

Reconnecting through glue: Bridging Past Practice, Present Analysis, and Future Conservation of the Lingnan School paintings

Identifying the historical adhesive of the Lingnan School to validate oral histories and develop future conservation

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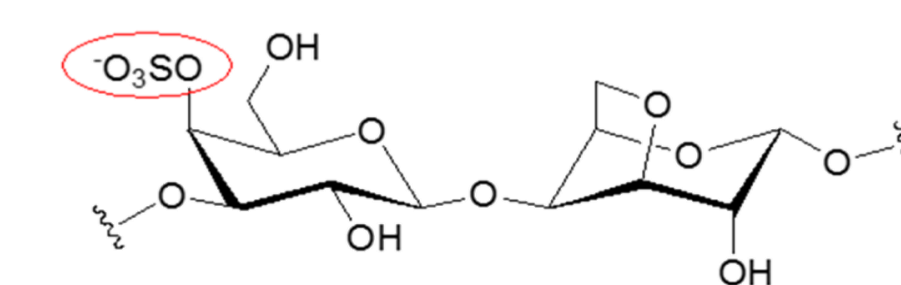
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Introduction

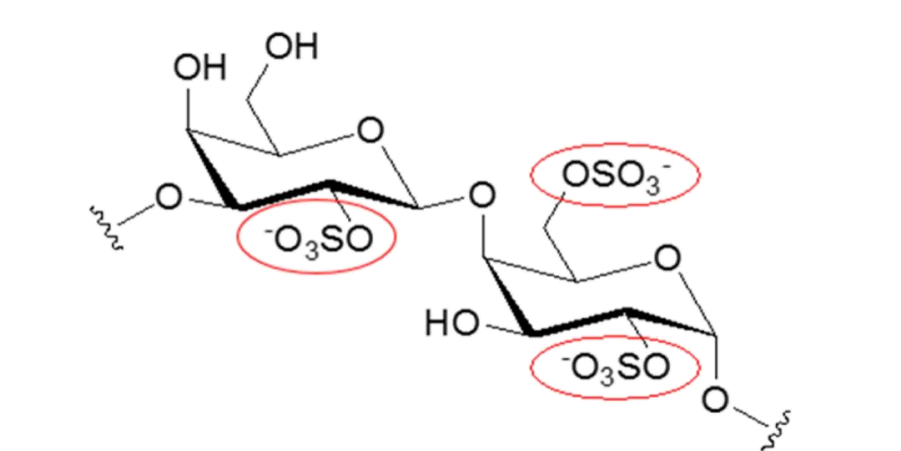
The Lingnan paintings in the Museum of Art collection represent a distinctive artistic tradition that developed in Southern China, marked by unique aesthetics and specialized mounting techniques. This study shows that Lingnan mounting practices evolved in response to the region's humid climate, using seaweed glue, which oral histories describe as soft, pliable, and resistant to mould, in place of traditional wheat starch paste. Paper borders were also preferred over conventional silk mounts. Despite their cultural significance, these materials and techniques remain poorly documented. By examining historical evidence and material practices, this study reconstructs the artists' original intentions and restores overlooked knowledge essential to the future preservation of Lingnan cultural heritage.



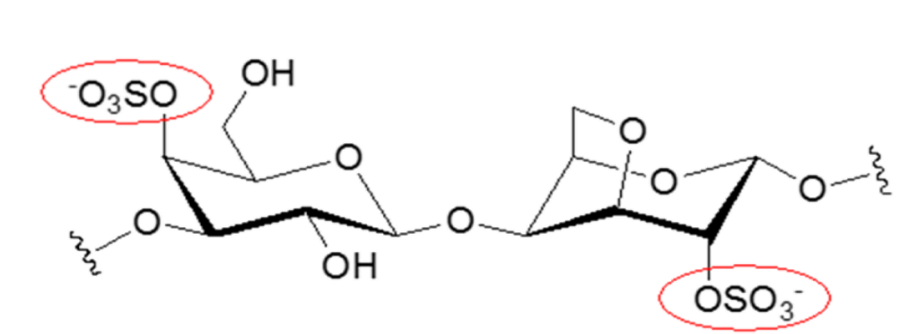
Seaweed



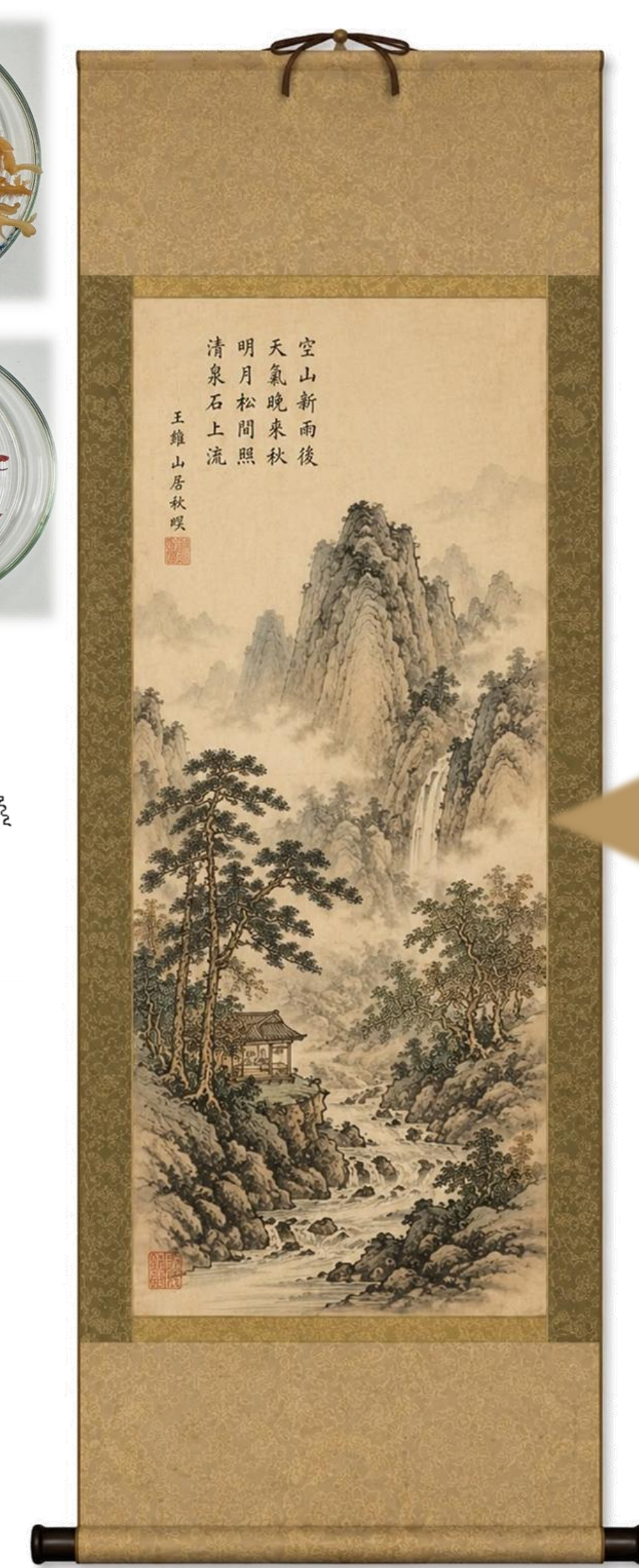
κ-carrageenan



λ-carrageenan



ι-carrageenan



包邊 Wrapping paper

鑲料 Paper border

紙背 Backing paper

Objective

- ❖ Scientifically identify the primary adhesive used in historical Lingnan School mountings.
- ❖ Challenge long-standing misconceptions that Chinese mounting is a monolithic tradition.
- ❖ Validate marginalized oral histories from local practitioners.
- ❖ Provide a crucial material benchmark to develop specialized conservation strategies in the future.



Methodology

Sample Collection:

1. Extracted glue from historical Lingnan paintings (dating 1870s–1970s) from the Hong Kong Museum of Art collection.
2. Prepared modern reference samples of red seaweed glue in collaboration with contemporary practitioners based on oral histories.
3. Compared against commercial carrageenan standards (iota, kappa, lambda).

Analytical Techniques:

4. **Extraction:** Small paper mount samples were heated in deionized water at 80°C. The extract was filtered and dried to form a film layer for analysis.
5. **Identification:** Employed complementary analytical techniques:
 - **Fourier Transform Infrared (FTIR) Spectroscopy** – to identify molecular compositions based on characteristic absorption bands (e.g., sulfate ester S=O stretch at ~1240–1260 cm⁻¹).
 - **Raman Spectroscopy** – to identify molecular compositions based on characteristic scattering bands (e.g., C-O-S bending at ~800–850 cm⁻¹ and sugar ring vibrations at ~900–1200 cm⁻¹).
 - **Scanning Electron Microscopy with Energy Dispersive X-ray Spectroscopy (SEM/EDX)** – to determine elemental compositions and examine morphological features.

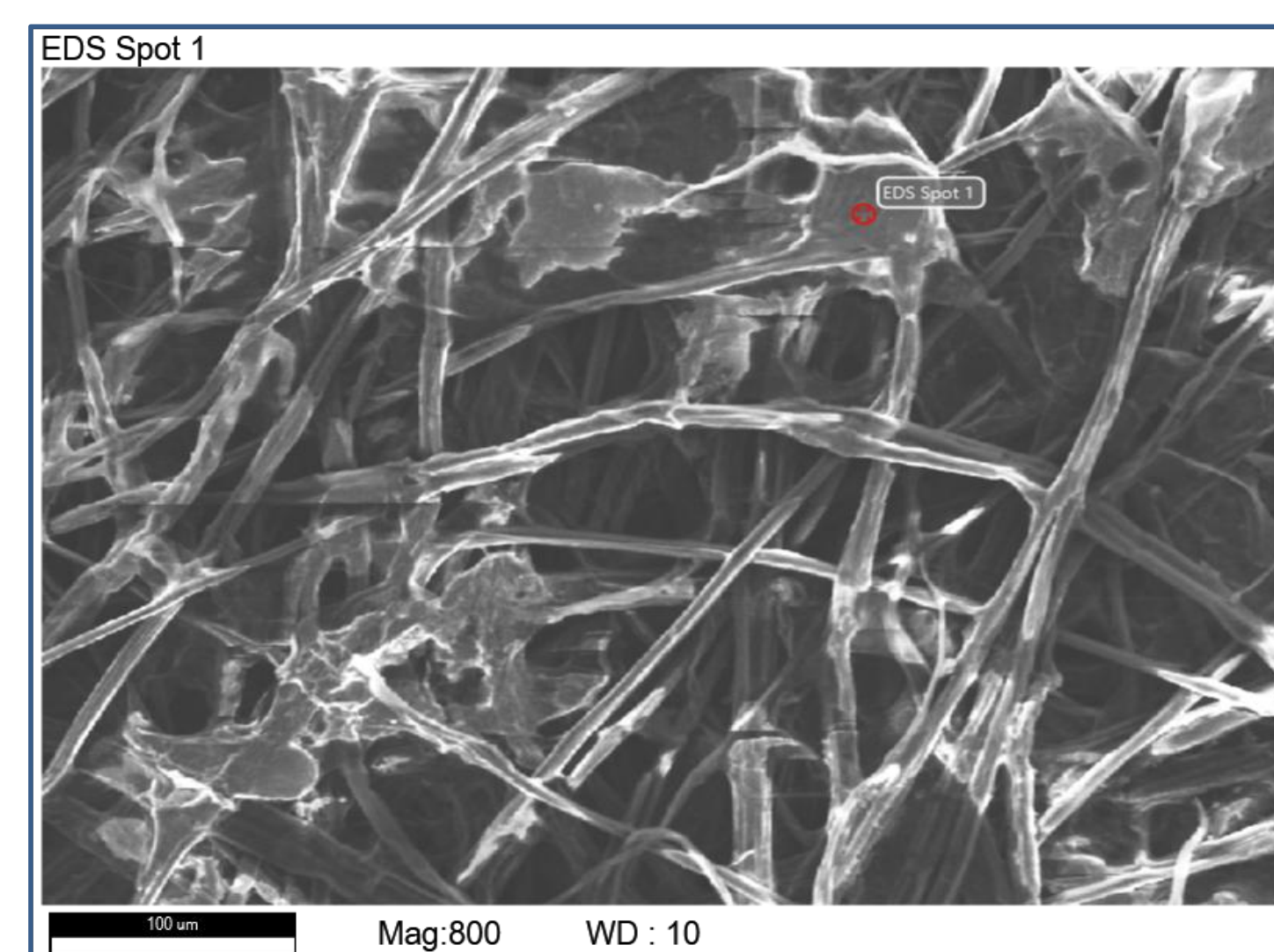


Figure 1a. SEM/EDX elemental analysis of historical Lingnan mounting glue, revealing sulfur (S), potassium (K) and calcium (Ca), consistent with carrageenan.

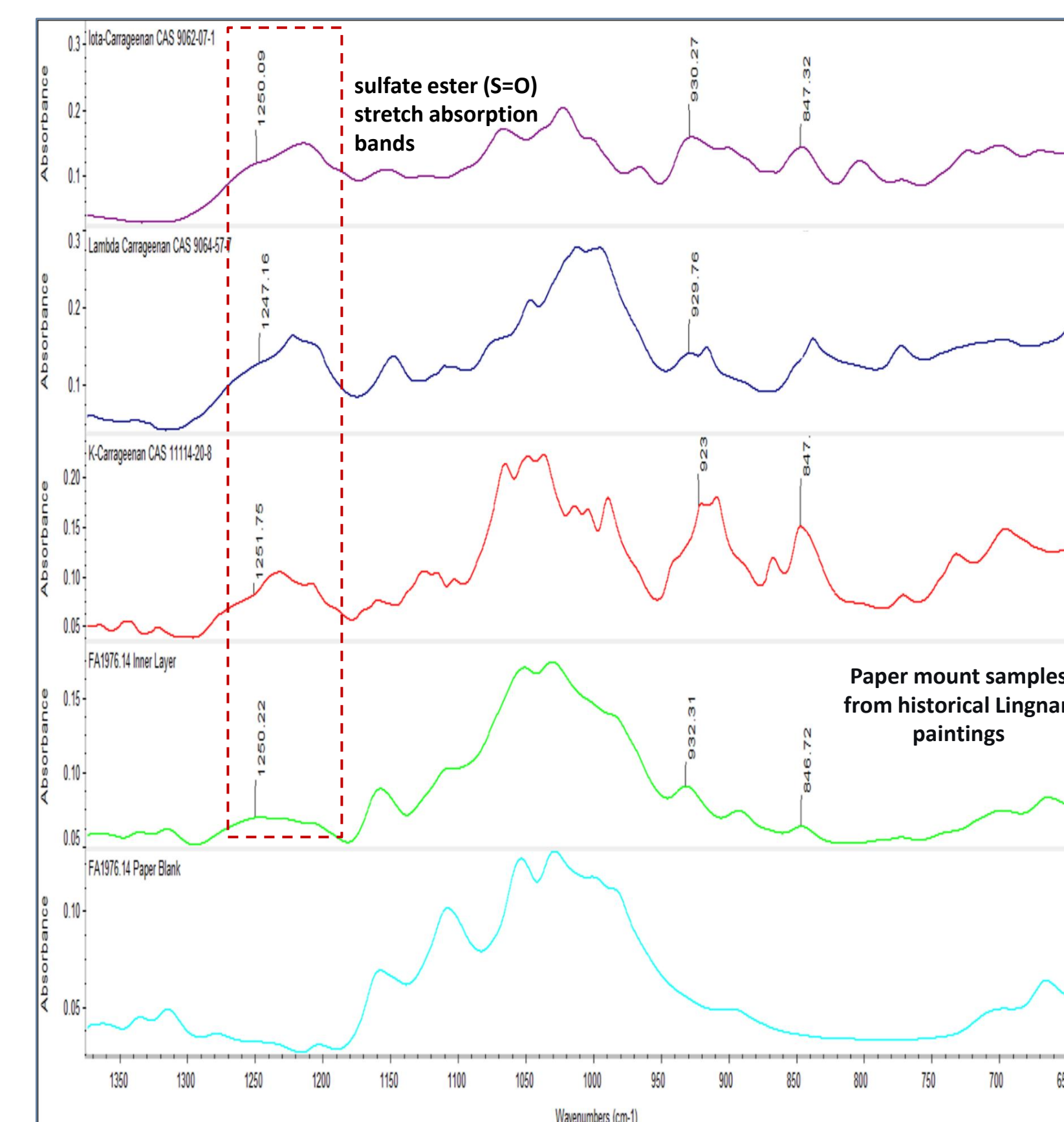


Figure 1b. FTIR spectra of historical Lingnan mounting glue compared with commercial carrageenan references (iota, kappa, lambda), showing characteristic sulfate ester (S=O) stretch at ~1240–1260 cm⁻¹.

Results

The analysis conclusively identified **carrageenan** as the primary adhesive in the Lingnan mountings.

Key FTIR Spectroscopic Signatures:

- ❖ Distinctive sulfate ester (S=O) stretch absorption bands at ~1240–1260 cm⁻¹.
- ❖ Sugar ring vibrations observed in the ~900–1200 cm⁻¹ region.

Raman Spectroscopy:

- ❖ the C–O–S bending modes (~800–850 cm⁻¹) in Raman spectra.

Key SEM/EDX Findings:

- ❖ Elemental analysis revealed the presence of **sulfur (S)**, **potassium (K)** and **calcium (Ca)**, consistent with the chemical composition of carrageenan (a sulfated galactan). While elemental data are consistent with carrageenan, definitive identification relied on molecular fingerprints from FTIR and Raman spectroscopy.
- ❖ Morphological examination showed characteristic film structures distinct from wheat starch paste.

Comparison to References: These signatures matched mixed forms of carrageenan (iota, kappa, lambda) and the collaboratively prepared seaweed samples, definitively distinguishing them from traditional wheat starch paste.

Analysis

These findings prove that the Lingnan method was **not a provincial shortcut** but a distinct, innovative practice of its time. This scientific evidence achieves three critical things:

1. **Validates Oral History:** Confirms the accounts of local practitioners that red seaweed was the primary material, elevating this marginalized knowledge.
2. **Challenges Traditions:** Breaks the misconception of a monolithic Chinese mounting tradition, highlighting regional diversity.
3. **Identifies New insights:** The hygroscopic and pliable nature of carrageenan-based mountings presents unique preservation considerations that are distinct from traditional wheat starch paste. This explains why previous, generic remounting interventions have been inappropriate.

Future Investigations

This research has successfully re-forged the link between past practice and present analysis by scientifically identifying carrageenan in Lingnan School mountings using FTIR, Raman Spectroscopy and SEM/EDX.

Looking Forward: This recovered knowledge is not merely academic; it identifies the conservation needs in the future. The next phase of our research (Part II) will examine the unique mould resistant properties of these seaweeds by subjecting them to mold incubation, and investigate why seaweed-based glue was chosen over wheat start paste during the early 20th century. We aim to develop tailored conservation strategies to safeguard this integral aspect of Lingnan artistic heritage for future generations.

Key References:

- Pereira, L. et al. (2009). Identification of selected seaweed polysaccharides by vibrational spectroscopy. *Food Hydrocolloids*, 23, 1903-1909.
- Swider, J.R. and Smith, M. (2005). Funori: Overview of a 300-Year-Old Consolidant. *JAIC*, 44(2), 117-126.

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