Porous Palladium Substrates by Cosputtering and Dealloying to Enhance Hydrogen/Deuterium Loading

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Anomalous heat generation in palladium-based materials in the presence of deuterium has been a subject of active research since Martin Fleischmann and Stanley Pons claimed this mysterious phenomenon as nuclear fusion. More recently, nanostructured palladium have been investigated due to the large surface area that would increase the deuterium loading. We have developed a process to obtain nanoporous palladium foil by cosputtering and dealloying technique. Nickel-Palladium alloy (NiPd) films were cosputtered on plain palladium foil as well as on aqua regia etched palladium foil by sputtering system. Dealloying, is a technique where an element is selectively etched out from an alloy. Ferric chloride was used to etch Nickel from NiPd films. As deposited and dealloyed films were characterized by different analytical tools like X-ray diffractometer, EDX, electrochemical measurements and SEM. Elemental analysis confirm that Nickel is completely removed after dealloying and SEM images reveal a Micro/nano porous palladium structure. Cyclic Voltammetry (CV) measurements show high electrochemically active surface area implying the fabricated porous structure grants easy access to the electrolyte solution. Studies are underway to determine the effect of porosity on the loading of hydrogen/deuterium in these porous palladium structures.