Gastight Rotating Cylinder Electrode: Towards Decoupling Mass Transport and Intrinsic Kinetics in Electrocatalysis

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Abstract

Decoupling and understanding the various mass, charge and heat transport phenomena involved in the electrocatalytic transformation of small molecules (i.e. CO2, CO, H2, N2, NH3, O2, CH4) is challenging but it can be readily achieved using dimensionless quantities (i.e. Reynolds, Sherwood, Schmidt, Damköhler, Nusselt, Prandtl, and Peclet Numbers) to simplify the characterization of systems with multiple interacting physical phenomena. Herein we report the development of a gastight rotating cylinder electrode cell with well-defined mass transport characteristics that can be applied to experimentally decouple mass transfer effects from intrinsic kinetics in electrocatalytic systems. The gastight rotating cylinder electrode cell enables the dimensionless analysis of electrocatalytic systems and should enable the rigorous research and development of electrocatalytic technologies.

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