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Application of small angle neutron scattering to investigate archaeological pottery production technologies

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For the examination of the pottery forming techniques, two series of experimental vessels have been made with three different, historical forming techniques (coil-building, wheel-shaping, wheel-throwing). Cubical samples from each experimental vessel were measured by SANS in three perpendicular orientations, and the recorded anisotropic scattering maps were analysed in 2D. The measure of anisotropy and the direction of the elongation of the detected nano-inclusions indicate the preferential particle/void alignments. After examining the 2D scattering plots, correlation between forming techniques and the direction and magnitude of the alignment was detected. The differentiation of these techniques provides a significant new analytical tool for investigating the geographic and temporal dissemination of the potter's wheel, contributing to ongoing debates regarding the spread of this technology.
In order to examine the maximum firing temperature of archaeological ceramics, three different raw material series of control briquettes have been prepared and fired at temperatures from 500℃ to 1000℃. These samples have been measured on a wide scattering vector range, and after the routine calibration process, the intensity versus scattering vector curves were obtained. The least square method fitting was used to obtain the fractal exponent which has been correlated to the firing temperature. This method was then applied to a series of Late Roman/Early Medieval archaeological pottery sherds from the fortification of Keszthely (Hungary) in order to better understand production technologies of the post Roman period.
The measurements were performed at the YS-SANS and FSANS instruments at Budapest Neutron Centre.

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