

Analysis of clay from Market Rasen

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As part of an assessment of the potential of characterisation studies to aid the study of the Romano-British pottery industry at Market Rasen, the author raised the need to have comparative data for the local Oxford Clay which, it was suspected, might be the source of the potting clay used at the site (Vince 2001).

Subsequently, a sample of this clay obtained during the 1960s excavations was located and submitted for petrological and chemical analysis.

Methodology

The clay was leather hard when located and rather than wetting it and reworking into a briquette the sample was fired in a modern electric kiln in an oxidizing atmosphere at about 1000° C. The fired clay was then thin-sectioned by Paul Hands at the Department of Earth Sciences, University of Birmingham, and a subsample was ground to a fine powder by Peter Hill and submitted to Dr N Walsh, Department of Geology, Royal Holloway College, London for chemical analysis using ICPAES (Inductively Coupled Plasma Spectroscopy).

Description

Petrological analysis

The thin-section, V1110, was examined at various magnifications using a petrological microscope. No inclusions larger than silt size were noted although there were a few irregular voids up to 0.5mm across. The groundmass was variegated and there were lenses of dark material, probably iron rich compounds, which seem to have formed along cracks in the parent clay through iron panning. Despite being fired at a high temperature in an oxidizing atmosphere the majority of the sample is reduced, light grey, with a thin oxidized margin. It is likely that this local reduction is a result of a high organic content and the texture of the groundmass in the grey core appears to be very vesicular, suggesting that material has burnt out during firing. Interestingly, this is not the case in the margin. Moderate to abundant quartz silt and sparse muscovite laths occur in the groundmass.

The characteristics of this clay sample are comparable with those of the PART vessels produced at Market Rasen although there are obviously differences due to the contrasting firing conditions: the Romano-British vessels would have been fired at a lower temperature, probably in a reducing atmosphere.

Chemical analysis

The chemical composition of the Market Rasen Oxford clay is given in Appendix 1. This data was compared with that obtained from samples of the pottery itself. A principal components analysis of the dataset shows that if only the major elements (App 1a) are included, the clay sample clusters with a group of seven of the PART vessels (samples V981, V982, V984, V986, V987, V990 and V995). Whereas, if the entire dataset is analysed, including a value for the unmeasured silica content (obtained by subtracting the total oxides from 100%) then the clay sample falls slightly outside this cluster. Both of these results are consistent with the PART vessels being produced from locally-available Oxford Clay which, however, contains slightly more silica than the measured sample (and consequently, slightly less of all other elements). This missing silica was probably partly added as sand, which is present even in the untempered PART vessels in small quantities, and partly by choosing silt-rich beds within the clay.

Appendix One

App 1a Major elements measured as percentage oxides

AL2O3	FE2O3	MGO	CAO	NA2O	K2O	TIO2	P2O5	MNO
19.98	6.36	1.24	0.85	0.29	3.10	0.98	0.13	0.02

App 1b Minor and trace elements measured as parts per million

BA	CO	CR	CU	NB	NI	SC	SR	V	ZN	ZR*	LA	CE	ND	SM	EU	DY	YB	PB	LI	Y
374.00	23.00	128.00	30.00	0.00	58.00	19.00	109.00	195.00	107.00	127.00	46.00	92.00	47.75	6.96	1.69	4.80	2.80	191.84	105	27