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Palladium Layers on an Au(111) Nanoparticle and Their Catalytic Activity to Formic Acid Oxidation

김병권, 서대하, 송현준, 박주현

한국과학기술원 화학과

Nanoparticles have been received great attention from many researchers for several decades because of their good and unique properties. In particular, researches in the field of synthesis of bimetallic nanoparticles showed good results for the past ten years. In this research, Pd thinlayer on Au nanoparticles were synthesized by electrochemical deposition method. Well-defined Au(111) nanoparticles were synthesized by solution based reduction method. Electrochemical deposition conditions for Pd thinlayer on Au(111) nanoparticles surface were carefully regulated by controlling parameters of cyclic voltammetry. To calculate exact mass and surface area catalytic activities of deposited Pd thinlayer on Au(111) nanoparticle, electrochemically active surface area (ECSA) and mass of the deposited Pd thinlayer were measured by cyclic voltammetry in 0.1 M HClO₄ solution. Afterward, catalytic activities of the deposited Pd thinlayer were measured in 0.1 M HClO₄ + 0.2 M formic acid solution. In case of less negative deposition potential, the amounts of deposited Pd mass and surface area were small. However, mass and ECSA activity of the deposited Pd to oxidize formic acid were increased.

Keywords: nanoparticle, palladium, electrochemical deposition