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STUDY ON MOISTURE-CURED POLYURETHANE AS UNDERCOATING LAYER FOR METALLIZATION

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ABSTRACT

In this work a technique of metallizing substrate via electroless plating using moisture-cured polyurethane (MCPU) system as the undercoat is presented. MCPU prepolymer was prepared by mixing polyethylene glycol divinyl ether and diphenylmethane-4, 4'-diisocyanate in 1:1 ratio. The effects of etching time as well as curing period on the surface characteristic of MCPU undercoating were investigated. Contact angle measurements, FTIR and SEM were employed to study the changes on the surface of the treated MCPU undercoats prior to electroless nickel plating. Electroless plating was performed using nickel bath and visual inspection was performed after completing the electroless plating cycles. Relative increase in wettability of the treated MCPU was observed. The surface became hydrophilic after subjecting to mild etching for 1 minute. SEM analysis revealed different pitted structures on the treated MCPU that were cured at different periods. FTIR analysis of the treated MCPU showed some chemical changes marked by the presence of free hydroxyl group and decrease of CH (methylene), urethane C=O, urethane amide and ether peaks. FTIR also showed the sign of further NCO reaction, which indicates by the decrease of NCO peak and increase of NH and urea C=O peaks. The standard pull-off testing method (ASTM D 4541) was employed to evaluate the adhesion strength of nickel deposits coated on MCPU undercoating layer. The test results revealed that curing period and etching time influence the adhesion performance. The results also show that at a selected curing period, prolong etching time will decrease the adhesion strength. Meanwhile prolong curing period will improve the adhesion strength.

Keywords: Moisture-cured polyurethane, undercoating layer, electroless plating, nickel

1. INTRODUCTION

Electroless plating is the ideal for applications in automotive and non-automotive decoratives. electronics, sporting goods, appliances and plumbing [1]. Decorative application accounts for about 80% of the nickel consumed in plating [2]. However, this number does not reflect the genuine utilization of plating application for decorative structures. This was due to plating for decorative it is usually limited to platable substrates, whereas artworks such as relics and many crafts are fabricated from variety of non-platable materials. Many techniques are available nowadays for plating substrates other than the platable grades such as paints and vacuum

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