Proton Exchange Membrane Fuel Cells Powered with H₂/CO Mixture and Pure Carbon Monoxide

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Abstract: Proton exchange membrane fuel cells (PEMFCs) suffer extreme CO poisoning even at PPM level, owning to the preferential CO adsorption and the consequential blockage of the catalyst surface. Herein, however, we report that CO itself can become an easily convertible fuel in PEMFC using atomically dispersed M-N-C catalysts. With CO to CO₂ conversion initiates at 0 V vs. RHE, pure CO powered fuel cell attains unprecedented power density at 236 mW cm⁻², with maximum CO turnover frequency (64.65 s⁻¹, 363 K) far exceeds any chemical or electrochemical catalysts reported. Moreover, by regulating the active center of the catalysts, we achieve a high fuel cell performance with H₂+CO mixture as fuel. The carefully regulated M-N-C catalyst confers the PEMFCs with a maximum power density at ~650 mW cm⁻² using H₂+1000 ppm CO as fuel. We attribute such catalytic behavior to the weak CO adsorption and the co-activation of H₂O due to the interplay between two adjacent single metal sites.

References:

Biography:
Prof. Dr. Junjie Ge received her Ph.D. in physical chemistry from Chinese Academy of Sciences in 2010. She worked at University of South Carolina and University of Hawaii as a postdoc fellow for almost 5 years. She joined Changchun Institute of Applied Chemistry in 2015 as a professor, where she was recruited in the Hundred Talents Program in CAS (2015). Her research interests comprehend fuel cells, electrochemistry, and catalysis. She has published 80+ peer-reviewed papers on J. Am. Chem. Soc., Nat. Commun, Angew. Chem. Int. Ed., Energy Environ. Sci., etc. She’s currently a board committee member of IAOEES, a youth editor of 《Chinese Chemical Letters》, a member of international society of electrochemistry (ISE), and etc.