376d Effects of Catalyst Introduction Methods on Metal Pattern Structure and Selectivity Using Dendrimer/Polyelectrolyte Multilayer Coated Substrates

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Modern nano and microelectronic research is heading toward flexible substrates combined with inexpensive metal patterning techniques that have high selectivity. We demonstrate novel versatile processes for creating selective metal patterns on various substrates by utilizing various generations of dendrimers and/or polyelectrolyte multilayer (PEM) coatings, microcontact printing (μCP), and electroless and/or electro depositions. Optical microscopy, quartz crystal microbalance, atomic force microscopy, contact angle measurements, ellipsometry, electron microscopy and energy dispersive x-ray spectroscopy were used to analyze the selectivity and structure of the deposited metal (e.g., copper, nickel, and gold) that were created by different methods of patterning palladium catalysts on PEM surfaces. The different methods include direct stamping of the palladium catalyst, directed self-assembly of the catalyst, and encapsulation of the catalyst in a carrier molecule. In the directed self-assembly approach positively charged poly(amidoamine) (PAMAM) dendrimers were μCP onto a negatively charged surface and utilized as a template to direct the negatively charged catalyst to specific regions on the surface. Different generations of PAMAM dendrimers were used as carrier molecules to encapsulate palladium catalyst ions and nanoparticles before μCP onto the PEM surface. The direct catalyst stamping method was determined as the most selective method. The catalyst stamping method was further studied with electro or electroless deposition.