Research on the Technical Improvement of Traditional Handmade Paper in Guangdong, China

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Abstract. In order to make the traditional handmade paper in Guangdong more suitable for modern application, this article tried to improve the manufacturing technology by some practical experiments. In these experiments, the mechanical properties and surface effects of the paper was improved by compositing material, sizing surface, adding texture, embossing and polishing. These experiments show that the handmade paper has good processing adaptability, it can apply many manufacturing processes flexibly, and can get a lot of effect with beautiful form and good performance. All of these technologies can provide a good material basis for modern application and cultural inheritance, which can be used in many paper mills and folk cultural institutions widely.

Introduction

Paper is a flat and even sheet made by depositing plant fiber, mineral fiber, animal fiber, chemical fiber or mixtures of these fibers. They are made by drying with suitable forming equipment [1]. It can be seen from the above that as long as the handmade paper does not break away from the process of fiber flaking, it still belongs to the category of papermaking. Therefore, we can make many kinds of paper for different aesthetic characteristics and meet the needs of modern creative design by adding materials and changing part of the process. Of course, we should implement it on the premise of preserving the historical flavor and technological essence of handmade paper. This can give more new functions and roles to Chinese traditional handmade paper, which is of great significance.

There are two aspects to change the process of traditional handmade paper: one is to improve the existing process; the other is to add the follow-up process. The advanced technology of modern mechanical paper is interspersed in the process of manual paper making to improve the quality of handmade paper, so as to realize the activation and protection goals of traditional handmade paper from remote mountains to cities and from ancient times to modern times.

Adding Composite Materials in Papermaking

Using natural materials is the characteristic advantage of traditional handmade paper, it also brings the disadvantage of blank appearance. If put other pulp into the raw materials, such as wood pulp, cotton pulp, straw pulp and fluorescent powder, to reconcile the appearance of traditional manual paper. It will get a special effect [2).

In the first experiment, we add straw pulp and Broussonetia bark pulp into bamboo pulp. The mixing of these pulp will deepen the paper color, let the color become dark. The effect of straw pulp on the paper texture is not obvious, but if the rough bark is added, in addition to the deepening of the color of the paper, the lines of the bark will also make the paper present an abstract texture, making the appearance of the paper more special. After many tests, when the ratio of each size is as shown in Table 1, the paper can achieve a good balance between appearance and texture. Another way to mix multiple papers is to make recycled paper from waste paper. For example, test with
discarded white paper, add bamboo pulp into the pulp of waste white paper, and you will get a softer white paper. The promotion of recycled paper is conducive to publicity environmental protection and resource conservation, and has important social significance [3].

Table 1. Composition and blending method of composite pulp.

| Pulp type            | Percentage | order |
|----------------------|------------|-------|
| Yellow bamboo pulp   | 73%        | 1     |
| Rice straw pulp      | 18%        | 3     |
| Broussonetia bark pulp | 9%      | 2     |

In the second experiment, we added silver and blue glittering powder to the waste pulp, and got a new paper with both glittering luster and simple texture. After these two kinds of glittering powder are added to the pulp, it gives people a high sense of luster and dazzling beyond the simple color, endows the paper with a shining personality and temperament, and enables the paper to have a greater use.

Through these two experiments, we can know that when other materials related to personal emotion or memory are added in the process of handmade paper making, compared with the special paper produced by machinery, it has more abundant content and ideological connotation [4]. If you want to present pleasant memories in hand made recycled paper, the added materials can be cheerful and relaxed, such as petals, leaves, so that the paper presents a delicate, gentle feeling, soft to touch, smell fragrance. If it is a painful memory, the added material is heavy, such as wood, stone slag and so on, the final form of paper will have a stiff sense of distance, so that people do not want to touch. Add other material for manual paper is through the understanding of the characteristics of paper, make these with composite paper can postpone the personality traits of character, Serve our specific themes.

**Surface Sizing of Handmade Paper**

Paper is an important material to express feelings, thoughts and designs. In the process of making a piece of hand-mad paper, the paper made by a series of processes such as material selection, foam, cooking, beating, paper making, paper cooling and so on is called base paper. It does not have any follow-up processing, and the surface of this paper will inevitably have certain looseness. In order to improve the performance of paper, we need to do post-processing on paper to improve its physical performance. In this process, it is processed twice to make it have a specific texture, touch, smell, color and other characteristics with strong individuality, and it is marked with an obvious personal mark, so that it has a story and a character [5].

The sizing technology of paper is relatively simple. In ancient times, there was a technique of making "cooked paper" by adding glue and alum to the paper of calligraphy and painting. After gluing, the paper will become hard, straight, when painting, the ink permeability is not good, there will be a sense of lethargy. But on the other hand, if no sizing, paper will make ink absorption too strong and difficult to control. Later, a "light sizing" technique was created, in which the desired effect could be achieved by replacing gelatin with saponin and properly controlling its component [6]. Light sizing can plug paper’s tiny holes, improve paper’s cohesion and avoid appearance of hair, and slow down the diffusion of ink.

In our experiment, we applied the sizing treatment to the handmade paper in Guangdong Sihui, spread the glue mixed with starch, soap and white latex on the handmade paper evenly. It will made the original loose texture of the paper stronger and denser after drying, and improved the phenomenon of diffusion after inking. The composition of this glue is shown in Table 2. Sizing process has many advantages, such as locking the fiber of paper surface, preventing scratch and fibre loss, and making paper have better visual and decorative effects. Therefore, light sizing process is an effective way to improve the surface effect of handmade paper [7]. Taking the handmade paper in Guangdong Sihui as an example, its texture is thicker and its color is deeper after sizing, which makes the paper have new characteristics such as texture, temperature, texture, softness and hardness in the future use. However, light sizing can also have a negative effect. After
sizing, the softness of the paper will be reduced and the paper will become brittle. Therefore, the application process should be based on needs.

Table 2. The production method of paper glue.

| Glue composition | Mixture ratio | Blending temperature |
|------------------|---------------|----------------------|
| Purified water   | 60%           | Heating to 80 °C     |
| Starch           | 5%            | Normal temperature   |
| Soap solution    | 12%           | Heating to 60 °C     |
| White latex      | 15%           | Normal temperature   |
| Talc             | 8%            | Normal temperature   |

**Embossing and Calendering the Surface of Paper**

Calendering and embossing is a common technique in modern papermaking, which can form a variety of paper products with rich effects. In the embossing process, generally speaking, hot press to obtain coarse paper, cold press to obtain fine paper. In industrial production, the texture or particle effect of paper is generally completed through the roller with decorative patterns or relief plate with special embossing machine, printing press or die-cutting machine under pressure [8]. On the basis of the original materials, handmade paper can be embossed with different artistic features and become a unique carrier to narrate ideas and express emotions.

Through experiments, we adopt the method of cold pressing. Use the texture of bamboo curtain to add regular stripes to the thick paper made of composite materials, as shown in figure 1. Because the paper fiber of composite material is thick and has wild style, we need to increase order beauty in wild by embossing, so that its regular texture and irregular fiber can cooperate with each other, increase the aesthetic connotation of paper, and can be better applied in many packages, posters and books that need texture.

In terms of the test of the effect of embossing, we mainly used the roller of the printer to hot press the paper, the surface of the paper after embossing was smooth and clean, and the writing style was smoother. What's more, the fiber texture of the paper still existed, which did not affect the performance of the artistic effect, but expanded the connotation of handmade paper, and showed the rich artistic temperament of paper as a cultural medium.

**Add Color Texture to the Paper**

The dyeing and processing methods of handmade paper have existed in ancient times. People created processing methods such as dyeing, soaking, printing, quicksand, sprinkling gold silver powder and mica powder. Some of these methods are to bring special mechanical properties to paper, and some are to have better decorative effect. Such as "quicksand paper", the production process is to add the diffusion anti mixing agent into the ink, and then drop the ink on the water surface, the ink will spread, and randomly form various streamline patterns. Then people covered
the water with hand-made paper, and the paper absorbed the color ink, forming a beautiful quicksand paper. In addition, there is a "marble paper". Its production method is to add astringent and diffusing agent into various facial shakes, so that the marble texture or other patterns can be displayed on the paper [9].

Chinese traditional handmade paper has the color of plant cellulose. The ink absorption performance is different from other paper types. Its fiber texture is more obvious. After dyeing, it can show more colorful texture and bring wonderful effect. Color texture can be composed of repetition, gradual change, emission, variation, contrast, etc. The color treatment methods of hand-made paper include splashing, dropping ink, scraping, stamping, etc [10]. These techniques can bring rich color texture to the paper. In order to get a better color effect, we try to apply red, green, blue and other colors on handmade paper that be marked in Yangjiang Guangdong. In the experiment, we found that splashing and embossing are the most simple techniques, but the best texture effect is obtained. It is suitable for creative color. It is shown in Figure 2.

![Figure 2. The color texture of handmade paper in Yangjiang Guangdong.](image)

**Summary**

Chinese traditional handmade paper comes from the folk. In the application of traditional culture, on the one hand, we can use it directly, on the other hand, we can innovate and improve the tradition to meet the needs of modern life and culture. The innovation and development of traditional culture is an effective way to inherit traditional culture and develop new culture. The craft improvement of handmade paper is not only the inheritance of traditional culture, but also the pursuit of sustainable development. It can meet the needs of modern design and application, improve its mechanical properties, enhance its artistic charm, and improve people's love for handmade paper products. So we will have more new technologies of handmade paper in the future.

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