

Electrochemical Atomic Layer Deposition of Platinum Group Metal Electrocatalysts

안상현[†], 이현주

중앙대학교 화학신소재공학부

(shahn@cau.ac.kr[†])

Commercialization of hydrogen production and utilization technology via energy conversion are limited by cost problem due to the use of noble metal electrocatalysts. In order to overcome the bottleneck, the development of overlayer electrocatalysts has been investigated to reduce the cost as well as increase the catalytic activity. There are various methods to fabricate the overlayer structure in subnanometer scale such as atomic layer deposition (ALD), chemical reduction and surface limited redox reaction (SLRR). However these conventional methods encounters the methodological disadvantages.

Here, a simple electrochemical process named electrochemical atomic layer deposition (EALD) is presented. The H passivation layer inhibit the further reduction of metal ions in electrolyte at highly negative overpotential. However, the surface of electrode can be reactivated by pulsing the potential to more positive values where the adsorbed H is oxidized. Interestingly, with the repeated pulses, the layer-by-layer structure can be obtained by the simple EALD process. The catalytic activity of ultrathin film electrocatalyst match or exceed the best activity recently reported in fuel cell and water splitting reactions.