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Restoration of a 1930s Lease Document: Combination of a Traditional Chinese Mounting Technique with a Western Splitting Method

ABSTRACT

In this study, a combination of Western paper splitting and traditional Chinese mounting technique was adapted for mending tears in a 1930s lease document on machine-made paper. The paper was faced with *pi zhi,* a kind of Chinese *xuan* paper, and starch paste, instead of Japanese tissue and gelatin. Unlike gelatin, which sometimes requires the enzyme protease to aid in its removal, the gluten-free wheat starch paste is readily reversible. *Pi zhi* is strong enough to withstand the considerable sheer force exerted during the splitting process but is shorter-fibered and easier to remove than Japanese *kozo* paper.

INTRODUCTION

Lui Seng Chun is a four-story Chinese tenement building constructed in 193, which has been designated a Grade I historical building of Hong Kong in 2003 (fig. 1). The building, as well as its lease document, are both of great significance and merit long-term preservation. The lease is an eight-page bound document printed and written on both sides of machine-made paper with the watermark "Conqueror, London." It includes, by means of lace binding, a plan drawn on a thin linen fabric. Due to the prolonged folding of the document, major tears and heavy creases developed along the fold lines and on the edges, causing damage to the document and hence impairing its physical strength. For the sake of legibility and support, 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 (Liers, Wachter, and Muller 1996; Gast 1993).

This paper was presented as a poster at AIC 32nd Annual Meeting, June 9–14, 2004, Portland, Oregon. Received for publication Fall 2004. Color images for this paper are available online at http://aic.stanford.edu/bpg/annual/.

Fig. 1. Lui Seng Chun, built in 1931, Hong Kong

TRADITIONAL PAPER SPLITTING METHOD

As the name suggests, paper splitting means splitting a sheet of paper into two layers (fig. 2). It has been one of the reinforcement techniques used for repairing paper damage on a brittle document since the nineteenth century (Bansa and Ishio 1997). In order to split the paper effectively and safely, the paper substrate is first faced with another long-fiber tissue paper. Traditionally, restorers like to use concentrated gelatin (about 40% w/v) as a facing adhesive, and then use protease to remove the facing tissue (Brückle and Dambrogio 2000).

Although the method has been practiced for centuries, several technical problems remained to be resolved. First, the protease residues left behind are very difficult to remove entirely after application. They may become embedded in the paper fiber and give rise to further chem-

Fig. 2. Paper splitting

Fig. 3. Thin paste

ical reactions. Second, the Japanese *kozo* generally used as a facing tissue can be too strong in comparison with the fiber of the document and therefore its subsequent removal by mechanical means would be detrimental.

GELATIN OR STARCH PASTE?

In use about two thousand years in the Orient for mounting scroll paintings, starch paste has excellent proven compatibility with the oriental bast fiber papers like Japanese mulberry and Chinese *xuan* paper. Unlike other adhesives, such as gelatin and cellulose ethers, the hydrated amylose molecules in the starch granule can form additional hydrogen bonds with the paper fiber (Sivak and Preiss 1998; Galliard 1987; Daniels 1995).[1] 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 (fig. 3). Therefore 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.

Fig. 4. *Jin pi zhi*

SUITABILITY OF *JIN PI ZHI* AS A FACING TISSUE

Softer and more pliable than Japanese *kozo* paper, *jin pi* (淨皮) is comprised of straw and blue sandalwood fiber (*Pteroceltis tartarinowi* Maxim) in the mix of about 40:60% by content (fig. 4). It not only adheres 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.

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.

Fig. 5. Facing paper is applied

Facing Technique

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 brush (fig. 5). In this case, a thick paste was used in order to prevent excessive water from mobilizing the ink writing, while also providing 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) (fig. 6).

The paper document was split carefully. A Japanese tissue coated with methyl cellulose adhesive was inserted between the split layers. The split paper was joined at the center and brushed evenly with a palm brush. The brushing angle with a palm brush should be slightly inclined, neither at 90° nor 45°; otherwise, the sharp edges of the brush might damage the wet paper (fig. 7). With the firm brushing action, the split paper and the core tissue were combined and returned to their original appearance as a single intact paper document. Here, the brushing action served to spread the adhesive molecules, facilitating them to diffuse evenly, interlock, and form chemical bonding with the adherend, i.e. the paper substrate (fig. 8) (Neimo 1999; Comyn 1997).[2]

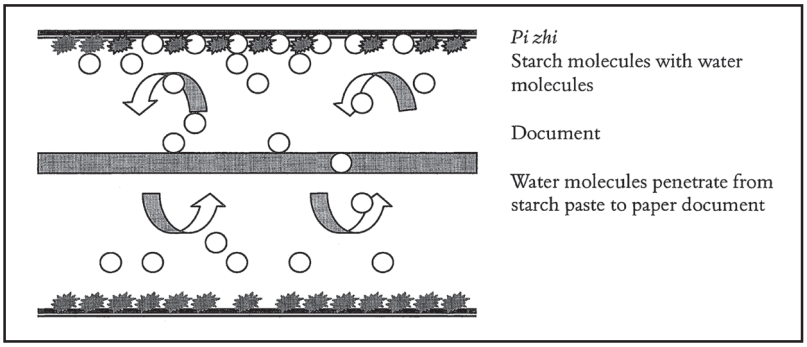

Fig. 6. Water from the paste penetrates the pores of the document surface

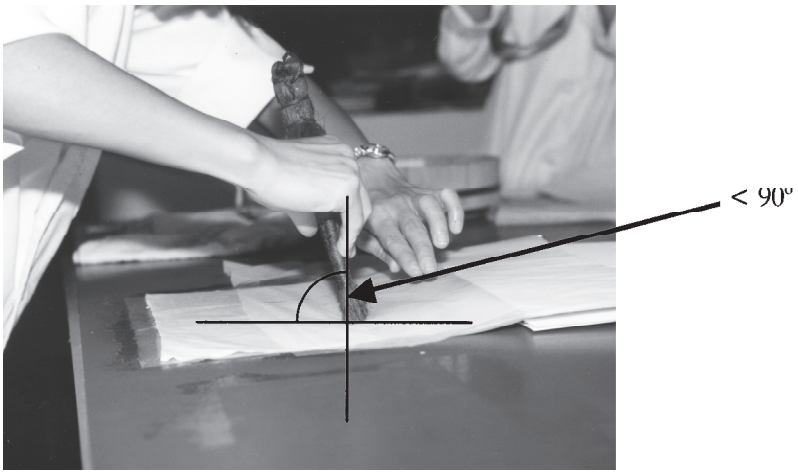

Fig. 7. Paste applied with the brush slightly inclined

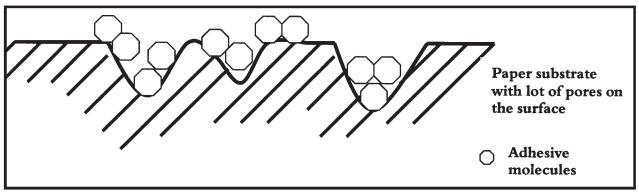

Fig. 8. Bonding between adhesive and paper substrate

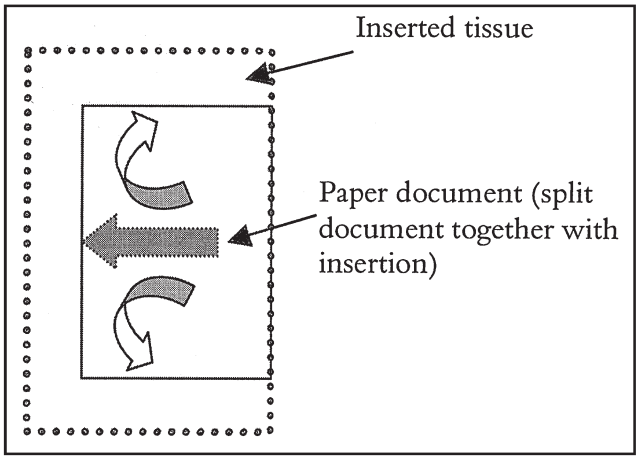

Fig. 9. *Jin pi zhi* facing is removed

The *jin pi zhi* facing was removed while the document was still wet (fig. 9) and the treatment was completed (fig. 10).

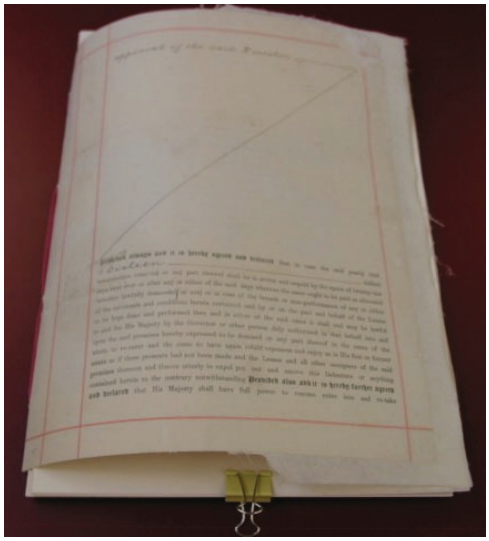

Fig. 10. Document with treatment complete

CONCLUSION

The document paper was successfully split into two halves and rejoined together around a core lining tissue paper with the aid of *jin pi zhi* (淨皮紙), which served as a comparatively strong facing support for the original paper. The machine-made Conqueror paper was split in order to mend tears without obscuring information printed on both sides of the document. In this case, starch paste instead of gelatin was chosen as the facing adhesive and no chemicals other than water, such as protease, were used to remove it.

FURTHER STUDIES

Areas for further study include:

1. the reaction mechanism between starch paste molecules and fibers of oriental papers;
2. the relative performance of watery starch paste vs. gelatin;
3. how the morphology of starch molecules affects the strength of adhesion in various papers; and
4. how the brushing action of traditional Chinese mounting assists in paper joining.

ACKNOWLEDGMENTS

This work was made possible by 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.

NOTES

1. Amylose is one of the main components of the starch granule. It is a straight helical chain of 1,4 glucose polymer with a crystalline structure. It may be of three types of arrangement. The other component is amylopectin.

2. Adhesion theory includes these components: (1) physical adsorption; (2) chemical bonding; (3) diffusion; and (4) mechanical interlocking.

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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 (U.K.) Ltd, Unit 1, Pony Road, Horspath Industrial Estate, Cowley, Oxfordshire OX4 2RD, Tel: 0865 747755, Fax: 0865 747035

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