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The role of low coverage sodium surface species on electrochemical promotion in a Pt/YSZ system

Abstract

The effect of sodium-modification on the catalyst and electrocatalytic properties of a platinum catalyst supported on a YSZ solid electrolyte was studied. Increasing the sodium coverage on the catalyst surface appears to block some of the three-phase boundary (tpb) sites and reduces the rate of the charge transfer reaction. The promotion of the platinum surface reaction (ethylene oxidation) seems to a first approximation to be a function of the rate of oxygen supply or removal to or from the surface irrespective of whether this is contaminated by sodium or not (samples with sodium contamination require a higher overpotential to achieve the same current density as a clean sample because of poisoning in the tpb). At high negative polarisations (oxygen removed from the surface) the sodium contaminated samples show a significant increase in rate, possibly due to the decomposition of e.g. sodium hydroxides and carbonates.

Keywords

Cyclic voltammetry; EPOC; Ethylene oxidation; Na species; Oxygen charge transfer; Pt; YSZ