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Hydrogen evolution at Pt(111) – activation energy, frequency factor and hydrogen repulsion

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Abstract

Hydrogen evolution on Pt(111) is investigated as a function of temperature; the results are interpreted in terms of the theory of electrocatalysis. The current-potential curves are consistent with a Volmer-Tafel mechanism, in which the recombination of two weakly adsorbed hydrogen atoms determines the overall rate, and in which the adsorbed hydrogen shows a repulsive interaction. The pre-exponential factor of about 10^9 A cm^{-2} is high and indicates a rate determining step that occurs only on the surface. The activation energy is of the order of 0.5 – 0.6 eV and concurs with previous theoretical estimates.

keywords: hydrogen evolution; activation energy; pre-exponential factor; Pt(111)

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