Object Number	K283-2	Description	Pair of hilt-plates in gold of oval form with garnet bosses. Catalogue no. 243.

Sample Description and location.

K283-2 separated from main body of material between hilt plates during handling.

Figure 1. Sample K283-2 separated from main body of horn material during handling..

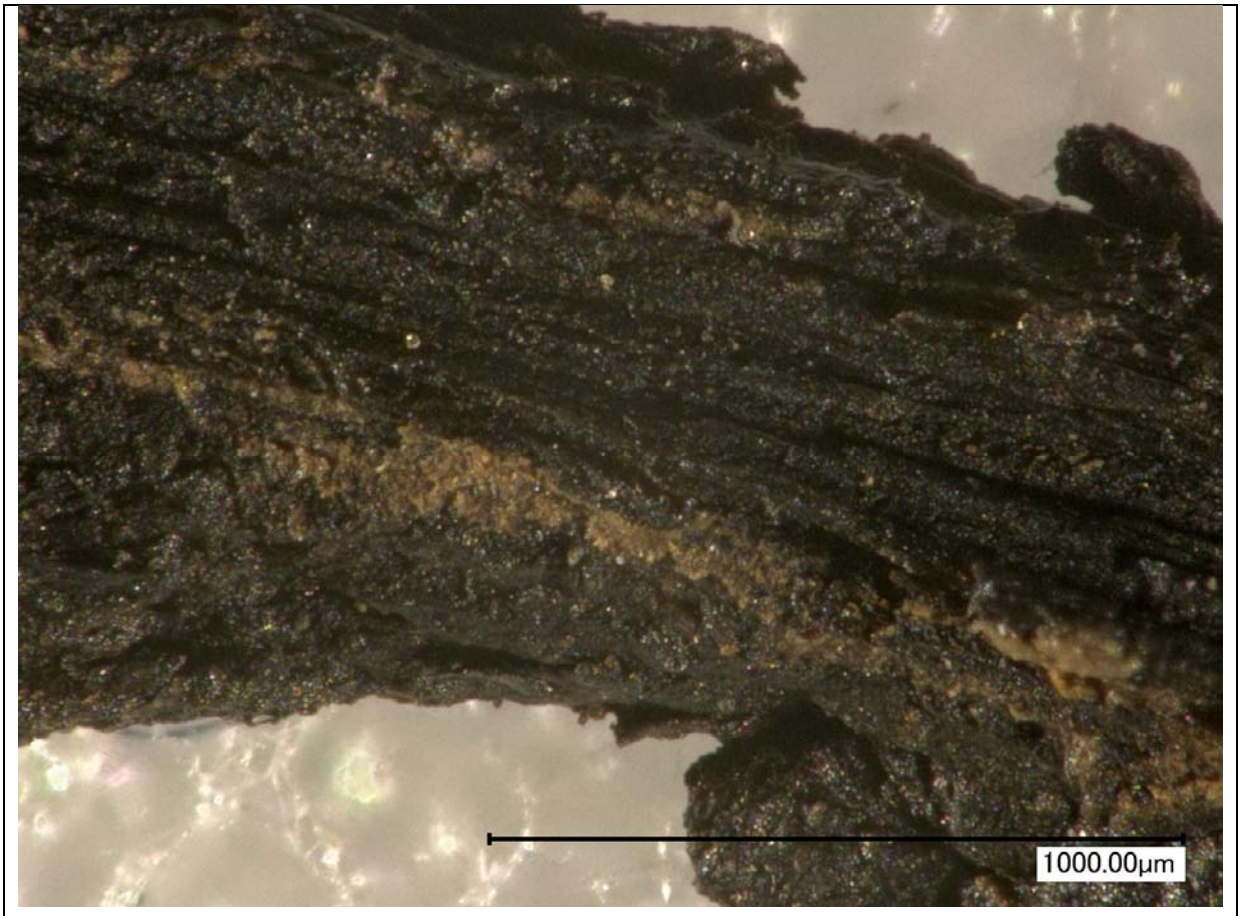

Figure 2. Detail of K283-2 showing lamellar microstructure consistent with horn material.

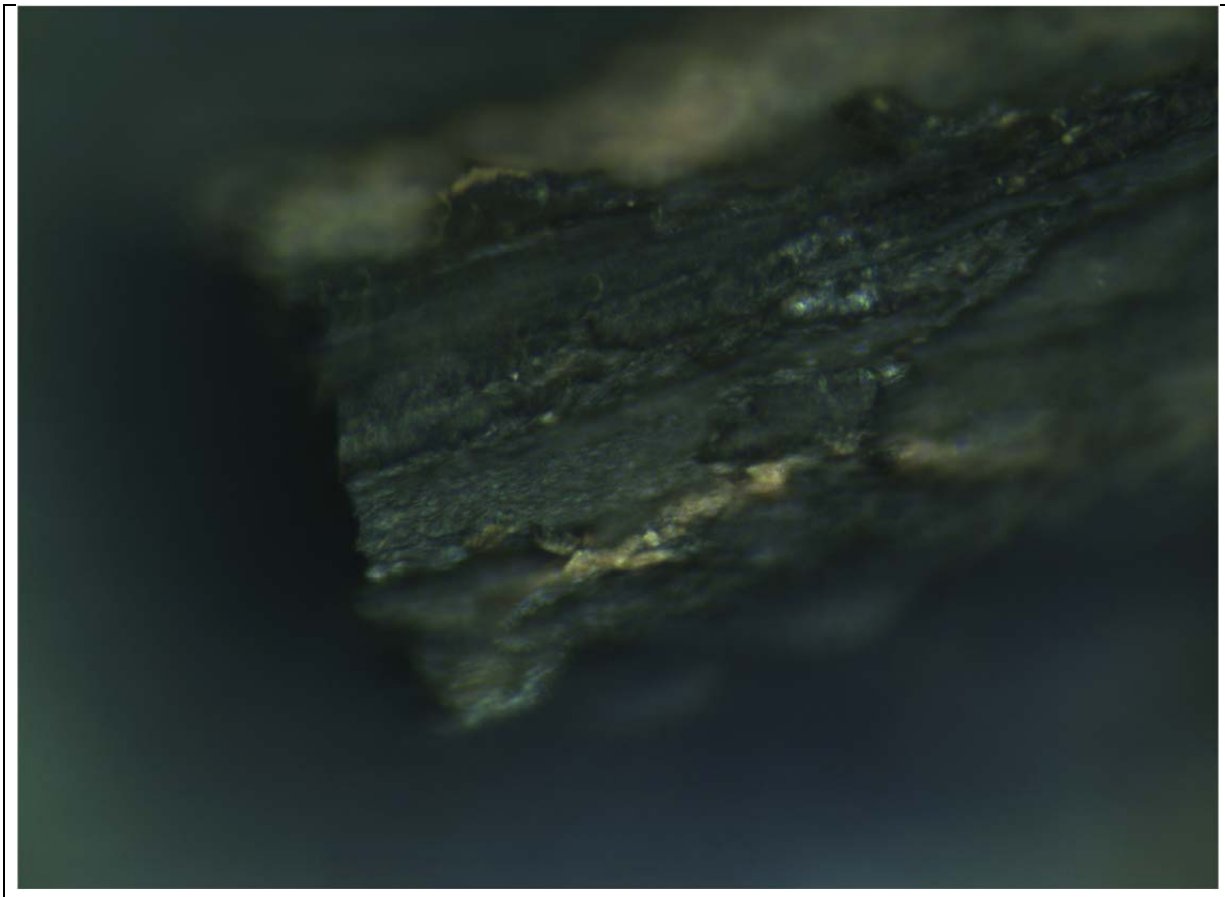

Figure 3. Detail of K283-2-3 sub-sample showing FTIR analysis location.

FTIR Analysis

Comments: Sample K283-2-3 (top, brown) is a clear spectral match for reference sample for bleached horse hair (bottom, blue). Hair and horn are both keratinous hard tissues where the hardness of the tissue is due in part to bonding with cysteine molecules with a central di-sulphide bond. Oxidation or bio-deterioration of the S-S bond structurally decomposes the material producing cysteic acid as a by-product. The FTIR spectrum for horn exhibits peaks for amide I (C=O stretching) between 1700 and 1600 cm^{-1}, and amide II (CN stretching and NH bending) between 1560 and 1500 cm−1, a sharp, broad band centred at around 3300cm^{-1} related to N-H stretching. A doublet between 3000 and 2800cm^{-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). The spectrum for 283-2-3 shows all of the peaks typically associated with proteinaceous material with an additional intense peak at 1040cm-1 which likely relates to cysteic acid from degradation of di-sulphide bonds in cysteine. This could relate to natural degradation of keratinous material or could relate to processing for production of animal glue. Sample looks like degraded horn, but SEM recommended to confirm micro structure of sample.

Representative Spectrum

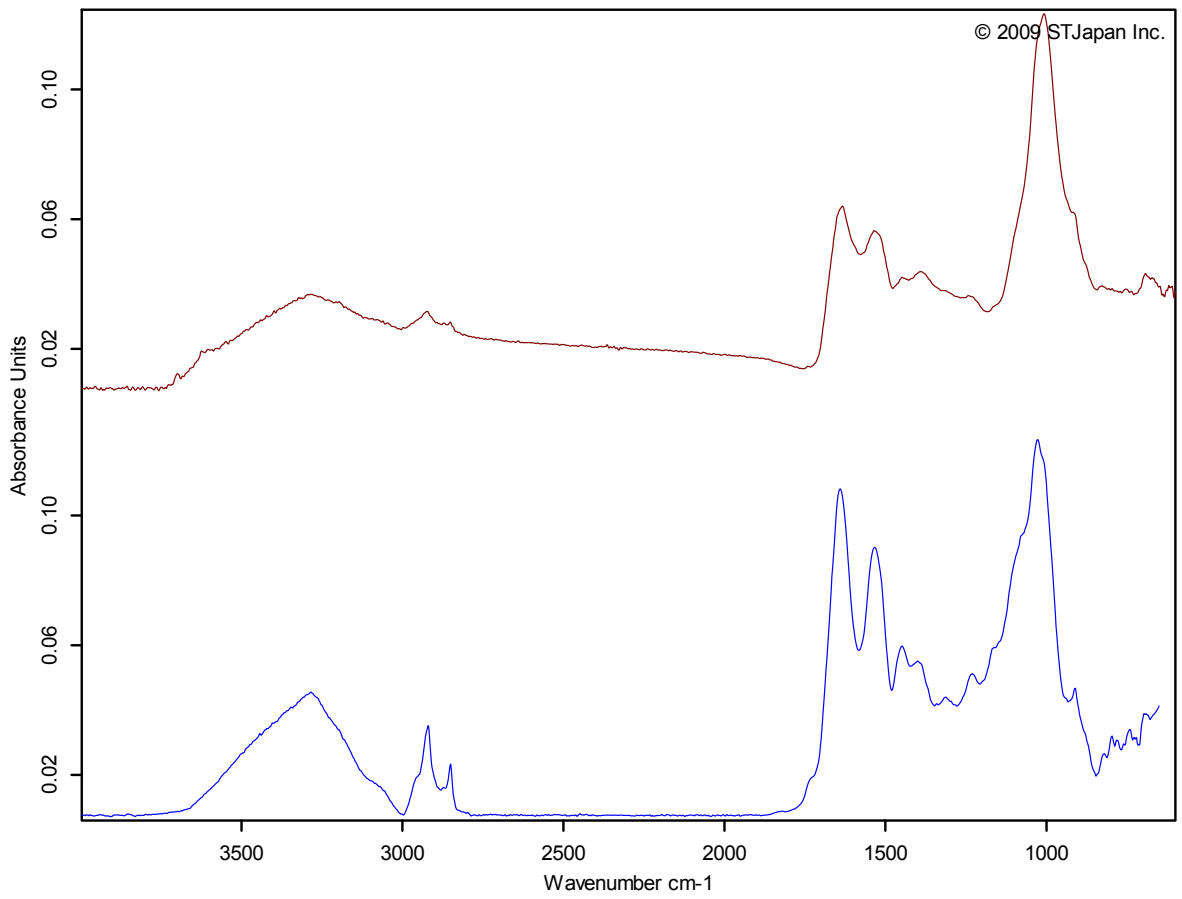

Figure 4: Top (brown) K283-2-3. Bottom (blue) Oxidised horse hair reference spectrum, ST Japan 2009.