# Restoration of a 1930s lease document --- Combination of a Chinese traditional mounting technique with a western splitting method

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## I) Introduction

Lui Seng Chun is a 4-storey Chinese tenement (Photo.1) built in 1931 and has been accorded as a Grade I historical building of Hong Kong in 2003. The building as well as its lease document is both of great significance meriting long-term preservation.

The lease is an 8-page bound document printed and written on both sides of machine made paper laid with watermark "Conqueror, London" and includes by means of lace binding a premise plot drawn on a thin linen fabric. Due to the prolonged folding of the document, major tears and heavy creases have developed along the fold lines and on the edges causing damage to the document and hence impairing its physical strength. For legibility and support consideration, face mending tissues were not used, but the method of paper-splitting was adopted to reinforce the already brittle document as well as to repair the tears and creases without obscuring any information on the lease. [1,2]

## II) Traditional Paper-splitting method

As what the name suggests, paper splitting (photo.2) means splitting a paper into two whole sheets through its fabric. It has been one of the reinforcement techniques used for repairing paper damage on a brittle document since the 19th century[3]. In order that the paper can be effectively and safely split, the paper substrate would need to be faced with another long-fiber tissue paper first. Traditionally, restorers like to use concentrated gelatin (about 40% (w/v)) as a facing adhesive, and then protease to remove the facing tissue.[4]

Although the method has been practiced for centuries, several technical problems remain to be resolved. First, the protease residues left behind is very difficult to get rid of totally after its application. They may be embedded in the paper fiber and give rise to further chemical reactions. Second, the Japanese Kozo generally used as a facing tissue will be too strong in comparison with the fiber of the document and

therefore its subsequent removal by mechanical means can be detrimental.

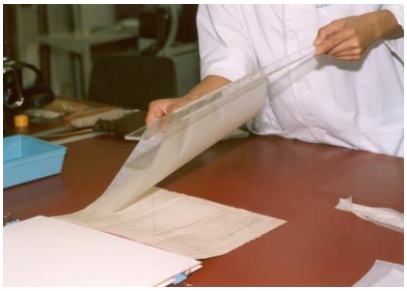
**III) Gelatin or Starch paste?**

Having been used for about two thousand years in Orient for mounting scroll paintings, starch paste (photo.3) has proved to have excellence compatibility with the oriental bast fiber papers like Japanese mulberry and Chinese Xuan paper. Unlike other adhesive, such as gelatin and cellulose ether, the hydrated amylose[ℜ5,6,7] molecules in the starch granule can form additional Hydrogen bonds with the paper fiber. By virtue of such strong chemical bonding, papers can be firmly attached together even with a very thin paste, i.e. in a slurry, watery state. It is therefore obvious that starch paste is a very promising facing adhesive, which will adequately hold the facing tissue to the paper substrate during the splitting process. Moreover, the facing tissue can subsequently be removed from the substrate with the mere application of moisture, which will activate and soften the starch adhesive. After the facing tissue is removed, any starch residues left behind can serve as a size for the paper document.

**IV) Suitability of Jin Pi Zhi as a Facing Tissue**

Being softer and more pliable than Japanese Kozo paper, Jin Pi (淨皮) (photo.4) is comprised of straw and blue sandalwood fiber (Pteroceltis tartarinowi Maxim) in the mix of about 40%:60% by content. It does not only adhere well to the paper document substrate upon the application of a small amount of paste, but also provides a good support for the document in the course of splitting because of its exceptional mechanical properties. As Jin Pi has a shorter fiber length than the Kozo tissue, it can be removed more easily afterwards.

**V) Paper splitting by Traditional Chinese Mounting technique**



✧ Before splitting

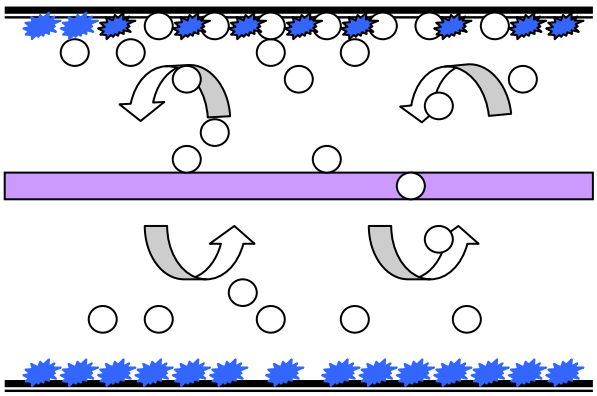
The document was surface cleaned with grated vinyl eraser and stains were removed by controlled washing and local bleaching on a Suction table.

✧ Facing technique (Photo.5)

The starch paste was prepared in a traditional way and was applied on the wire side of the facing tissue direct with a Japanese paste

ℜ Amylose is one of the main components of starch granule. It is a straight helical chain of (1,4) glucan polymer with crystalline structure. It maybe of three types of arrangement. The other component is amylopectin.

brush. In this case, a thick paste were used in order to prevent any excessive water moisture from mobilizing the ink writing, while at the same time, provide adequate water molecules to moisten the paper document. Water molecules from the paste penetrated into the pores or roughness pits at the surface of the document by means of migration along the fiber surface (intrafiber penetration) and diffusion through the fibers (interfiber penetration).




Drawing 1

The paper document was split carefully.

✧ A Japanese tissue coated with methylcellulose adhesive was inserted into the split papers.

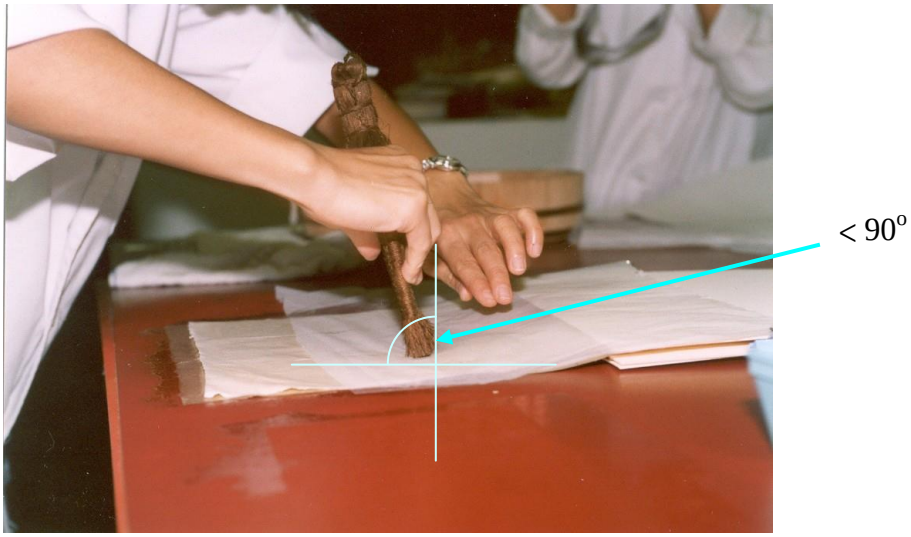
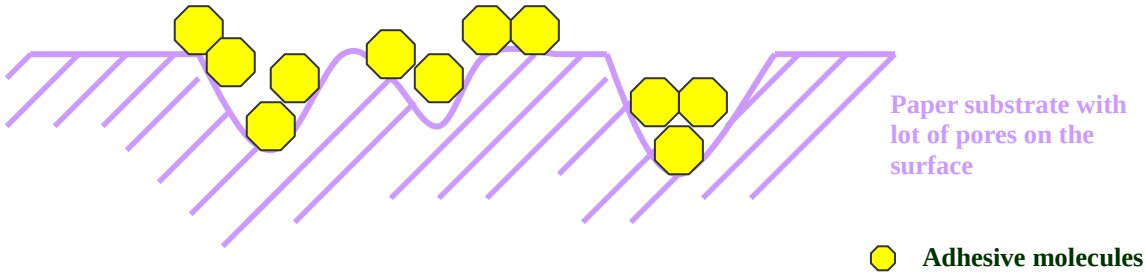



Photo. 6

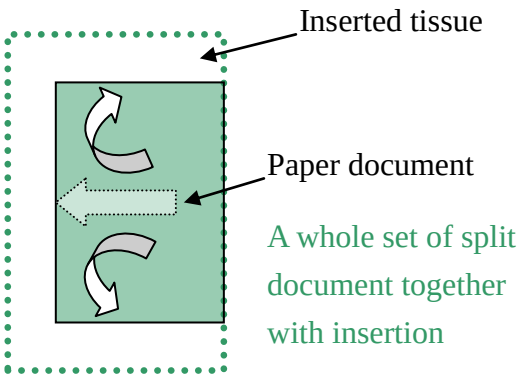
✧ The split papers together with the Japanese tissue lining at center were joined again and brushed evenly with a palm brush. The brushing angle should be slightly inclined but neither in 90 nor 45, otherwise, the sharp edges of the brush might

damage the wet paper. With the firm brushing action, the split papers and the core tissue were combined and returned to its original appearance as if an intact piece of paper document. Here, the brushing action served to spread the adhesive molecules evenly facilitating them to diffuse, interlock and form chemical bonding with the adherend, i.e. the paper substrate[8,9 ℜ]



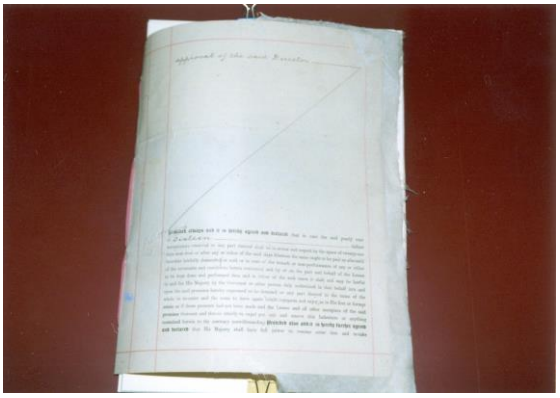

Drawing 2

The brushing direction:




Drawing 3

- ✧ The facing Jin Pi Zhi was removed while it was still wet.
- ✧ Treatment completed.



**V) Conclusion**

The document paper has been successfully split into two halves and rejoined together with the insertion of a core lining tissue paper with the aid of Jin Pi Zhi (淨皮紙) which serves as a comparatively strong subsidiary support for the original paper, the machine made

ℜ Adhesion theory : i) Physical Adsorption theory, ii) Chemical bonding theory, iii) Diffusion theory, iv) Mechanical Interlocking

conqueror paper was split for tears mending without obscuring the article information printed on both sides of the document. In this case, starch paste instead of Gelatin has been chosen as the facing adhesive and no other chemicals, like protease, were used.

## VI) Further studies

1. The reaction mechanism between the starch paste molecules and fibers of the oriental papers;
2. Better performance of watery starch paste than Gelatin;
3. How does the morphology of starch molecules affect the strength of adhesion towards various paper; and
4. How does the brushing action of traditional Chinese mounting assist in paper joining.

## VII) Acknowledgements

This work is only made possible with the encouragement and direction from my Section Head, Mr. S.W.Chan. Special thanks are also due to Mr. Edward Tse for his resourceful advice on my experimental work.

## VIII) References

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## IX) Materials and Suppliers

- ✧ Starch paste
  Wing Wah Chun, Mezzanine, No.22, Temple Street, Kowloon, Hong Kong
- ✧ Xuan paper, Pi zhi, Palm brush and goat hair brush
  Man Luen Choon Chinese Stationeries, 29-35 Wing Kut Street, 2/F., Harvest Bldg., Central, Hong Kong, Tel: 852-2543 0515, Fax: 852-2545 9750
- ✧ Japanese tissue
  Masumi Corporation, 4-5-2 Sugamo, Toshima-ku, Tokyo 170 Japan,

Tel: 81-3-3918-5401, Fax: 81-3-3918-8666

- Methyl cellulose

  Conservation Resources (UK) Ltd, Unit 1, Pony Road, Horspath Industrial Estate, Cowley, Oxfordshire OX4 2RD, Tel: 0865 747755, Fax: 0865 747035

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Photo.1

Photo.2

Photo.3

Photo. 4

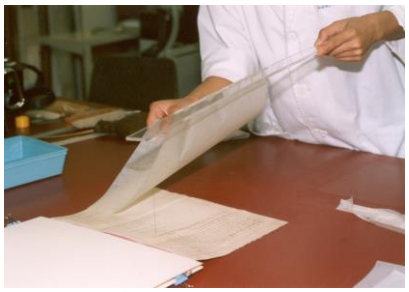
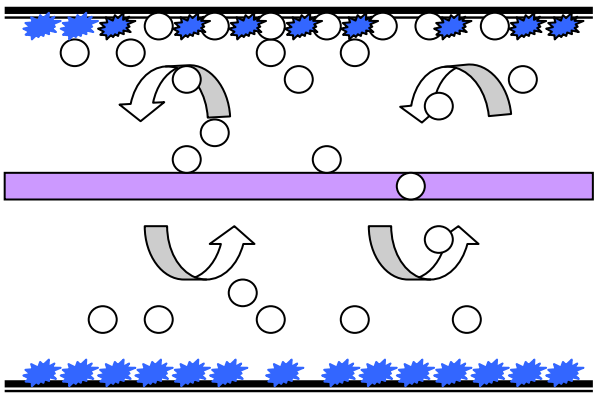


Photo.5



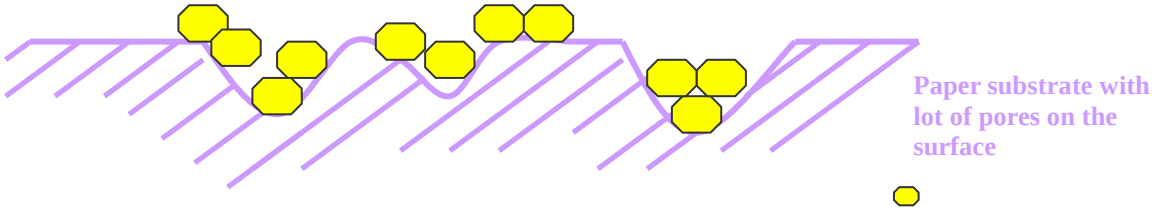
Pi zhi
Starch molecules with water molecules

Document

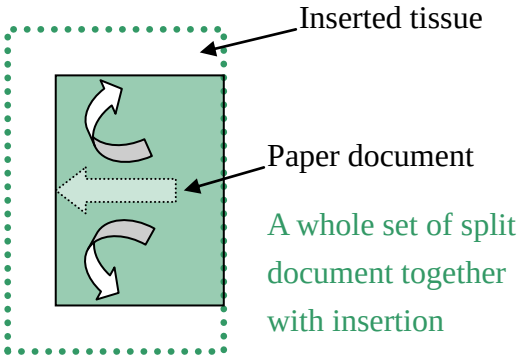
Water molecules penetrate from starch paste to paper document

Drawing 1

Photo. 6




Drawing 2




Drawing 3

Photo. 7