Electrochemical Fabrication of Pseudo Platinum Foam and its Application in Methanol Electrooxidation

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Porous non-noble metal foams find many industrial applications, however applications of noble metal platinum (Pt) foams were scarce. In this work, we demonstrate a successful fabrication of a pseudo Pt foam by electrochemically coating Pt onto a Ni foam template. A thin ~55 nm Pt layer was electrochemically deposited on a Ni foam with a solution consisting of a low concentration of chloroplatinic acid (H₂PtCl₆) and polyvinyl pyrrolidone (PVP) additive, using cyclic voltametric deposition technique (-0.3 ~ 0 V vs Ag/AgCl). PVP played a critical role in forming a thin and compact Pt layer. The fabricated pseudo Pt foams were free from cracks and presented good stability in acidic solution. The pseudo Pt foams contained trace amount of Pt, and exhibited typical chemical properties of metallic Pt and high surface area same as Ni foam base. With the application of as obtained Pt foam as a catalyst for methanol electrooxidation, the mass-specific current obtained is comparable to the commercial Pt/C electrocatalyst. The as-fabricated three-dimensional interconnected porous Pt foams may find versatile electrochemical applications as cost-effective working electrodes or auxiliary electrodes, in fuel cells, (dye sensitized solar cells) DSSCs, sensors, supercapacitors, and so on.

Keywords: Pt foam; Ni foam; fuel cell; methanol; electrodeposition; PVP

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