Platinum-free fuel cells: development of nanostructured electrocatalysts for anion exchange membrane fuel cells

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One of the biggest obstacles to the diffusion of fuel cells is their cost, a large part of which is due to platinum (Pt) electrocatalysts. Recent analyses have shown that around 20 % of the total system cost comes from platinum (Pt). Therefore, complete removal and replacement with metals that are less expensive and more abundant in nature is crucial to make this technology an affordable solution for automotive as well as other large scale applications. This is a difficult if not impossible task for proton exchange membrane fuel cells (PEM-FCs) because of the corrosive nature of the acidic membrane. The *Alkaline* Exchange Membrane Fuel Cell (AEM-FC) has been proposed as a solution as non-Pt metals may be employed. Despite this, few examples of Pt free AEM-FCs have been demonstrated with modest power output. The main obstacle preventing the realization of a high power density Pt free AEM-FC is sluggish hydrogen oxidation (HOR) kinetics of the anode catalyst. Here we describe a Pt free AEM-FC that employs a mixed carbon-CeO_2 supported palladium (Pd) anode catalyst that exhibits enhanced kinetics for the HOR. AEM-FC tests run on dry H_2 and pure air show peak power densities of more than 500 mW cm^{-2}.