臺灣省林業試驗所合作報告

第十七號

中國農村復興聯合委員會

合作

CO-OPERATIVE BULLETIN

of

TAIWAN FORESTRY RESEARCH INSTITUTE

No. 17

in co-operation with

THE JOINT COMMISSION ON RURAL RECONSTRUCTION

纖維物質成型物製造之研究

Studies on Manufacture of Molded Articles with Fibrous Materials

趙順中　林勝傑　潘登灶

S. C. Chao　S. J. Lin　T. T. Pan

中華民國五十八年十二月

臺灣省林業試驗所印行

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纖維物質成型物製造之研究

Studies on Manufacture of Molded Articles With Fibrous Materials

趙順中　林勝傑　潘登灶

S. C. Chao　S. J. Lin　T. T. Pan

一、緒　言 (Introduction)

一般纖維物質不僅可以製造紙張及紙板，而且還可以製造其他物品，例如日常生活中所用之桌椅，家具，及菜盤碗碟；工業上所用之電器及機器零件；以及裝飾用之工藝品，紀念品及室內之地板，地磚等等。

製造此等物品所用之纖維並非造紙所用之纖維，而是不易造紙或不能造紙之廢料，例如木屑及樹皮。將此等廢料配合適當之膠料在高溫高壓下可以製成多種形狀之有用物品。

膠料之進步已使木材加工業起了革命性的變化，目前之合成樹脂膠 (Resin glues) 可以改良木材本身原有之缺點，可以使小形木料變成大的建築材料，不但如此，另外還可以使不能製成建築材料之碎料或廢料變成有用之物。本試驗之目的即研究此類物品製造之方法與技術。

化學膠料在逐漸進步，新的用途及新的方法將不斷出現，膠合工業勢必日益發達。本試驗僅設計四種模型，製出二十種產品，以供參考，希望能引起有關人士之興趣，促進膠合工業之發展，並希望木材工業專家學者賜予指教是幸。

本試驗承農復會森林組楊組長志偉暨潘技正長弼提供寶貴意見，林務局林產組蔡組長佑之暨利用課洪課長耀淇賜予指教，膠料方面承本所化學系林技士振益供給資料，原料方面承橫貫公路開發處翟技師思湧贈送檜木樹皮，謹此敬致謝忱。

二、試材及藥品 (Raw Materials and Chemicals)

1.試　材 (Raw Materials)

A. 纖維物質——闊葉樹全纖維木漿、亞麻絲、木屑、檜木樹皮及椰子殼粉等。

B. 紙張——相片紙、卡片紙、銅版紙、模造紙、宣紙、玻璃紙及PE紙等。

2.藥　品 (Chemicals)

A. 尿素膠 (Urea Resin Glues)

B. 美麗明成型粉 (Melamine Resin Molding Powder)

C. 南寶樹脂 3-B (Nan-Pao Resin 3-B)

D. 硬化劑 (Hardeners)

三、設　　備 (Equipments)

所用之設備均爲本省製造，其名稱如下：

A. 熱壓機 (Hot Press Machines) —50噸及100噸兩臺

B. 鋼　模 (Moulds) —地板磚 (Floor tile)、盤子 (Dish)、鏡框 (Frame) 及椅子 (Chair) 四種。

C. 乾燥機 (Drying Maching)

D. 混合機 (Mixing Maching)

四、方　　法 (Methods)

1.準備試材：將木屑樹皮等試材磨成細粉，或染成紅黃等顏色，然後烘乾備用。

2.膠料處理：將相片或劃片等在貼壓前先以膠液浸漬或以膠液塗刷表面，乾燥後備用。

3.混　　合：熱壓之前，先將試料及膠料充分混合，使其均勻。

4.熱　　壓：將準備妥當之試料塡入鋼模內，然後將鋼模放進熱壓機內保持適當之壓力，溫度及時間，最後取出，打開鋼模，即得成品。

5.貼　　壓：將處理妥當之印刷紙類置於成品上，進行第二次熱壓工作，仍保持適當之壓力，溫度及時間。

6.修　　磨：成品邊緣如有不整齊之處須用細銼或砂布略予修理，然後打臘上光，愈增其美觀。

五、製造實驗 (Experiments on Manufacturing)

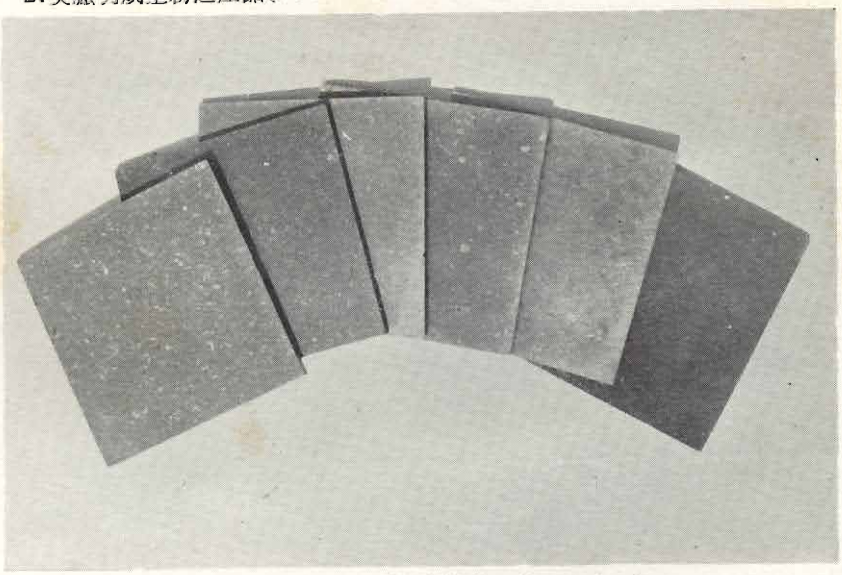
將以上所述之試料與膠料分別以不同之比例作適當之配合，然後以不同之製造條件製成二十種產品，玆將其照片及製造條件分別敍述於后。

1.尿素膠之產品(Products of Urea Resin Glues)

地板磚及地板磚貼壓劃片(Floor tiles and floor tiles overlaid with colored picture)—木屑製(Made of sawdust)

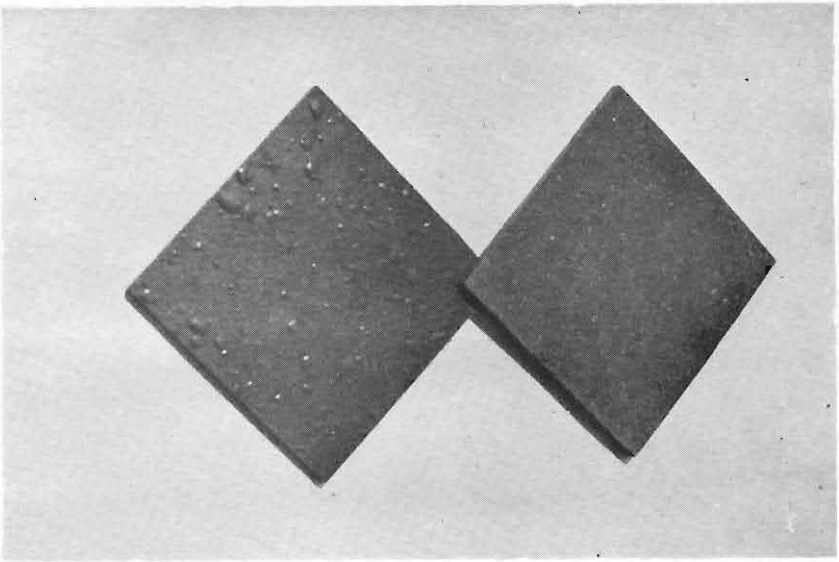
膠　比 (Resin/sawdust ratio): 1 : 1, 1 : 2 (on weight)
溫　度 (Temperature): 135°C
壓　力 (Pressure): 130 kg/cm²
時　間 (Time): 10 minutes

2.美膴明成型粉之產品(Products of Melamine Resin Molding Powder)

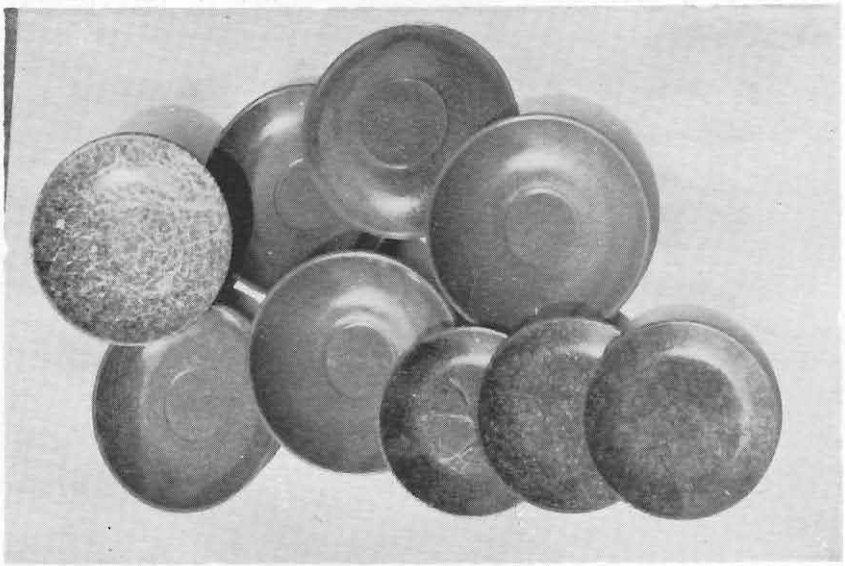


地板磚(Floor tiles)—木屑製 (Made of sawdust)

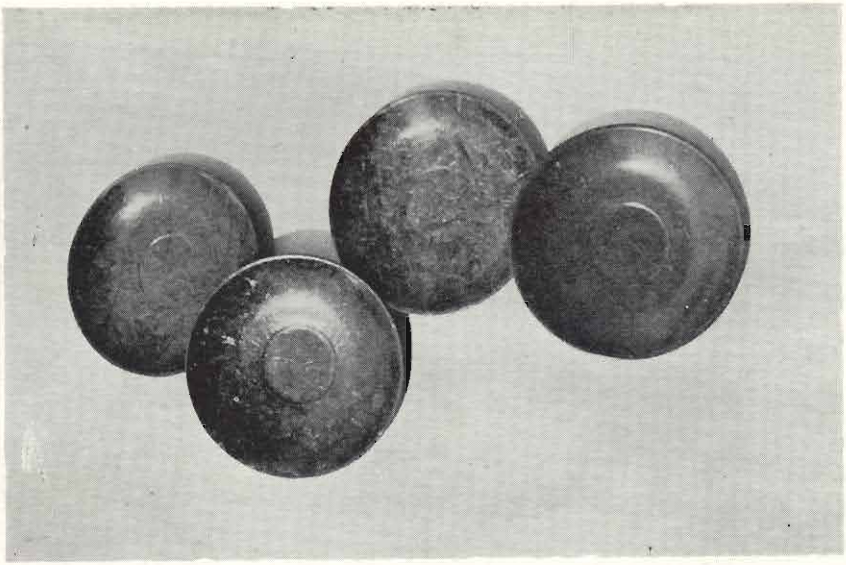
膠　比 (Resin/sawdust ratio): 1 : 1, 1 : 2 (on weight)
溫　度 (Temperature): 135°C
壓　力 (Pressure): 130 kg/cm²
時　間 (Time): 10 minutes



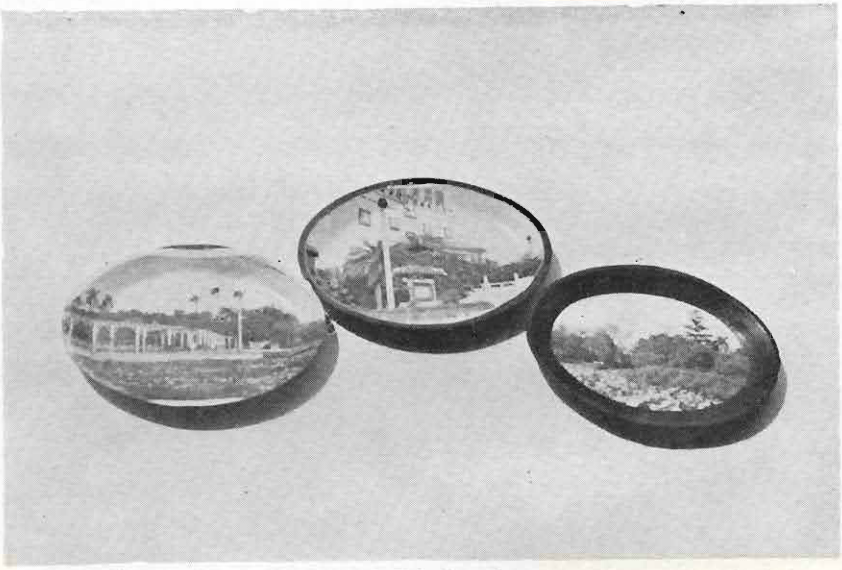
地板磚(Floor tiles)—木屑上鋪紙漿製 (Made of layers of sawdust and pulp)
膠　比 (Resin/sawdust ratio): 1 : 1, 1 : 2 (on weight)
溫　度 (Temperature): 135°C
時　間 (Time): 10 minutes
壓　力 (Pressure): 130 kg/cm²



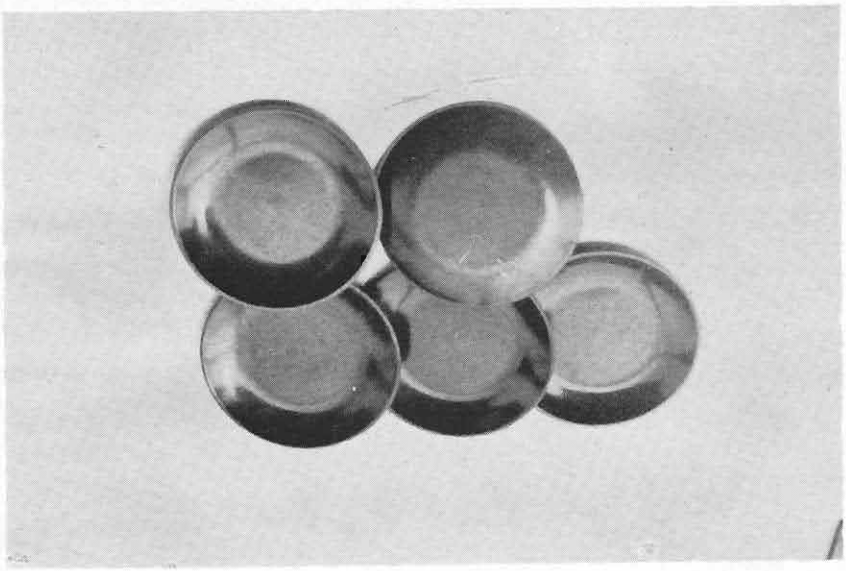
盤子(Dishes)— 本色及染色木屑製 (Made of sawdust of original color or dyed color)
膠　比 (Resin/sawdust ratio): 1 : 1, 1 : 2 (on weight)
溫　度 (Temperature): 130°C.
壓　力 (Pressure): 130 kg/cm²
時　間 (Time): 8 minutes



盤子(Dishes) —木屑加木片或麻絲製 (Made of layers of sawdust and chips or flax fiber)
膠 比 (Resin/sawdust ratio): 1 : 1, 1 : 2 (on weight)
溫 度 (Temperature): 130°C
壓 力 (Pressure): 130 kg/cm²
時 間 (Time): 8 minutes

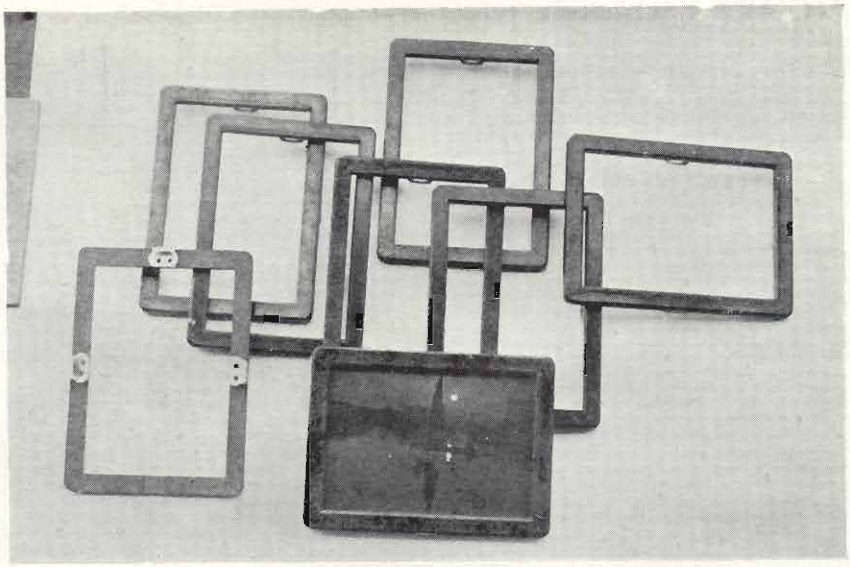


盤子(Dishes) —椰子殼粉製 (Made of cocoanut shell powder)
膠 比 (Resin/sawdust ratio): 1 : 1, 1 : 2 (on weight)
溫 度 (Temperature): 130°C
壓 力 (Pressure): 130 kg/cm²
時 間 (Time): 8 minutes



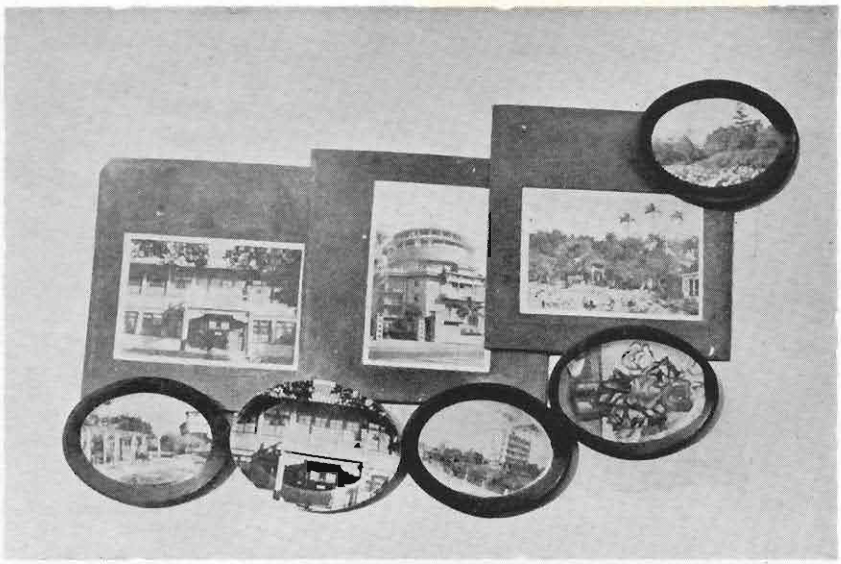
盤子(Dishes) —樹皮粉製 (Made of bark powder)
膠 比 (Resin/sawdust ratio): 1 : 1, 1 : 2 (on weight)
溫 度 (Temperature): 130°C
壓 力 (Pressure): 130 kg/cm²
時 間 (Time): 8 minutes

盤子(Dishes)— 紙漿製 (Made of pulp)
膠 比 (Resin/sawdust ratio): 1 : 1, 1 : 2 (on weight)
溫 度 (Temperature): 130°C
壓 力 (Pressure): 130 kg/cm²
時 間 (Time): 8 minutes

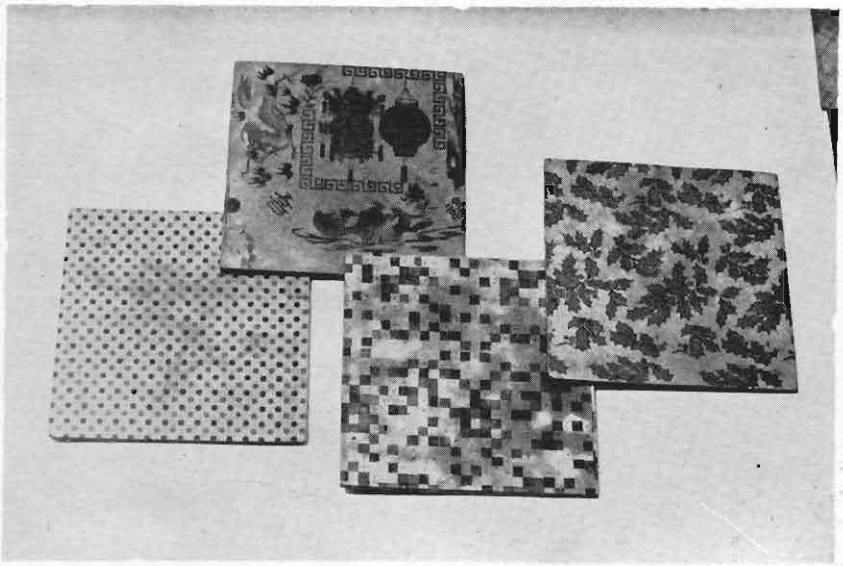


鏡框(Frames) —木屑製(Made of sawdust)
膠 比 (Resin/sawdust ratio): 1 : 1, 1 : 2 (on weight)
溫 度 (Temperature): 130°C
壓 力 (Pressure): 130 kg/cm²
時 間 (Time): 9 minutes

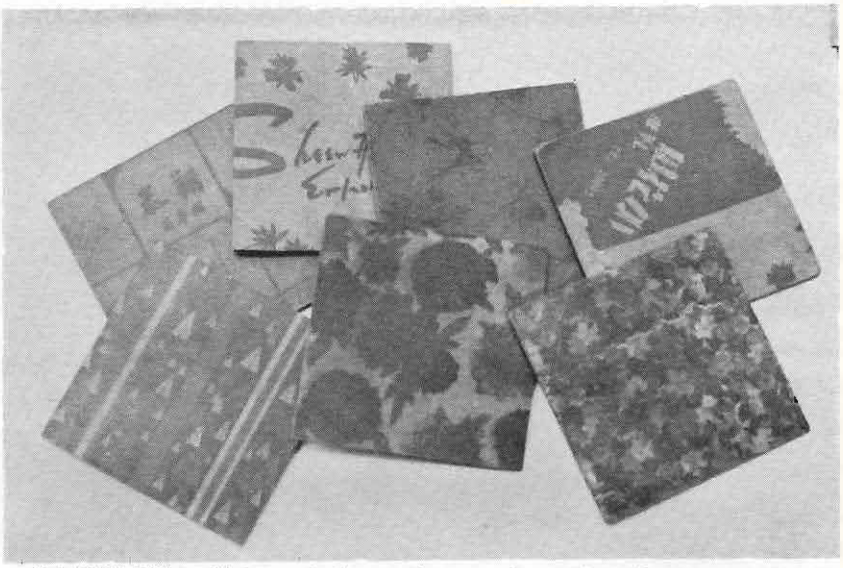
椅子(Chairs)—木屑製 Made of sawdust)
膠 比 (Resin/sawdust ratio): 1 : 1, 1 : 2 (on weight)
溫 度 (Tempeature): 140°C
壓 力 (Pressure): 140 kg/cm²
時 間 (Time): 10 minutes



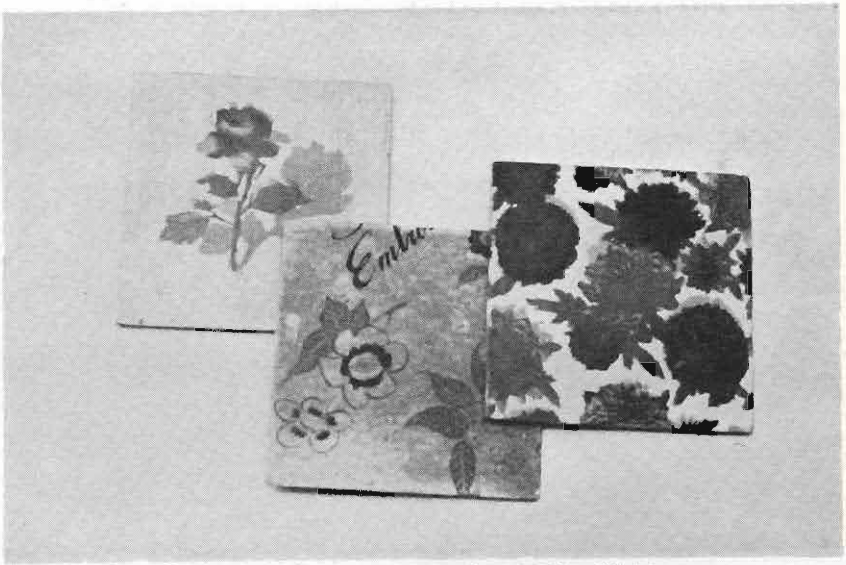
相片紙貼壓 (Overlaying of photographic paper)—塗佈法 (Coating process)
溫　度 (Temperature): 105°C
壓　力 (Pressure): 125 kg/cm²
時　間 (Time): 7-8 minutes



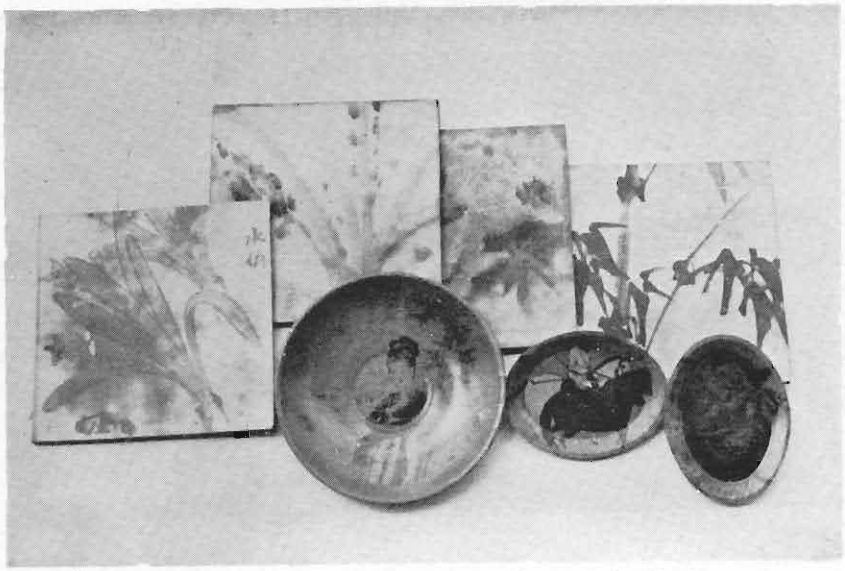
彩色紙貼壓(Overlaying of chromatic paper)　塗佈法 (Coating process)
溫　度 (Temperature): 100°C
壓　力 (Pressure): 125 kg/cm²
時　間 (Time): 7-8 minutes



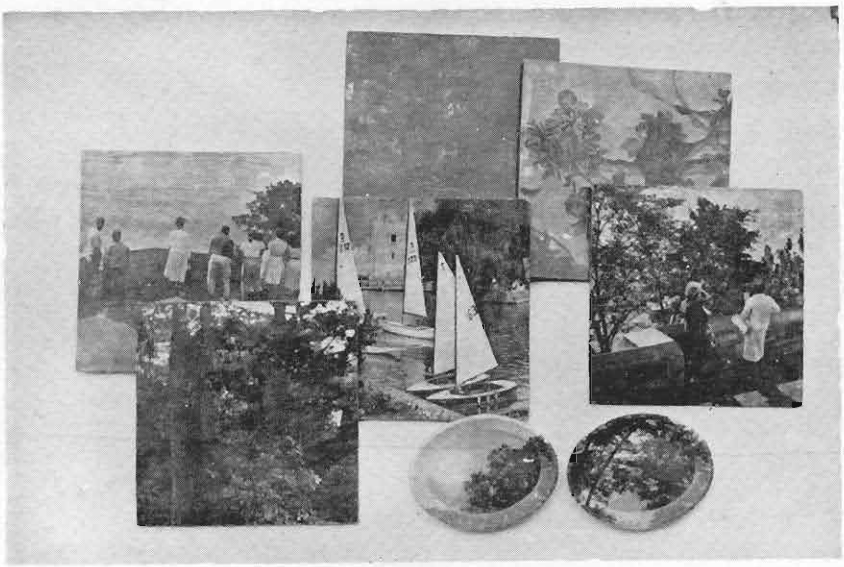
彩色紙貼壓(Overlaying of chromatic paper) 浸漬法(Soaking process)
浸漬時間 (Soaking time): 30mins
溫　度 (Temperature): 100°C
壓　力 (Pressure): 125 kg/cm²
時　間 (Time): 7-8 minutes



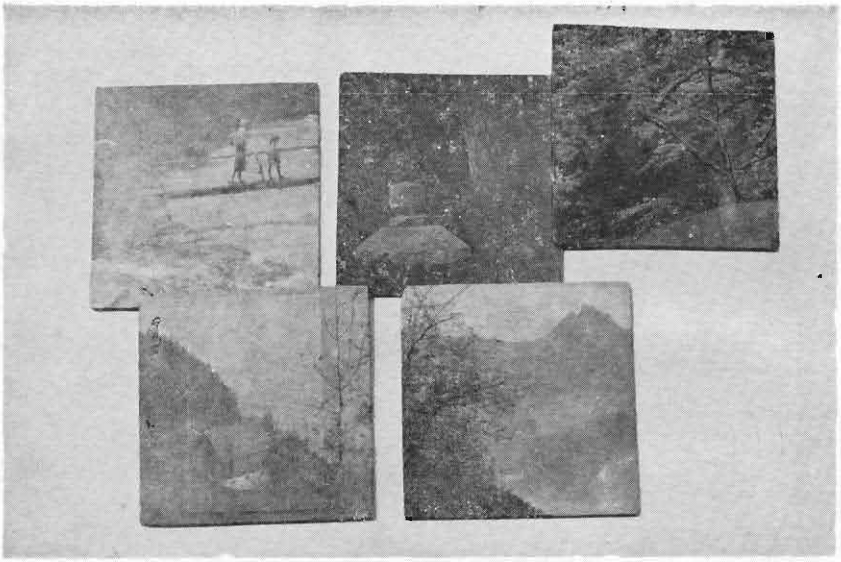
彩色紙貼壓(Overlaying of chromatic paper) 冷壓法 (Cold pressing process)
壓　力 (Pressure): 125 kg/cm²
時　間 (Time): 120 minutes
與冷膠混合使用 (Mixing with cold press resin)



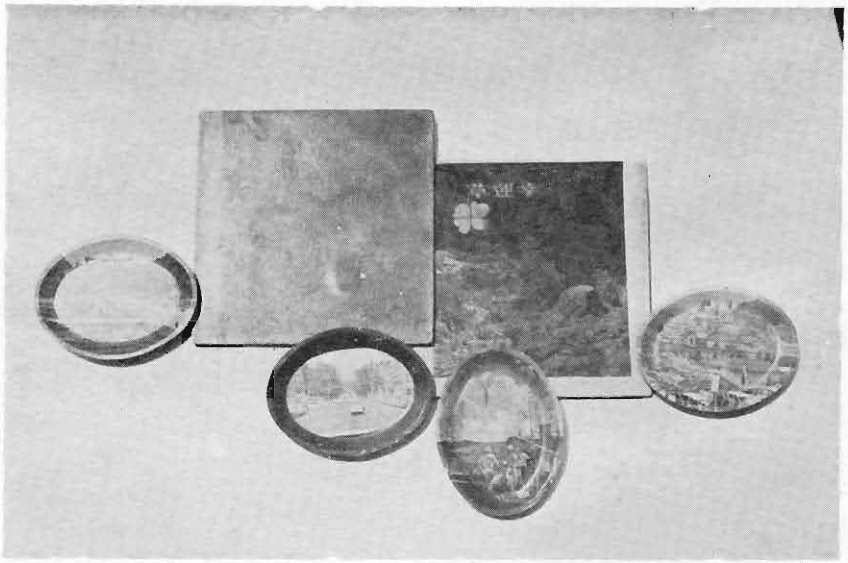
宣紙貼壓(Overlaying of chinese-made paper) 浸漬法 (Soaking process)
浸漬時間 (Soaking time): 30mins
溫　度 (Temperature): 105°C
壓　力 (Pressure): 125 kg/cm²
時　間 (Time): 8 minutes



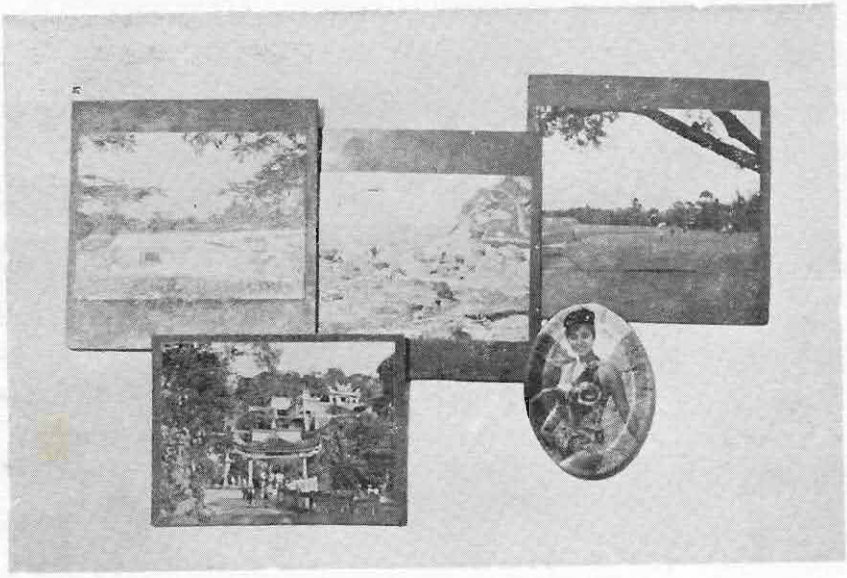
銅版紙貼壓(Overlaying of coating paper) 塗佈法 (Coating process)
用玻璃紙或PE布 (With overlaying of cellophane or PE sheet)
溫　度 (Temperature): 105-110°C
壓　力 (Pressure): 125 kg/cm²
時　間 (Time): 8 minutes



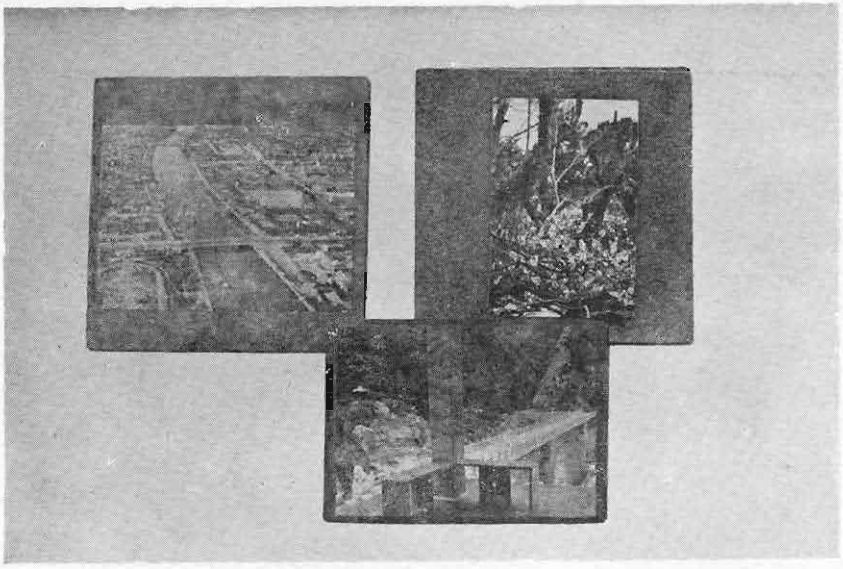
銅版紙貼壓(Overlaying of coating paper)—塗佈法 (Coating process)
不用玻璃紙或 PE 布 (Without overlaying of cellophane or PE sheet)
溫　度 (Temperature): 105–110°C
壓　力 (Pressure): 125 kg/cm²
時　間 (Time): 8 minutes



銅版紙貼壓(Overlaying of coating paper)—浸漬法 (Soaking process)
不用玻璃紙或 PE 布 (Without overlaying of cellophane or PE sheet)
浸漬時間 (Soaking time): 45mins
溫　度 (Temperature): 110°C
壓　力 (Pressure): 125 kg/cm²
時　間 (Time): 8 minutes



卡片紙貼壓(Overlaying of card paper)—塗飾法 (Coating process)
溫　度 (Temperature): 110°C
壓　力 (Pressure): 125 kg/cm²
時　間 (Time): 8 minutes



卡片紙貼壓(Overlaying of card paper)—浸漬法 (Soaking process)
浸漬時間 (Soaking time): 60mins
溫　度 (Temperature): 110°C
壓　力 (Pressure): 125 kg/cm²
時　間 (Time): 8 minutes

六、結　　論 (Conclusions)

1.本試驗製得之產品具有堅硬、光滑、美觀、抗水、耐熱、不燃燒，及不易破碎等優點，可將相片及印刷物品等多種紙類壓貼其表面，並可保持其原有彩色永久不久變。
2.試料磨成細粉可使成品表面更爲光滑細緻美觀，磨粉愈細愈佳。
3.膠料與原料在熱壓前必須混合均勻，則產品更爲美觀。
4.製造工藝品所需之原料少，成本低，但售價高，較爲有利。
5.樹皮爲一極佳之原料，其價格最低而且容易磨成細粉。
6.壓貼相片紙、卡片紙、銅版紙、模造紙及宣紙等所用之方法略有不同，刷膠方法較佳。
7.本試驗僅製造地板磚、盤子、鏡框及椅子等四種鋼模，其他物品亦可製成鋼模，仿照此方法製造。

七、英文摘要 Summary in English

Studies on Manutacfure of Fibrous Materials Molding Articles

1. The purpose of this experiment is to study the posibility and technology for making household articles, furniture, artistic decorations, electric articles, and machine parts with pulp or alleid materials by application of hot press process.
2. The raw materials used in this experiment were hardwood pulp, sawdust, bark of Chamaecyparis formosensis and cocoanut shell powder. The glues used in this experiment were melamine resin molding powder, Nan-pao resin 3-B and urea resin. The equipments were hot press machine, drying machine, mixing machine and steel molds.
3. The manufacturing process was mixing homogeneously the raw materials and glues in proper proportion; putting the mixture into the mold; placing the mold in the hot press machine and controlling the machine to maintain the proper temperature, pressure and time period, then the product was finished.
4. Twenty kinds products were made under different manufacture conditions in this experiment. According to the results of above experiments we have reached the following conclusions:
   A. The feature of the products made in this experiment were their hardness, smoothness, attractiveness, water resistance, heat resistance, uninflammableness, and etc. Photographs and colored printings could be pressed on the surface of the products. Their original color were not fade.
   B. Smoother, more beautiful and more delicate products can be made if finer powedr is used as raw material. The finer the powder the better the products.
   C. The raw material and glue putting in mold must be mixed very homogeneously to make the products perfect.
   D. Manufacturing artistic articles are more profitable because the quantity of raw material required is less and therefore the cost is lower and the price is higher.
   E. The bark is a very good raw material. Its price is the lowest. It's easy to graunlate it.
   F. Coating paper, photographic paper, card paper and Chinese-made paper could be pressed on the surface of the products under different conditions. Coating process was better than soaking process.

G. Four kinds of steel molds were made in this experiment. They were floor tile, dish, frame and chair. Other articles also can be made with steel mold like this by the above mentioned process.

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