


Object Number	K273-cons9	Description	Strip-mount in gold with garnet cloisonné decoration. Catalogue no. 550.
		Sample Description and location.	
		K273-1 collected from dark brown material within empty cell shown in Figures 1-3.	



Figure 1. Sample collection area for K273-1.



Figure 2. Detail of sample collection area for K273-1.

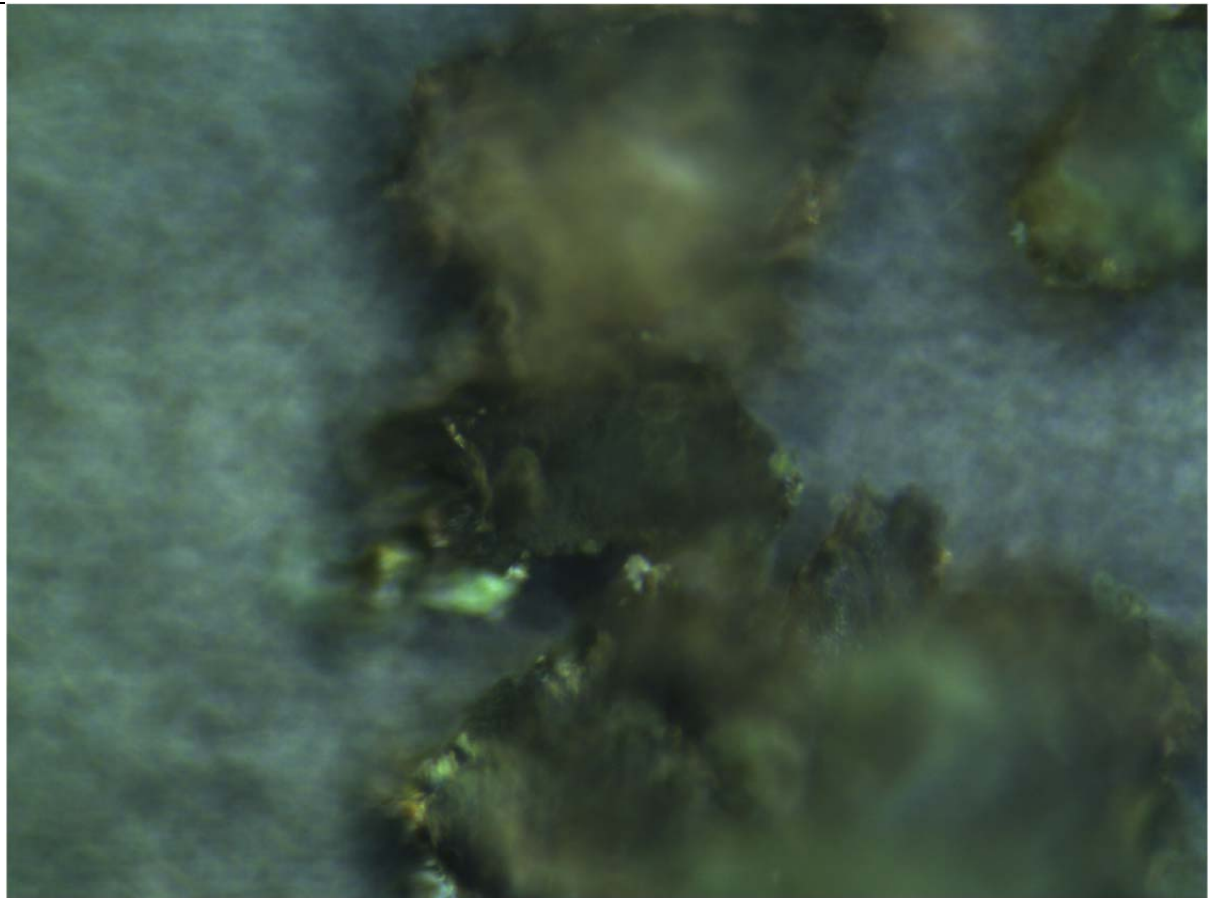


Figure 3. Detail of sub-sample K273-1-3.1

## FTIR Analysis

Comments: Sample K273-1-3.1 (top, green) appears to be a mixture of beeswax and a proteinaceous material- possibly an animal glue derived from keratinous material such as horn or hooves. The FTIR spectrum for beeswax is characterized by dominant absorption bands around  $2950\text{cm}^{-1}$  and  $2850\text{cm}^{-1}$  that relate to C-H stretching of the methylene ( $\text{CH}_2$ ) groups, a band at  $1740\text{cm}^{-1}$  that relates to C=O bonding characteristic of the ester groups, a band around  $1460\text{cm}^{-1}$  relates to C-H bending, and a doublet between  $720$  and  $730\text{cm}^{-1}$  relating to non planar skeletal deformation vibrations of long chain hydrocarbons (Derrick *et al* 1999, Birshtein and Tul'chinskii 1977). The bands in the region  $1350 - 1180 \text{cm}^{-1}$  may be assigned to a phenomenon known as a 'band progression' present in fatty acids and fatty acid esters which result in a series of evenly spaced bands in this region. These are due to wagging and twisting vibrations of successive carboxyl coupled methylene groups (Baeten *et al.* 2010).

The FTIR spectra for keratinous materials exhibit characteristic bands for amide I (C=O stretching) between  $1700$  and  $1600 \text{cm}^{-1}$ , and amide II (CN stretching and NH bending) between  $1560$  and  $1500 \text{cm}^{-1}$ , and a broad band centred at around  $3300\text{cm}^{-1}$  related to N-H stretching. A doublet between  $3000$  and  $2800\text{cm}^{-1}$  relating to C-H stretching of methylene groups are characteristic of keratinous proteinaceous materials. (Welsch *et al.* 2012, Kennedy *et al.* 2013, Mansilla *et al.* 2011, Derrick *et al.* 1999). In oxidised keratinous materials such as the oxidised horse hair spectrum shown in Fig.4 an intense peak at about  $1030\text{cm}^{-1}$  is attributable to S=O bonding in cysteic acid. (Welsch *et al.* 2012, Kennedy *et al.* 2013, Mansilla *et al.* 2011). This peak should be interpreted with some caution in this sample however as silicate based material such as is found in earth minerals also exhibit a sharp band at approximately  $1000\text{cm}^{-1}$  which relates to Si-O bonding. The peak at  $1030\text{cm}^{-1}$  may derive from cysteic acid in oxidised keratinous tissue, silicate based earth minerals deliberately added to the paste or from the burial environment, or a combination of both.

Representative Spectrum

