Elucidation of the Oxygen Reduction Volcano in Alkaline Media using a Copper-Platinum(111) Alloy - DTU Orbit (01/01/2019)

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The relationship between the binding of the reaction intermediates and oxygen reduction activity in alkaline media was experimentally explored. By introducing Cu into the 2nd surface layer of a Pt(111) single crystal, the surface reactivity was tuned. In both 0.1 m NaOH and 0.1 m KOH, the optimal catalyst should exhibit OH binding circa 0.1 eV weaker than Pt(111), via a Sabatier volcano; this observation suggests that the reaction is mediated via the same surface bound intermediates as in acid, in contrast to previous reports. In 0.1 m KOH, the alloy catalyst at the peak of the volcano exhibits a maximum activity of 101±8 mAcm−2 at 0.9 V vs. a reversible hydrogen electrode (RHE). This activity constitutes a circa 60-fold increase over Pt(111) in 0.1 m HClO4.

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