Cr- AND Pd-FREE ELECTROLESS PLATING ON 3D-PRINTED PHOTOCURABLE RESIN PARTS

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ABSTRACT

Plating on plastics (PoP) is a key process for producing a metallic coating on non-conductive polymeric substrates to enhance their wear and corrosion resistance and to aesthetically improve their appearance. Currently, industrial processes employ toxic and/or expensive chemicals such as chromic acid for the etching and Pd-Sn colloidal solutions for the activation of the polymeric surface before the final electroless deposition step (metallization).[1] In the last 20 years, the PoP research community has been investigating greener and less expensive alternative procedures that do not involve the use of Cr^{6+} and/or Pd-Sn. In addition, coupling of PoP with 3D polymer-based printing technologies can lead to the manufacturing of complex, custom-made metallized plastic objects that are used in scientific, industrial, and daily life applications.

In this study, photocurable resin flat parts were 3D printed via stereolithography (SLA) and then coated via an environmentally benign process that employs KOH for the etching (instead of Cr^{6+} solutions),[2] [$Ni(CH_3COO)_2$] for the activating (instead of Pd/Sn colloidal solutions)[3] and Ni-P electroless solutions for the final metallization step. The chemical and morphological properties of the polymeric surface were evaluated by FT-IR spectroscopy, thermogravimetric analysis, contact angle measurements and scanning electron microscopy (SEM). A uniform, smooth Ni-P layer of approximately 4 μm thickness was obtained.

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KEYWORDS: Plating on plastics, palladium-free, chromium-free, 3D printing, Ni-P plating

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