6. METHODS

6.1 Introduction

This chapter outlines the methods used to petrographically analyse and record the ceramic sherds selected for analysis. As the pottery assemblages from the three sites selected were already macroscopically analysed (Chapter 5), only the petrographic recording criteria is outlined here. The chapter describes the site selection process and sampling strategy (section 6.2), the methodology employed to create the samples (section 6.3) and the techniques utilised to examine and record the resulting thin sections (section 6.4).

6.2 Site selection and sampling strategy

Three sites were selected for petrographic analysis from Leicestershire, Rearsby Bypass (section 5.4), Syston (section 5.5) and Castle Donington (section 5.6). The sites were chosen due to their previous lack of petrographic analysis, their availability and the range of ceramic typologies present, particularly within Rearsby Bypass, which would allow for intra-site, as well as, inter-site comparison. The sites targeted also contained material which may be comparable, as all contain late Neolithic and early Bronze Age material. Seven samples were taken from Rearsby, two from Syston and one from Castle Donington. Rim sherds and decorated pieces were avoided, where possible, so as to avoid undue damage to diagnostic sherds, which are generally scarce in Leicestershire. A sample was taken from each identified fabric type within the assemblages from each site. The thin section samples will be deposited at a suitable repository following completion of this research.

6.3 Sample preparation

Paul Hands from the department of Earth Sciences at the University of Birmingham produced the thin sections from the selected samples for this study. The methodology utilised to produce the sections was as follows. The pottery samples were cut using a circular diamond tipped saw and subsequently ground down to a sufficient thickness to produce the sample in preparation to be mounted on the glass slide. The mounting adhesive was an epoxy resin. The samples were vacuum impregnated to ensure that the samples did not disintegrate during later stages of thin section preparation. The slides were further ground down using a carborundum abrasive mix to a thickness of 0.03 millimetres (mm). This specific thickness allows the light to pass through the thin section and for the identification of minerals and matrix of the thin section. The samples had a coverslip inserted on top of the thin section. The sections were not polished (Hands *pers comm.).*

6.4 Recording Approach

The analysis of ceramic thin sections including the identification of plastic (clay micromass) and non-plastic components (inclusions) was outlined in section 4.4.1. The recording criteria used to analyse the ten thin sections created for this research was based upon this recording criteria and also followed the recording standards and terminology outlined by Whitbread (1995: Appendix 3). Whitbread (1995) was followed, where possible, in order to ensure standardisation of recording techniques in ceramic petrography research and enable improved qualitative comparisons to be made between petrographic studies (Freestone 1997: 399-402). As the University of Bradford lacked suitable ceramic petrography equipment, analysis and recording of the thin sections was undertaken at the University of Leicester. Training in the study of ceramic thin sections was personally organised under the tutorage of Dr. Robert Ixer (University of Leicester). Due to time constrictions and available space at Leicester, a thorough analysis incorporating all of the recording criteria outlined by Whitbread (1995) was unfortunately not possible. Therefore, it was decided to focus on specific criteria aimed at analysing and describing the clay micromass and identifying any inclusions within the thin sections. These are outlined below (section 6.4.1) and were deemed sufficient to provide a good understanding of the thin sections forming the focus of this research. A Nikon Eclipse E600 polarising microscope was used to examine the thin sections in detail. Dr. Philip Mills (University of Leicester) assisted with the set-up and examination of the thin sections. Photomicrographs of the sections were produced under cross-polarised light at x2 and x4 magnification.

6.4.1 Petrographic Recording Criteria: Clay Micromass and Inclusions

The petrographic recording criteria employed for the purposes of this research was adapted to focus specifically on the description of the clay micromass and the identification of any obvious inclusions or additives.

Clay Micromass

The clay micromass was recorded using both plane and cross polarized light. Broad descriptive terms were employed to describe the texture of the fabric, for example: *silty*, *clean* and varying degrees in between. This terminology refers to how fine the clay appeared in thin section and how many inclusions/voids were present. Cross polarized light was used to determine optical activity. This was visually assessed based upon the colour of the micromass, more specifically the presence or absence of interference colours. This was recorded by simply using *optically active* or *optically inactive*, following Whitbread (1995: Table A3.5).

Inclusions

Inclusions were identified using colour and pleochroism, cleavage, birefringence and extinction angle. The identification of most inclusions was relatively straight forward with only the amorphous concentrations and distinguishing between clay pellets/clasts and grog providing potential difficulties. Visual identification charts from the *The Study of Prehistoric Pottery* (2010) produced by the Prehistoric Ceramic Research Group focused on describing density (Figures 6.1 & 6.2), inclusion sorting (Figure 6.3) and angularity (Figure 6.4) were used in combination with the following frequency scale (Whitbread 1995: Table A3.1).

- Predominant: >70%
- Dominant: 50-70%
- Frequent: 30-50%
- Common: 15-30%
- Few: 5-15%

- Very few: 2-5%
- Rare: 0.5-2%
- Very rare: <0.5%

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Figure 6.1 Density Chart 1 (Prehistoric Ceramic Research Group 2010: 48)

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Figure 6.2 Density Chart 2 **(**Prehistoric Ceramic Research Group 2010: 49)

The degree of inclusion sorting was determined using the following visual identification chart (Figure 6.3). The level of difference between mineral sizes of the same type may indicate whether the inclusion is intentionally added or a naturally occurring impurity within the clay micromass.

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Figure 6.3 Inclusion Sorting Chart (Prehistoric Ceramic Research Group 2010: 50)

Angularity was defined using the terms and visual identification illustrated in Figure 6.4. Angularity or roundedness of mineral inclusions (not including organic material) can indicate the origin of an inclusion and whether it has been intentionally added to the clay micromass.

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Figure 6.4 Angularity of Inclusions (Prehistoric Ceramic Research Group 2010: 51)

Voids are gaps within the fabric and their morphology can help to identify what may have been present. Some voids may previously have contained organic material and these can form linear channels, representing straw or rounded or elongated vesicles representing seeds. Others may have contained minerals, such as limestone which has leached out or been lost through diagenesis; these are called vughs. Voids were described using the following descriptive categories (Whitbread 1995: Table A3.3, with additions):

- Planar voids: Linear but can be three-dimensional, variable and irregular
- Channels/Micro-channels: Linear in thin section, but cylindrical in three dimensions
- Vughs: Large, irregular voids
- Vesicles: Regular and with some degree of roundness

Amorphous concentrations are opaque minerals which are not readily identifiable under normal conditions and usually require a polished thin section to enable identification (Hutchison 1974: 32). Consequently, rather than attempt to presume the identity of the amorphous opaque concentration, these have simply been described on a presence/absence basis.