Columbia Technology Ventures

In-Situ Plating and Etching of Material Covered with a Surface Film

Technology #m06-078

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Problem or Unmet need: Materials often need to be coated or plated with metal layers for to improve electrical conductivity, surface finishing, chemical tolerance or aesthetics. Coating a material through electroplating processes requires the material to act as one electrode in an electrochemical cell. When the current is passed between electrode and a counter electrode the metal ions from the electrolyte deposit on the material. Non-conductive coatings, such as oxidation, prevent ions from reaching the native surface. Electroplating of metals such as aluminum, tungsten, and tantalum becomes very difficult due to the presence of this oxide layer.

Existing techniques to coat such metals require long, expensive steps. For example to plate onto aluminum requires preliminary zincating steps. For tantalum and tungsten high temperature processing is required followed by gold plating prior to depositing the metal of choice. These extra steps make the electroplating of commonly used metals hard and cost intensive.

Details of the Invention: The present invention describes methods for etching and coating of materials which are already covered in a thin film of natural oxide. The process involves first etching the oxide film to clean up the surface of material and then using traditional electroplating techniques to plate the desired metal. Following processes can be used to take away the oxide layer: using a laser pulse as a source of heat to remove oxide, a current pulse as source of heat or metal scratching tools. These cleaning/etching processes can be combined together along with electroplating in the same system. Such hybrid systems can find excellent use as reel to reel electroplaters where a continuous sheet of material is fed inside the system; metals would be first cleaned then coated in a continuous motion. This leads to a significant reduction in processing time. The oxide coated metal to be plated is placed in the electrolyte and the laser, mechanical action or voltage discharge between anode and cathode, thereby all processing takes place in the electrolyte, eliminating many steps found in conventional plating. The described processes make it possible to obviate the need of a number of pre-processing steps as mentioned. This in turn leads to a major reduction in physical space or real estate for the plating line, an important cost saving benefit.

Applications: • Plating rapidly oxidized materials like aluminum, tantalum and tungsten in a fewer number of steps, hence reducing costs. • Reel to reel electroplating of metals sheets. • If localized control on the oxide etching can be achieved, for e.g. through focused laser pulse then this process can be used to plate new metal in defined regions of the existing metal plate. • Could have application in microprocessor industry where electroplating is currently the used for depositing metals (copper) or in optical memory fabrication. • Cleaning of oxide layers formed on artifacts and in preserving them through coating noble metals.
Advantages: • Fewer steps, no need for high temperature treatment for oxide removal. • Potentially low cost and faster electroplating for rapidly oxidizable materials. • Compact system design, target material is not exposed to outside atmosphere throughout the process, less chances of contamination.

Opportunity: Columbia University is seeking partners for licensing or sponsored research agreements to develop and commercialize methods for in-situ plating of oxidized metals.


Licensing Status: Available for Licensing and Sponsored Research Support

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