


| Object Number   | K710 | Description   | Pommel in gold, of cocked-hat form, with filigree decoration. Catalogue no. 19. |
|---|------|---|---|
|  |      | Sample Description and location.  |   |
|   |      | Small sample removed from soil like material on inside of pommel lining. Conservation report indicates area may have been consolidated. |   |



Figure 1. Sample K710-1 collected from soil like material inside pommel cap (circled).

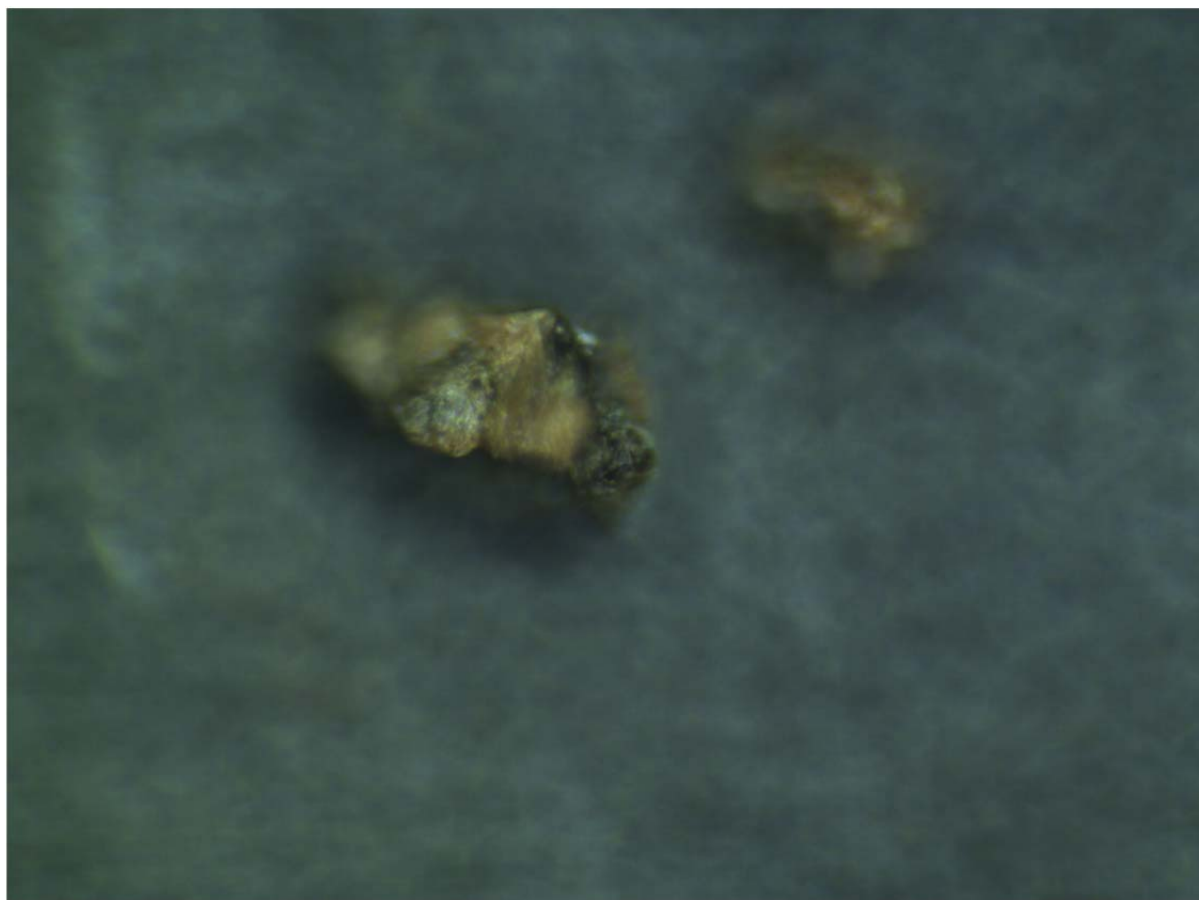


Figure 2. Detail of sub-sample K710-1-2 showing FTIR analysis location.

## FTIR Analysis

Comments: Spectrum K710-1-2 (top, red) is a rough spectral match for that of the reference sample for Egyptian Papyrus (bottom, blue), shown here as a generic comparison for 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).

Trace peaks that are not related to cellulosic material likely relate to those of Paraloid B72 consolidant e.g. the sharp peak around 1725  $\text{cm}^{-1}$  relating to C=O stretching.

## Representative Spectrum

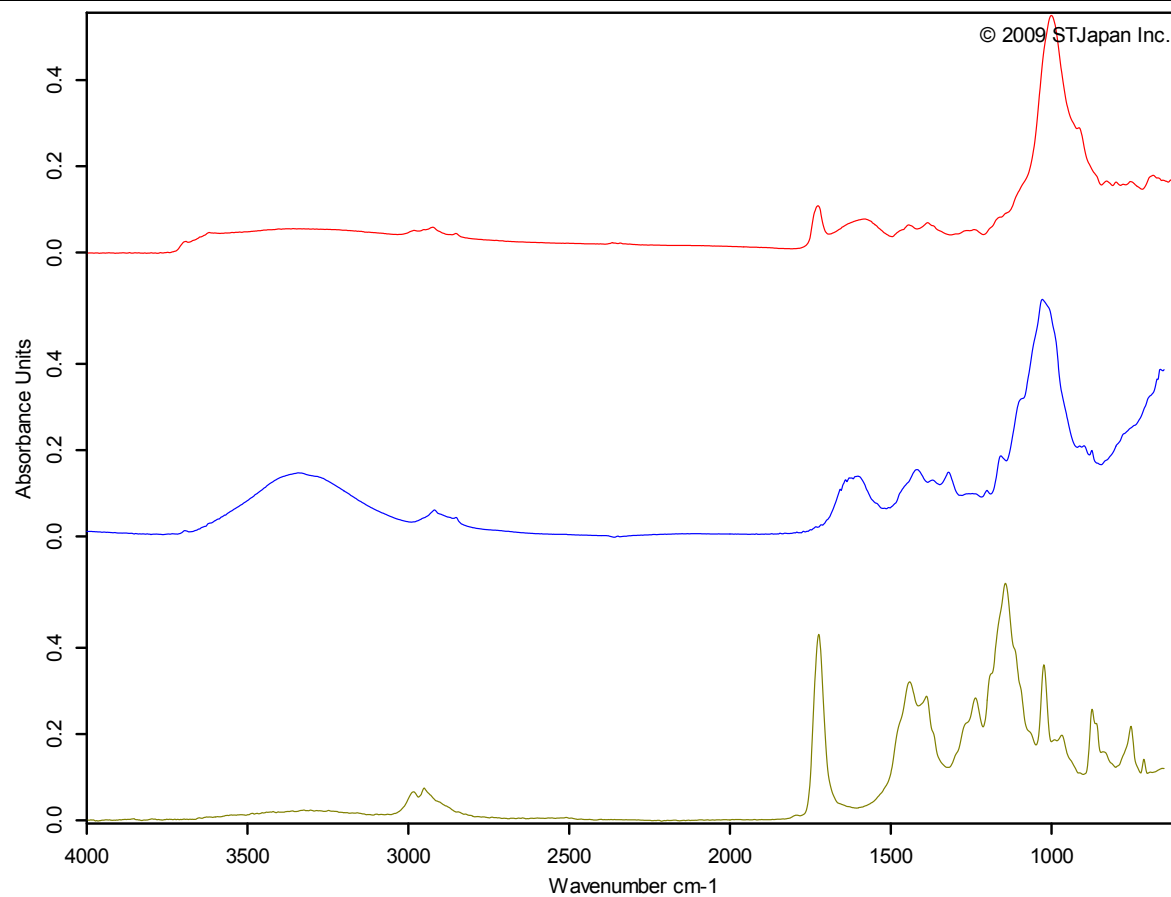


Figure 3. Top (red) spectrum for K710-1-2. Middle (blue) Papyrus, Egypt reference sample, ST Japan 2009. Bottom (green) Paraloid B72 reference spectrum, ST Japan 2009.