


Object Number	K1087	Description	Pommel in cast silver, of cocked-hat form with double sword-rings, with cast interlace and niello inlay, and mounts with cloisonné and filigree decoration. Catalogue no. 76.
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	Sample Description and location.
	Conservation sample 'bone in soil?' Labelled K1087-1 for FTIR analysis. White coloured specks within soil sample.

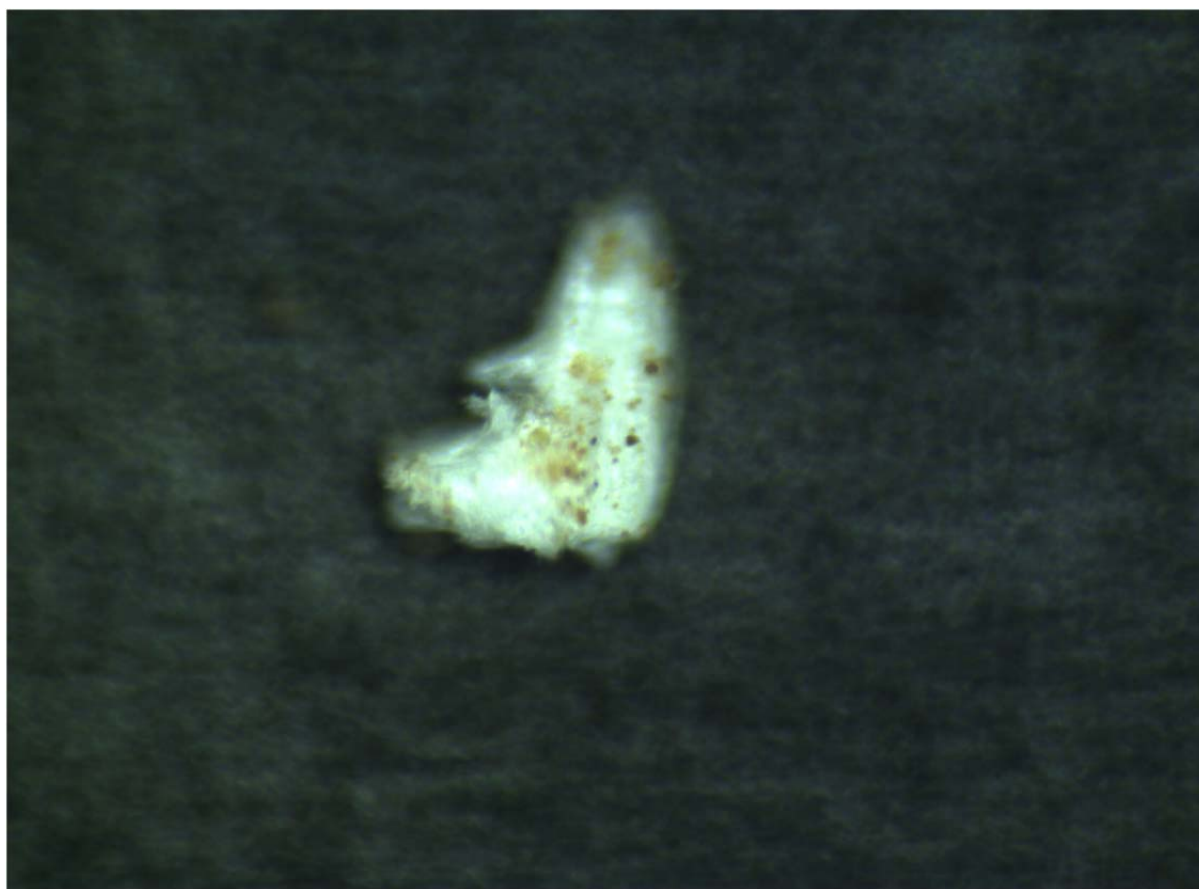


Figure 1. Sub-sample K1087-1-1 showing FTIR analysis location.

## FTIR Analysis

Comments: Spectrum K1087-1-1 (top, blue) is a reasonably close spectral match for Papyrus (bottom, red) shown here as a generic example of cellulosic carbohydrate. FTIR spectra of different cellulosic plant materials are superficially similar and cannot be readily distinguished by eye (Garside & Wyeth 2003). In addition, degradation of one or more components of the plant material e.g. through oxidation of the cellulose molecule, will influence the position and intensity of spectral peaks relative to non-deteriorated reference spectra (Stuart 2007, Ciolacu *et al.* 2011).

There are, however, a number of fairly consistent spectral peaks indicative of cellulosic carbohydrate within a sample. The majority of cellulosic carbohydrates will exhibit a broad band from 3600–3100 $\text{cm}^{-1}$  arising from O-H stretching in bound or absorbed water (Tipson 1968, Stuart 2007, Naumann *et al.* 2007, Bodirlau & Teaca 2009). A broad band relating to C-H stretching from aromatic hydrocarbons at 3100-3300  $\text{cm}^{-1}$  can be obscured or partially obscured by the broad O-H stretching band described previously (Tipson 1967). Additional peaks relating to the cellulose component of plant material include peaks for C-H stretching of methylene groups between 3000 and 2800 $\text{cm}^{-1}$ , C-H deformation in cellulose and hemicellulose at 1371 $\text{cm}^{-1}$ , C-H vibrations at 1319  $\text{cm}^{-1}$ , an intense peak at about 1030 $\text{cm}^{-1}$  relating to C-O bonding (this is typically a combined peak for cellulose and hemi-cellulose), and a shoulder at 897 $\text{cm}^{-1}$  relating to C-H bending. Additional shoulders at 1155 $\text{cm}^{-1}$  and 1105 $\text{cm}^{-1}$  on the C-O band at about 1030 $\text{cm}^{-1}$  relate to stretching and contraction (so called 'breathing') vibrations within the benzene rings, and glycosidic linkages between carbohydrate molecules respectively (Tipson 1968, Naumann *et al.* 2007, Bodirlau & Teaca 2009). This material may be cellulosic material associated with the burial soil.

Representative Spectrum

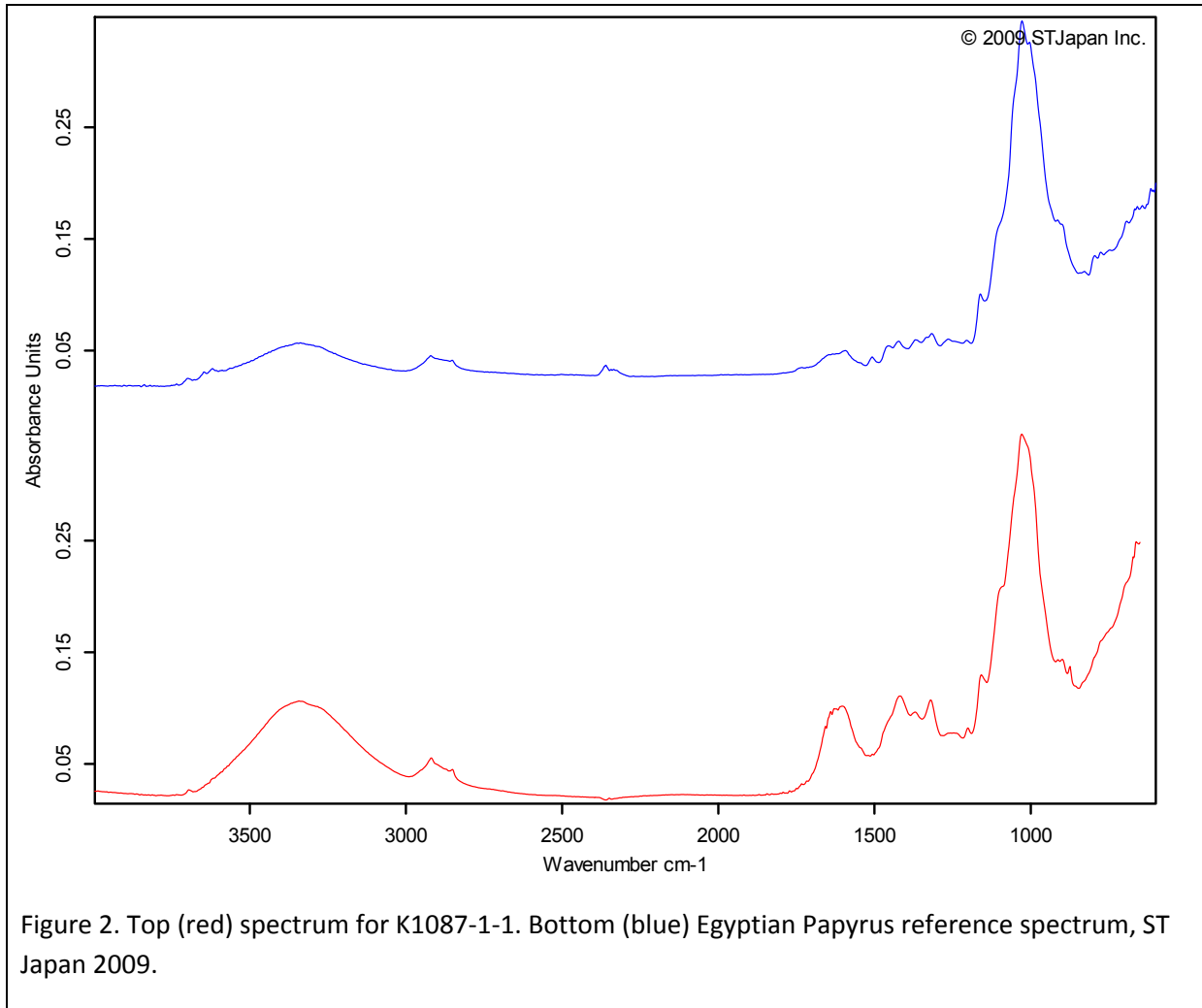


Figure 2. Top (red) spectrum for K1087-1-1. Bottom (blue) Egyptian Papyrus reference spectrum, ST Japan 2009.