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Plasma and laser surface activation of polymer coatings intended for direct electroless metallization

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In this work, results and comparison of plasma and laser modifications of specially compounded polymer coatings are presented. The main aim of the applied modification techniques was to form surface catalytically active and fully prepared for the direct electroless metallization. Polymer coatings were produced of copper(II) oxide and copper(II) acethyloacetonate powders, and acrylic resin as polymer matrix. Oxygen plasma (f=44 kHz) andArF excimer laser radiation (λ=193nm) were applied to modify the surface of polymer coatings. The coatings were exposed to oxygen plasma at various treatment times or irradiated with various numbers of laser pulses at different fluences. The metallization procedure of the plasma or laser treated coatings was performed by use of a commercial metallization bath and formaldehyde as a reducing agent. The samples were examined using the Fourier transform infrared spectroscopy (FTIR), X-ray photoelectron spectroscopy (XPS) and atomic force microscopy (AFM). Results show that the plasma as well laser treatments can induce reduction of copper(II) oxide to metallic copper(0), thus make the coating surfaces catalytically active and fully prepared for direct electroless metallization. Comparative analysis of laser and plasma induced surface alterations was presented and chemical reaction models were proposed.

Keywords
Plasma modification
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