

Immobilization of colloidal particles into sub-100nm porous structures by electrophoretic methods in aqueous media

ABSTRACT

Conventional direct current (DC) and pulse-DC assisted electrophoretic depositions of colloidal particles, with average sizes of 10 and 50 nm, into sub-100 nm scaled pore arrays made from anodized aluminum substrate has been investigated. At the applied voltages lower than the decomposition voltage of water (~ 1 V), the number concentration of particle deposited on the surface by conventional DC was higher than that of pulse DC. The number of deposited particles increased with increasing pH. Deposition efficiency inside the pores can be enhanced by applying pulse DC. In the case of high (~ 10 V) applied voltage, no particles were observed inside pores even though pulse DC has been applied. The adhesion strength (removal behavior) of deposition was evaluated by applying a particle detachment simple system based on ultrasonic energy. The particles deposited inside the pores were not detached compared with those of the surface of the substrate.

Keyword: Anodic aluminum oxide; Nanoparticle; Electrophoresis; Pulse; Detachment