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Inhibitive effect of Pt on Pd-hydride formation of Pd@Pt core-shell electrocatalysts: an in situ EXAFS and XRD study

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Abstract

In situ EXAFS and XRD have been used to study the electrochemical formation of hydride phases, H_{abs}, in 0.5 M H_2SO_4 for a Pd/C catalyst and a series of Pd@Pt core-shell catalysts with varying Pt shell thickness, from 0.5 to 4 monolayers. Based on the XRD data a 3% lattice expansion is observed for the Pd/C core catalyst upon hydride formation at 0.0 V. In contrast, the expansion was ≤ 0.6% for all of the core-shell catalysts. The limited extent of the lattice expansion observed suggests that hydride formation, which may occur during periodic active surface area measurements conducting during accelerated aging tests or driven by H_2 crossover in PEM fuel cells, is unlikely to contribute significantly to the degradation of Pd@Pt core-shell electrocatalysts in contrast to the effects of oxide formation.