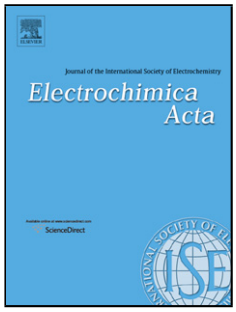

Title: Hydrogen evolution at Pt(111) – activation energy, frequency factor and hydrogen repulsion

Author: Zheng-Da He Jie Wei Yan-Xia Chen Elizabeth Santos Wolfgang Schmickler

PII: S0013-4686(17)31998-9
DOI: https://doi.org/doi:10.1016/j.electacta.2017.09.127
Reference: EA 30326

To appear in: *Electrochimica Acta*

Received date: 10-8-2017
Revised date: 15-9-2017
Accepted date: 20-9-2017

Please cite this article as: Zheng-Da He, Jie Wei, Yan-Xia Chen, Elizabeth Santos, Wolfgang Schmickler, Hydrogen evolution at Pt(111) ndash activation energy, frequency factor and hydrogen repulsion, *<![CDATA[Electrochimica Acta]]>* (2017), https://doi.org/10.1016/j.electacta.2017.09.127

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

Zheng-Da He[a], Jie Wei[a], Yan-Xia Chen[a*], Elizabeth Santos[b,c], and Wolfgang Schmickler[b*]
[a]Hefei National Laboratory for Physical Sciences at Microscale
Department of Chemical Physics
University of Science and Technology of China,
Hefei, 230026, China
[b] Institute of Theoretical Chemistry, Ulm University, Germany
[c]Facultad de Matemática, Astronomía y Física,
IFEG-CONICET
Universidad Nacional de Córdoba, Córdoba, Argentina

September 14, 2017

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 $10^9 \mathrm{A\ cm^{-2}}$ 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)

*corresponding authors