Assembling Nanoparticles into Macroscale Film: Electrophoretic Deposition of Colloidal Nanoparticles

하돈형†
중앙대학교
(dhha@cau.ac.kr†)

The inherent properties of nanoparticles (NPs) can be engineered into macroscopic structures by capturing the collective characteristics of the nanomaterials via a fabrication process to realize macroscopic functionality. To construct large volumes and the colloidal assembly domain for actual devices with nanosized materials as building blocks, two- or three-dimensional NP assemblies should be either aligned or randomly oriented on a substrate through alternative fabrication processes. In particular, electrophoretic deposition (EPD), which is a solution-based process suitable for depositing various colloidal NPs dispersed in polar and non-polar solvents on various substrates, is a well-known method for fabrication of large-scale NP films for nanostructured devices. Herein, we report a powerful manufacturing technique for fabricating NP films composed of highly porous NP layers conformally deposited on macroporous carbon paper that shows excellent electrochemical properties. In addition, in-situ analysis was performed to uncover the dynamics of NPs in a solvent under a high electric field.