# GREAT POTS ON FIRE: THERMAL PROPERTIES OF ARCHAEOLOGICAL CERAMICS

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Among the most significant advantages of ceramic materials are their enhanced thermal properties. Ceramics are heat resistant, i.e. they remain inert at considerably high temperatures and they present relatively high thermal shock resistance and heat capacity. For this reason they were the most common materials for various applications involving the use of heat, from daily life, such as cooking, up to specialised technical processes, as for example metallurgy or glass making. Depending on the application, however, different properties were required regarding the heat capacity and particularly the thermal conductivity. In some cases, for example, ceramics with high thermal conductivity were required, such as cooking pots, and in other cases such as smelting processes, ceramic furnaces with rather insulating properties were required. Also mechanical properties in terms of strength and toughness had to be suitable for the particular function.

The physicochemical properties of the ceramics depend on the nature of the raw materials, on the clay paste processing and on the firing technology. Indeed, various approaches can be observed in ancient functional ceramics, towards achieving suitable material properties. Most of these strategies concerned the ceramics' microstructure, i.e. porosity and type, size and distribution of inclusions. In this paper, ceramic microstructures are assessed for their thermal properties, by computer simulation. In order to achieve this, each ceramic was regarded as a multiphase composite, with the clay body, the voids and the particular inclusions being the different phases. Based on observations multiphase models of ceramic structures were developed and tested with computer simulations for the resulting thermal properties. In order to verify this simulation approach, the thermal properties of test ceramics with controlled microstructures were measured in laboratory experiments.

By knowing the properties of the base material components, computer models of particular ceramics can be developed. These models can be tested for their simulated performance during use in terms of heat transfer and thermal stress. The results demonstrate the importance of all the parameters

that constitute ceramic technology in the thermal performance of the final products.