

Photosensitive catalysts for electro-less plating with fine pattern

Advanced Materials Research Group, New Technology Research Laboratory

1. Introduction

When placing fine patterns of catalyst on plastics, glass, or ceramics, conventional printing processes present a number of problems. For instance, the large film thickness of the paste printing does not allow fine patterns. The thin film processes (deposition, sputtering) allow fine patterns but require a vacuum process or other additional processes that will add to the production cost.

The Pd-based catalytic liquid SOC-PA, developed by our company, is photosensitive and makes fine patterning of catalytic film less than $3\mu\text{m}$ in thickness possible in a simple process.

2. Main Features of the Product

2.1 Basic Properties of the Liquid (Examples)

SOC-PA is a yellowish transparent liquid containing palladium as a catalyst, and has the following properties:

Specific gravity : 0.95

pH : 3.2 (25°C)

Viscosity : 1.8cp

Main solvent : Water soluble

Storage method : Keep away from sunlight at temperature below 10°C (without freezing)

2.2 Photosensitivity

The catalytic liquid is suitable for a process that utilizes i-line steppers (dominant wavelength 365nm), and requires 500-1000mJ/cm² of exposure.

2.3 Resolution

The basic resolution of the catalytic film varies by the photo-lithographic process. The minimum resolution of $L/S = 3/3\mu\text{m}$ is secured with common i-line steppers.

2.4 Process

Fig. 1 shows a typical patterning process.

- * Catalytic liquid coating by spin coating and other coating machines
- * Exposure by an i-line stepper
- * Development by water-base developing solution. Glass and other flat surfaces only require development with pure water.

3. Typical Applications

3.1 Formation of Fine Metal Patterns

Fine patterns of metal film can be formed easily when the Pd catalytic patterns reacts to an electroless plating solution (Fig. 2). The metal patterns can be applied to electronic circuits, electromagnetic shielding, etc.

3.2 Formation of Plated Films on Glass and Plastics

The outstanding adhesion and strength of the catalytic liquid may be used for plating on glass or other non-platable substrates without etching or other cumbersome surface treatments. With entire surface application, it also allows formation of metal plating film in a very simple method. The resulting plated film (polycarbonate without surface treatment) presents a very high adhesive strength that passes a tape test (JIS H8504). Fig. 3 shows a typical correlation between Cu electroless plating time, plating thickness, and resistance.

4. Concluding Remark

Formation of catalytic patterns using SOC-PA and its applications (metallic patterns, formation of plated films) are introduced here. We plan to develop more applications based on the liquid's outstanding properties.

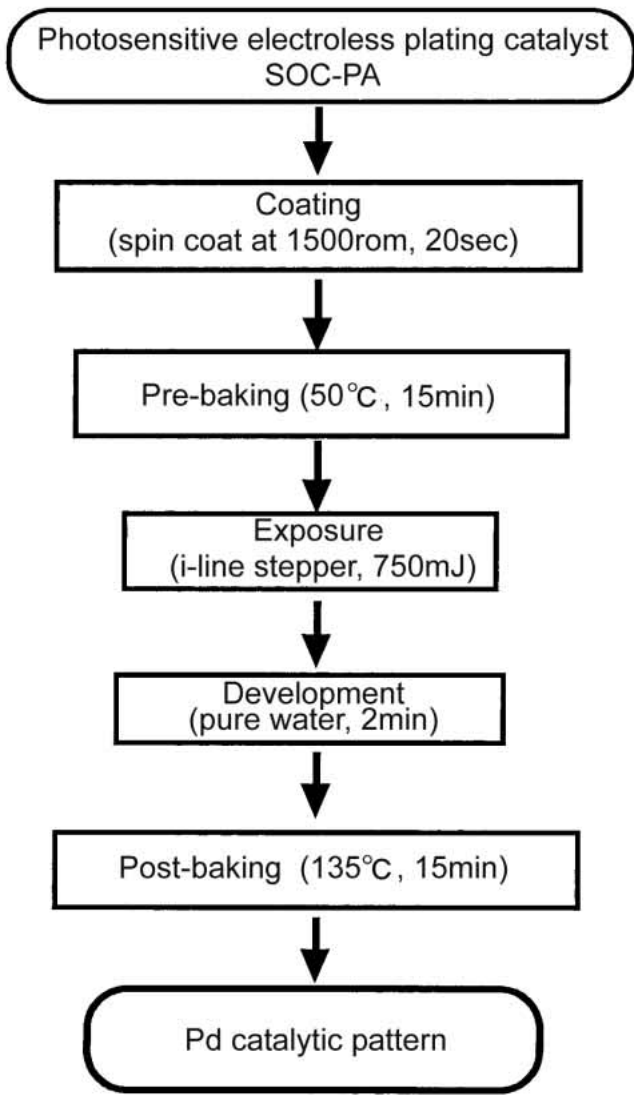


Fig. 1 Schematic process on glass substrate

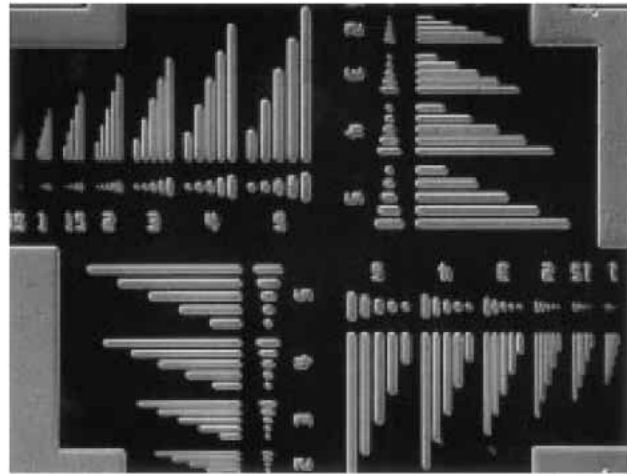


Fig. 2 Microscopic image of fine Cu patterns

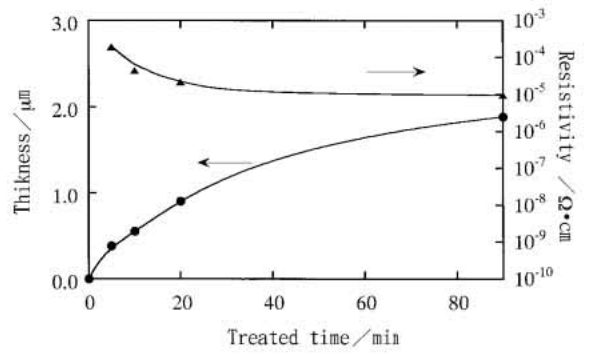


Fig. 3 Cu film thickness and sheet resistance vs. duration of electroless plating