

Combining Impedance and Hydrodynamic Methods toward Hydrogen Evolution Reaction to Characterize Pt(pc), Pt5Gd, and Nanostructure Pd Electrocatalyst

Authors : Kun-Ting Song, Christian Schott, Peter Schneider, Sebastian Watzele, Regina Kluge, Elena Gubanova, Aliaksandr S. Bandarenka

Abstract : The combination of electrochemical impedance spectroscopy (EIS) and the hydrodynamic technique like rotation disc electrode (RDE) provides a critical method for quantitatively investigating mechanisms of hydrogen evolution reaction (HER) in acidic and alkaline media. Pt5Gd represented higher HER activities than polycrystalline Pt (Pt(pc)) by means of the surface strain effects. The model of the equivalent electric circuit to fit the impedance data under the RDE configurations is developed. To investigate the relative reaction contribution, the ratio of the charge transfer reactions of the Volmer-Heyrovsky and Volmer-Tafel pathways on Pt and Pt5Gd electrodes is determined. The ratio remains comparably similar in acidic media, but it changes in alkaline media with Volmer-Heyrovsky pathway dominating. This combined approach of EIS and RDE can help to study the electrolyte effects and other essential reactions for electrocatalysis in future work.

Keywords : hydrogen evolution reaction, electrochemical impedance spectroscopy, hydrodynamic methods, electrocatalysis, electrochemical interface

Conference Title : ICET 2023 : International Conference on Electrochemistry and Technology

Conference Location : Reykjavik, Iceland

Conference Dates : November 20-21, 2023