Kinetic parameters for the Hydrogen Oxidation Reaction
on Pt(hkl) Electrodes in Dilute Sulphuric Acid

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In the modelling and computer simulation of PEM fuel cells, the prediction of activation polarization has generally concentrated on the cathode losses. Anode activation losses are commonly much smaller and tend to be ignored compared to cathode losses. Further development of the anode activation polarization term is being undertaken in order to broaden the application and usefulness of PEM models in general. The immediate goal is the development of better understanding of the kinetics and mechanism of the hydrogen oxidation reaction (HOR) on the various single-crystal Pt species. The eventual goal is to further develop the modelling of activation polarization at polycrystalline Pt anodes over the range of operating conditions found in PEMFC operation.

We analyse previously published experimental data for the hydrogen oxidation reaction (HOR) using Pt(hkl) electrodes in dilute H_2SO_4. Correlations for diffusion-free exchange current densities are presented for various single crystal Pt electrodes. The analysis proposes different mechanistic schemes and, by fitting to the experimental data, determines kinetic parameters.

It is concluded that the HOR on Pt(110) electrodes follows a Tafel-Volmer reaction sequence.