Staffordshire Hoard Research Report 13

Identification of the Fibres of Textile Fragments found embedded in the Soil inside Silver Gilt Collar K281 from the Staffordshire Hoard

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Information about this report

This report was produced in 2013 as part of Stage 1 of the project, i.e. before fragments were joined and catalogued. The fragment of textile was found within catalogue no. 126. Hilt-collar in gold, of narrow form, with filigree decoration.

The British Museum

DEPARTMENT OF CONSERVATION AND SCIENTIFIC RESEARCH

Identification of the fibres of textile fragments found embedded in the soil inside silver gilt hilt collar K281 from the Staffordshire Hoard

Science Report
Envelope No. PR07444-17

Caroline Cartwright

Abstract:

Fragments of textile were found embedded in the soil inside silver gilt hilt collar K281 from the Staffordshire Hoard during conservation cleaning of the piece. Although many areas of the fragments comprising textile K281c from the Staffordshire Hoard were mineralised by metal corrosion products and were largely covered by adhering soil particles, some fibres survived with sufficient diagnostic features to enable them to be identified as processed and unprocessed flax (*Linum usitatissimum*) using variable pressure scanning electron microscopy (VP-SEM). A plain weave structure with Z-twist yarns could be seen. Energy dispersive X-ray analysis of several areas of the textile confirmed the presence of iron, silver, copper and chlorine – indicating metal corrosion products – as well as many elements associated with soil, including calcium, aluminium, silicon, magnesium and potassium. VP-SEM examination of negative impressions of textiles on a clod of soil revealed no identifiable evidence of the original fibres present. Without direct radiocarbon dating of the textile, its age and direct contemporaneity with the silver gilt collar cannot be determined with complete certainty on the basis of the condition of the fibres alone, but it is possible to say that the use of flax in a plain weave textile is not out of place for the 7th or 8th century.

CSR Project no. PR07444-17

(External) Staffordshire Hoard number: K281c

4 November 2013

Introduction

Several small pieces of the textile fragment K281c from the Staffordshire Hoard were submitted for fibre identification using variable pressure scanning electron microscopy (VP-SEM), and for SEM-energy dispersive X-ray (EDX) analysis with regard to aspects of mineralisation. One of the fragments only exhibited impressions left by textiles, but no fibres have survived.

Methods

Examination of the textile fragments (Figure 1), and the soil fragment with impressions (Figure 2) was undertaken using a Hitachi S-3700N VP-SEM with the backscattered electron (BSE) detector at 15 kV (and occasionally at 20kV), a working distance of between 12.2 and 22.8 mm and magnifications ranging from x23 to x300. As the fibrous material of the textile fragments was in a friable condition with variable amounts of mineralisation present and detrital material adhering, the SEM chamber was only partially evacuated (30 Pa). The 3D mode (rather than Compositional) was selected to maximise the potential for revealing diagnostic features on the fibres and impressions. The brighter areas in the images correspond to those areas with heavier elements. The fragments were examined in the VP-SEM in their original boxes as the standard practice of removal of the fragments to be placed on adhesive carbon discs mounted onto stubs risked further fragmentation of the material.

Figure 1 Backscattered electron (BSE) image of main textile fragment K281c in the VP-SEM

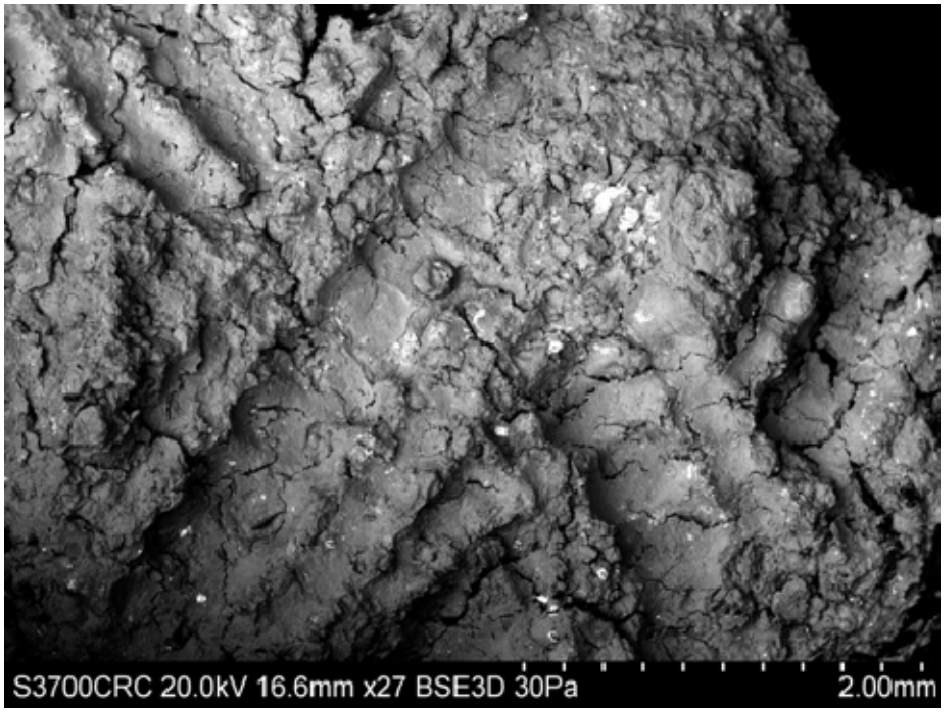

Figure 2 BSE image of the fragment of K281c with textile impressions only

Results

In all instances, the presence of detrital soil particles and other materials (including metal corrosion products) masked some of the key features required for swift identification of the fibres (Figures 3 and 4), but sufficient features could be discerned through detailed and more lengthy VP-SEM examination.

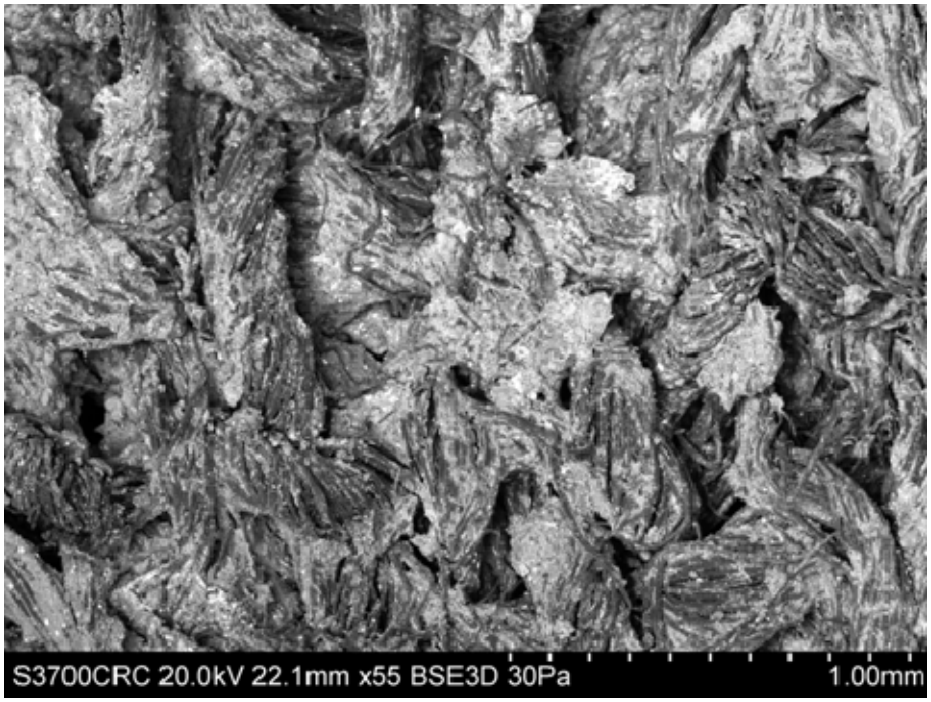

Figure 3 BSE image of the main textile fragment of K281c showing adhering soil particles and partial mineralisation of the fibres

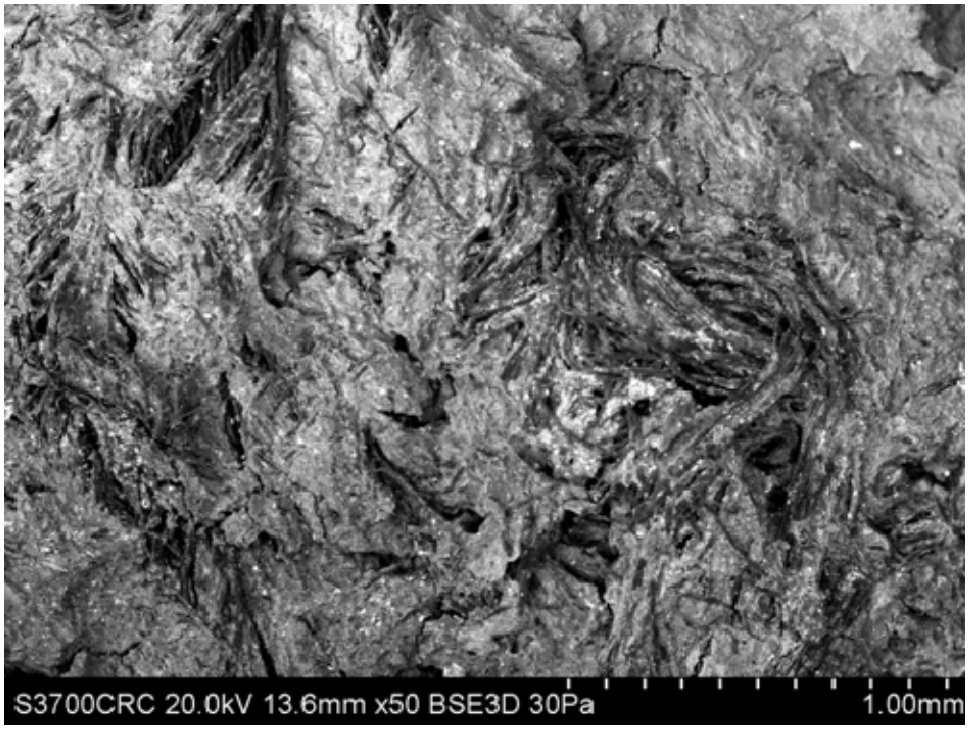

Figure 4 BSE image of a smaller fragment of K281c textile showing much adhering soil and partial mineralisation of the fibres

In some instances, the adhering soil and partial mineralisation was only present in patches, e.g. Figures 5 and 6.

Figure 5 BSE image of an edge of the main textile fragment of K281c showing patches of adhering soil and partial mineralisation of the fibres

Figure 6 BSE image of an unravelling portion of the main textile fragment of K281c showing patches of adhering soil and partial mineralisation of the fibres

In some areas in which there was little soil adhering, but mineralisation and/or degradation of the fibres was very apparent, features could be discerned on the fibres, but few could lead to secure identifications, e.g. Figures 7 and 8.

Figure 7 BSE image of an unravelling portion of the main textile fragment of K281c showing features on the fibres, but in insufficiently diagnostic condition

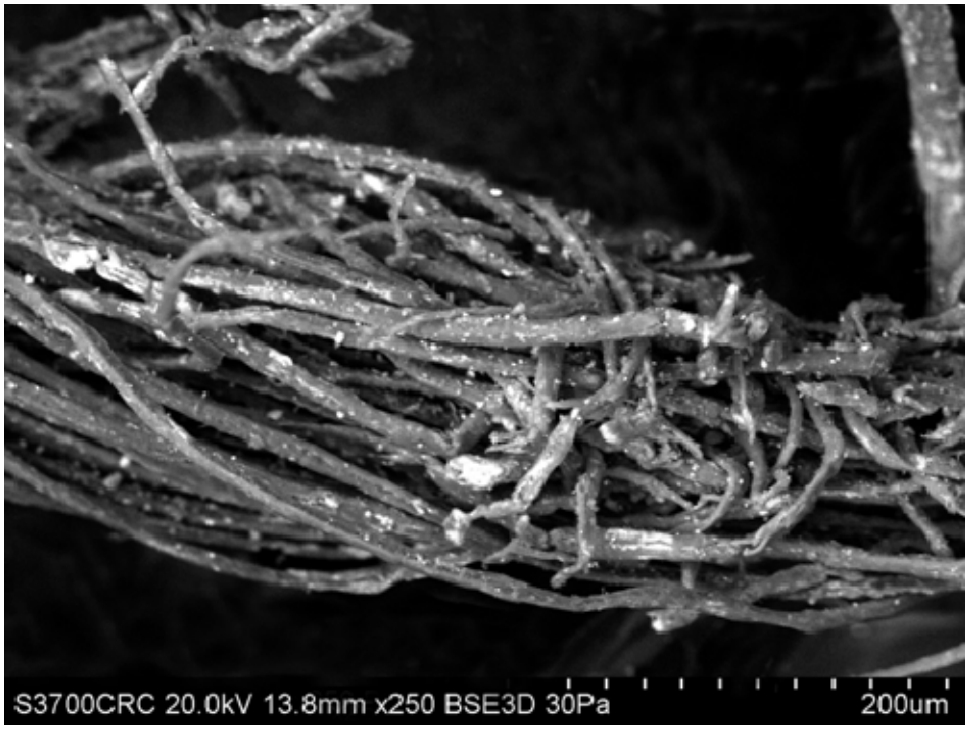

Figure 8 BSE image of an unravelling portion of a smaller fragment of K281c textile showing the brittle and fractured condition of the fibres

A few areas of the K281c textile fragments, however, showed less mineralisation, fewer adhering soil particles and other material masking the diagnostic features (Figure 9).

Figure 9 BSE image of a smaller fragment of K281c textile showing fibres towards the bottom of the image less encumbered by soil and mineralisation

From these, through characterisation of the diagnostic features present, it was possible to identify processed and unprocessed flax fibres (*Linum usitatissimum*), Figure 10, by comparison with reference collection specimens. These key characteristics included dislocations, cross-markings, swellings and longitudinal striations.

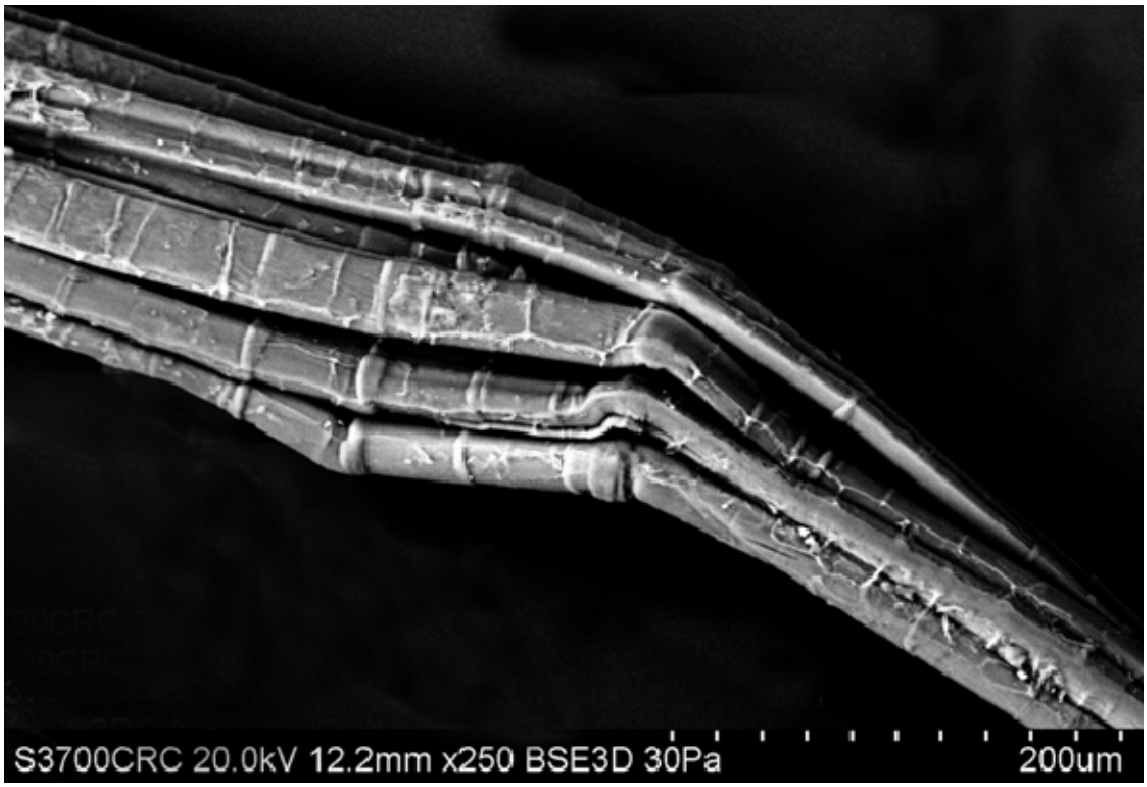

Figure 10 BSE image of a smaller fragment of K281c textile showing identifiable flax fibres with key characteristics such as dislocations, cross-markings, swellings and longitudinal striations.

For the fragment of K281c that only retained impressions of the textile in the parent soil rather than traces of the fibres (Figure 2), although superficially potentially useful in terms of the weave, in the VP-SEM it proved to be less so with regard to identifying the fibres once present. For example, the areas shown in Figures 11 and 12 were examined very closely to see whether negative traces of identifiable flax fibres survived as imprints, but no conclusive evidence could be determined.

The features shown in Figures 13 and 14 were likewise examined in detail using VP-SEM in case wool (with its diagnostic surface scale patterns) had been present, but although apparently scale-like features could be discerned, these were subsequently found to be present in other areas of the textile, not just within the negative textile impressions, and were thought to be traces or ‘casts’ of fungal hyphae.

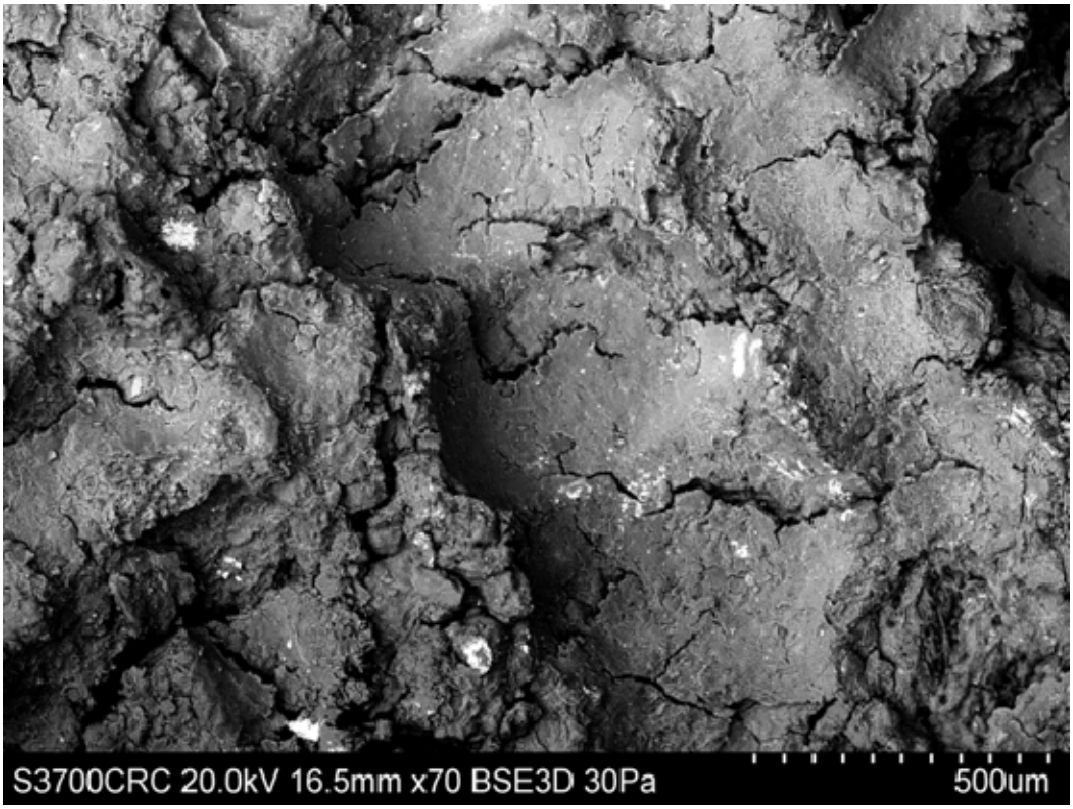

Figure 11 BSE image of the fragment of K281c showing textile impressions only, but with unidentifiable negative markings

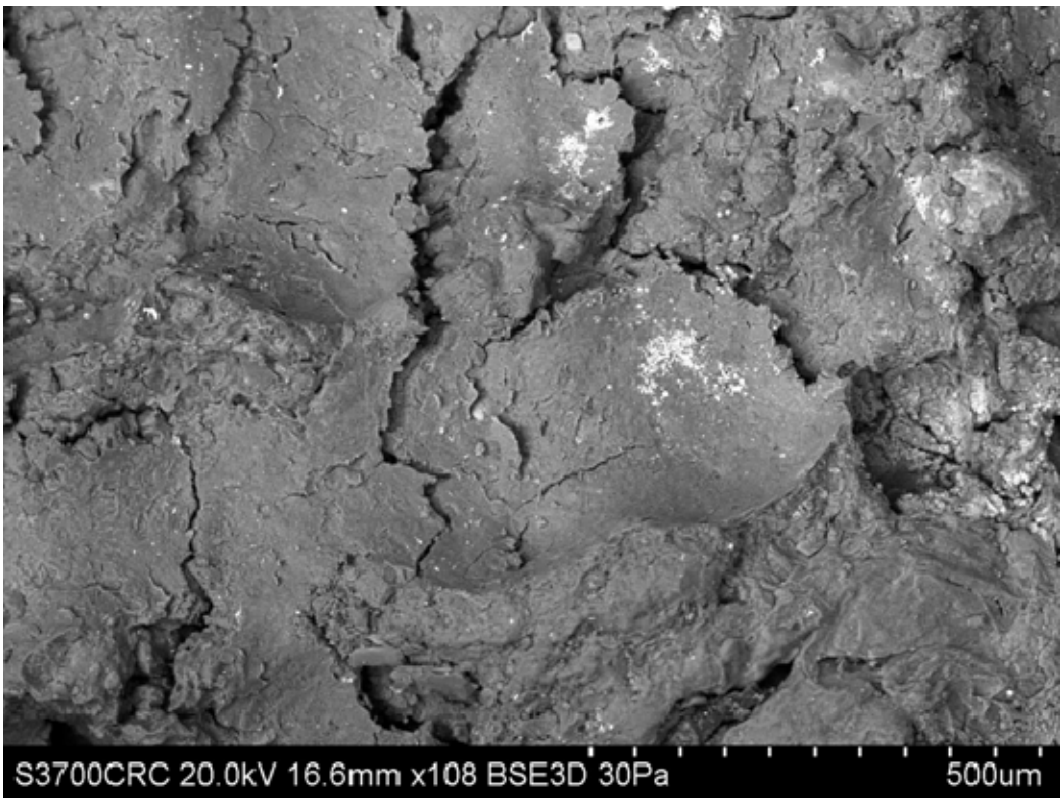

Figure 12 BSE image of the fragment of K281c showing textile impressions only, but with unidentifiable negative markings

Figure 13 BSE image of the fragment of K281c showing textile impressions only, but with negative markings most likely to represent 'casts' of fungal hyphae

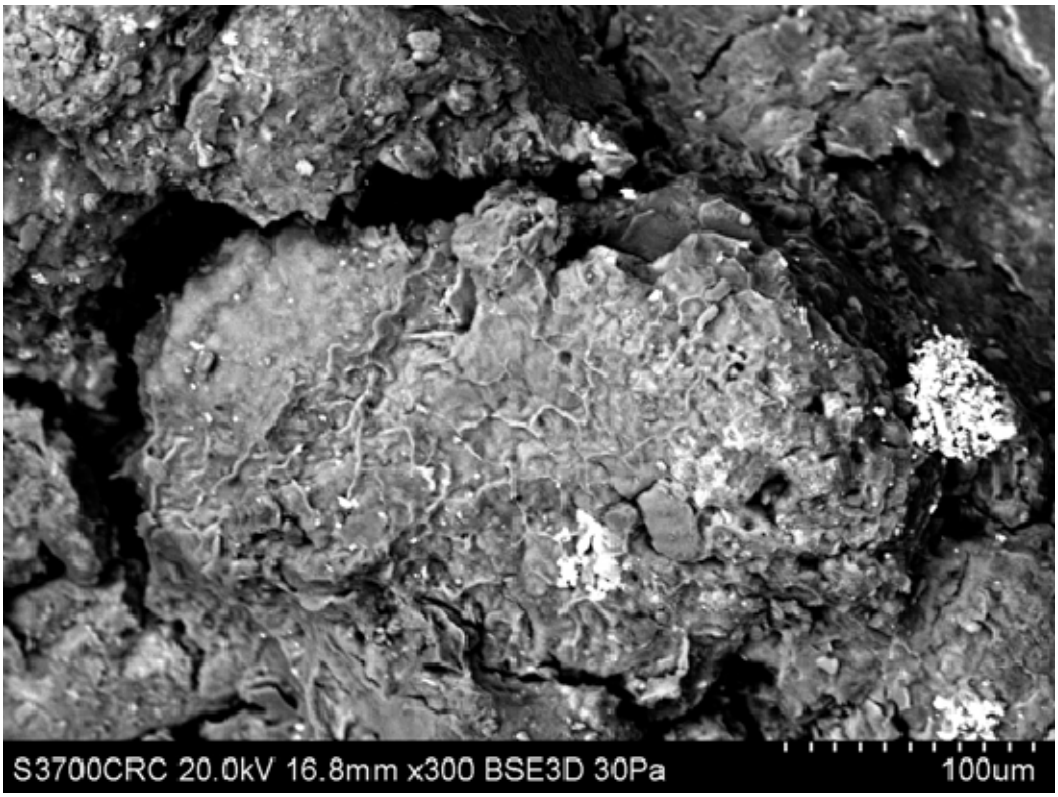

Figure 14 BSE image of the fragment of K281c showing textile impressions only, but with negative markings most likely to represent 'casts' of fungal hyphae

With regard to the weave, some areas of the K281c textile fragments were more informative than others. Figures 3 and 4, for example, are less clear than Figure 1, and Figure 15 is perhaps the most clear, (largely) showing a plain weave structure in which the weft threads pass over and under successive warp threads to form a simple, repetitive cross-cross pattern.

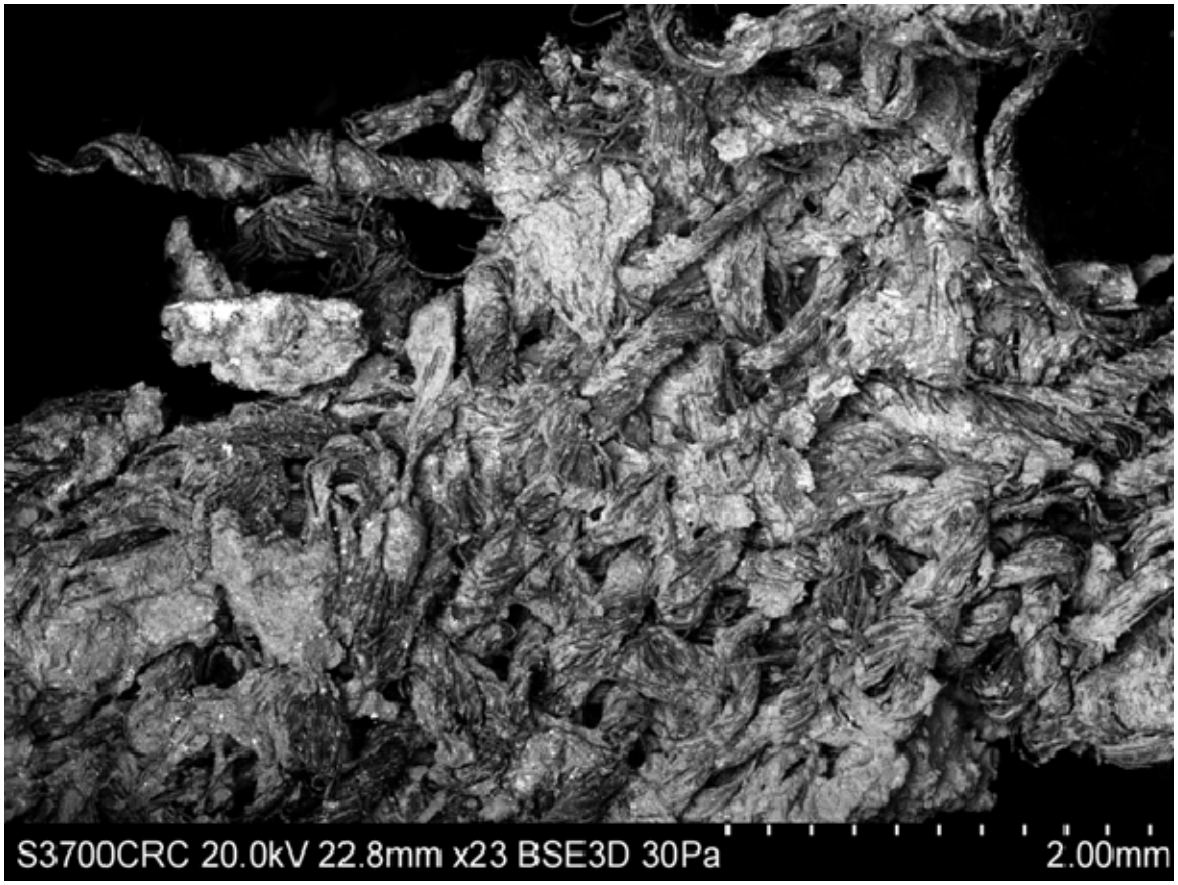

Figure 15 BSE image of main textile fragment K281c showing plain weave and Z-twist yarns

The textile is in a fragmented state, so loose and frayed edges are apparent. Whilst in several areas the twist of the yarn is wholly or partially masked (Figures 16–18), in Figure 15 examples of Z-twist yarns can be discerned. It may be that there are some plies present that are composed of two or more yarns twisted together, but these cannot be conclusively identified without cleaning of the textile. The fragments were also examined for signs of twining in which three thread elements are present, with two active being twisted around a single passive (Higgitt *et al*. 2011; 90), but again, despite tantalising hints, no conclusive examples can be determined from the textile in its current condition (i.e. without cleaning).

SEM-EDX was routinely carried out on all the textile fragments comprising K281c as interest had been expressed in the mineralisation present. EDX analysis of several areas of the textile detected iron, silver, copper and chlorine, presumably indicating the presence of metal corrosion products, as well as many elements associated with the adhering soil, including calcium, aluminium, silicon, magnesium and potassium.

Figure 16 BSE image of main textile fragment K281c where yarn twist is masked

Figure 17 BSE image of main textile fragment K281c where yarn twist is partly masked

Figure 18 BSE image of main textile fragment K281c where yarn twist is masked

Conclusions

Although many areas of the fragments comprising textile K281c from the Staffordshire Hoard were mineralised by metal corrosion products and were largely covered by adhering soil particles, some fibres survived with sufficient diagnostic features that enabled them to be identified through VP-SEM examination as processed and unprocessed flax (*Linum usitatissimum*). A plain weave structure with Z-twist yarns could be seen. SEM-EDX on several areas of the textile confirmed the presence of iron, silver, copper and chlorine – indicating metal corrosion products – as well as many elements associated with soil, including calcium, aluminium, silicon, magnesium and potassium. VP-SEM examination of negative impressions of textiles on a fragment of associated soil revealed no identifiable evidence of the original fibres present.

Questions were posed at the outset whether it was likely that the textile fragment was, or possibly could belong to the Hoard, or if it is a later intrusion into the soil inside the hilt collar. Without direct radiocarbon dating of the textile itself, its age and direct contemporaneity with the silver gilt collar cannot be determined with complete certainty on the basis of the condition of the fibres alone, but it is possible to say that the use of flax in a plain weave textile is not out of place for the 7th or 8th century. The textile's condition is likely to be consistent with burial since the 7th century, but preservation of textile fibres is a complex issue and is largely dependent on the burial conditions of the soil (rather than being directly indicative of chronological age).

Acknowledgements

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Caroline Cartwright Catherine Higgitt
4 November 2013

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Staffordshire Hoard Research Reports

Staffordshire Hoard Research Reports were produced by the project

Contextualising Metal-Detected Discoveries: Staffordshire Anglo-Saxon Hoard

Historic England Project 5892

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