510d Insights into the Overpotential for Oxygen Reduction on Pt and Pt Skin Alloys: a Comparison of Theory and Experiment

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The catalytic activity at cathode proves to be a major source of the overpotential that limits most PEM fuel cells. While it is well established that the formation of Pt skin layers on various alloys such as PtCo and PtCr can enhance the catalytic activity by preventing the formation of surface hydroxyl intermediates, it is unclear why there is only a modest change in the overpotential at the cathode. Herein, we examine the initial stages of adsorption and the activation of O2 as a function of applied potential over Pt in the presence of an aqueous media. The results suggest that while OH is minimized other intermediates can compete for O2 adsorption sites and thus limit its activation. The results are compared with experimental results on well-defined Pt and Pt skin alloys.