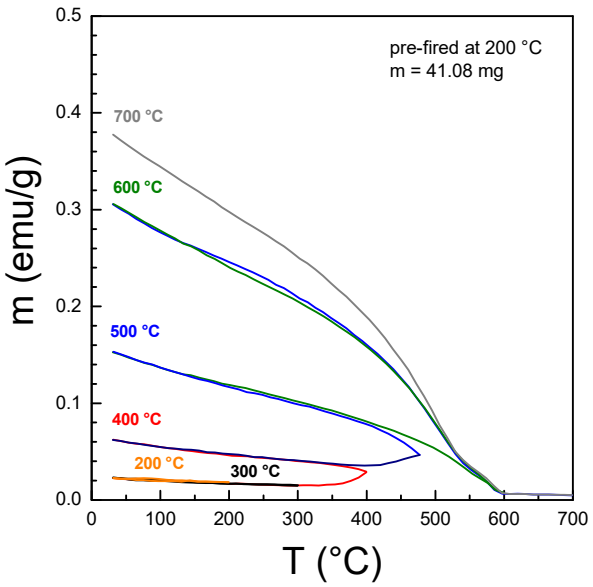

Fig. 1. Continuous thermomagnetic curves obtained after heating/cooling circles at increasing maximum temperatures (from 200 to 700 °C) for a clay sample experimentally pre-fired at 200 °C.