

# Daicel develops chromic acid-free etching technology for metal plating of ABS

## DAICEL POLYMER

Daicel Polymer is a resin compound belonging to the Daicel Chemical Industries group. The company has been developing various compounds to meet customer requirements in such industries as electrical and OA equipment, telecom and IT equipment, and automobiles. The product range covers functional ABS resin and its alloys with various kinds of engineering plastics.

Daicel Polymer has just developed an innovative plating technology that is a chromic acid-free etching technology for the metal plating of ABS resin. Decorative plating of resin is a lightweight means of obtaining a metallic external appearance and therefore the process is employed widely in automobile radiator grilles, door handles, emblems, and other decorative applications, and ABS resins have primarily been employed as a base

resin in metal plating traditionally. In order to obtain high adhesivity in electroless plating, an oxidant such as chromic acid is used to form an anchor in the etching process. Through this anchoring effect, strong adhesion of the plating layer to the resin is realized. However, the  $\text{Cr}_6^+$  ion contained in the chromic acid is recognized as a carcinogenic substance and it also requires costly wastewater treatment. Alternatives have been investigated in the past, but as yet, nothing has proved commercially viable.

A polymer alloy developed by Daicel Polymer consisting of ABS resin and hydrophilic polyamide (PA) resin shows good adhesion to the metal layer when it has been surface-treated with hydrochloric acid. The alloy can be employed without significantly changing the conventional ABS resin plating process, but without the need for chromic acid etching. The plating process was developed jointly with Okuno Chemical Industries.

The main components of the alloy are ABS resin and PA resin, with a compatibilizer and additives to improve plating also incorporated. The adhesion mechanism of the plating layer is entirely different from the conventional anchor effect. This resin material enables electroless plating without using the traditional chromic acid etching process for ABS resin. In addition, the external appearance of the plating (gloss) is excellent, high adhesion strength (.1–.3 MPa) is achieved, and furthermore excellent properties such as heat resistance and impact resistance are realized.

The key point of this plating technology is a combination of hydrophilic PA resin with ABS resin. The role of the PA component in the alloy resin is to take

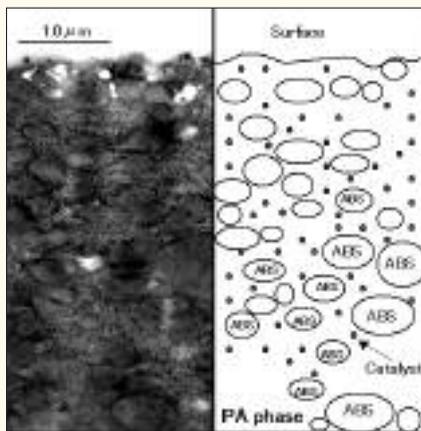


Chromic acid-free plating technology is widely applicable.

the palladium catalyst into the interior of the resin when the PA component swells from exposure to acid in the catalyst addition process. On the other hand, the role of the ABS component is to immobilize the catalyst dispersed in the resin structure without swelling, even during the catalyst addition process.

Scanning transmission electron microscope (STEM) observation indicates that the catalyst has permeated down from the molded product surface while avoiding the ABS phase, and that the structure thus formed is just like tree roots in the earth. Deposition of nickel metal in relation to this structure has also been verified in the plating process, and as a result of this structure it is thought that the strong plating adhesion is realized. More than 10 patents have been applied covering this technology.

Daicel Polymer believes that by using this plating technology it is theoretically possible to substitute all resin plating currently employing chromic acid etching. Future plans call for worldwide deployment of the technology in decorative coating applications, as well as for electromagnetic shield plating and printed circuit board plating, with joint business with other companies, including other resin manufacturers, also being an option.



STEM image shows enhanced plating adhesion obtained through the use of the new technology.