Pd-Al Alloys Formation by Aluminium Underpotential Deposition on Palladium from Equimolar $\text{AlCl}_3 + \text{NaCl}$ Melt

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The possibility of electrochemical underpotential deposition of aluminium onto palladium from equimolar $\text{AlCl}_3 + \text{NaCl}$ melts at temperatures between 200 ° and 300 °C was investigated. Electrochemical techniques used were cyclic voltammetry, chronoamperometry, potentiodynamic polarization and open circuit measurements. The results were analyzed by SEM, EDX and XRD. It was found that aluminium deposits underpotentially onto palladium at around 0.200 V vs. Al from the chloroaluminate melt used. It was established that under the given conditions, Al underpotential deposition onto the palladium substrate can result in AlPd and Al_3Pd_4 alloy synthesis by solid-state interdiffusion. The surface alloys synthesized are well adhering, microcrystalline deposits, having highly developed surface area suitable for applications such as hydrogen purification filters.

Keywords: Aluminium alloys, electrodeposition, intermetallics, solid-state interdiffusion, X-ray diffraction (XRD)

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