

A Combinatorial Approach to the Discovery of New Meso(Nano)porous and Nanoparticulate Materials

백성현*, Thomas F. Jaramillo¹, Alan Kleiman-Shwarsstein¹, Eric W. McFarland¹
인하대학교 화학공학과; ¹Department of chemical Engineering, University of California Santa
Barbara
(shbaeck@inha.ac.kr*)

Automated systems for electrochemical synthesis and high throughput screening of catalytic materials were developed and used to prepare a library of nanoparticulate materials and mesoporous materials. Nanoparticulate materials such as Pt, Au, and WO₃, were synthesized by combinatorial pulsed electrodeposition method and mesoporous WO₃ films were successfully synthesized by electrodeposition method using SDS (sodium dodecyl sulfate) as a templating agent.

A library of nanoparticulate gold supported on TiO₂ was synthesized and characterized by automated systems for electrochemical synthesis and high throughput screening of catalytic materials. Nanoparticulate tungsten oxide films were also synthesized by pulsed electrodeposition. Particle sizes between 25 and 330 nm were achieved.

Mesoporous WO₃ films with a lamella structure have been synthesized by electrodeposition using sodium dodecyl sulfate (SDS) as a templating agent. Compared to non-porous WO₃ prepared with isopropanol instead of SDS, lamella phase mesoporous WO₃ showed higher photocatalytic activity and greater current density for hydrogen intercalation.