

# The role of sodium surface species on electrochemical promotion of catalysis in a Pt/YSZ system: The case of ethylene oxidation

## Abstract

The role of sodium addition as foreign (impurity) species on the electrochemical promotion of ethylene oxidation in a Pt/YSZ system was investigated. It was found that the presence of sodium surface species on the catalyst surface can significantly affect its catalytic and electrocatalytic properties, but there is no clear evidence at this stage that such species are necessary for the observation of EPOC. Under negative polarisation, low coverage sodium was found to have a pronounced effect on the electrochemical promotion of ethylene oxidation as an electronic promoter. The reaction changed behaviour from electrophilic at low sodium coverage (0.11%) and low to intermediate oxygen partial pressure ( $p_{O_2} \leq 3.0$  kPa) to electrophobic at high sodium coverage (65%) and under high oxygen partial pressures ( $p_{O_2} = 8.0$  kPa). In between the two sets of conditions, the reaction showed volcano-type behaviour depending on the coverage of sodium and gas-phase oxygen partial pressure.