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ATOMIC LAYERED Au CLUSTERS ON α-MoC AS CATALYST FOR WATER GAS SHIFT REACTION

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ETH Hönggerberg, HCI J 3
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Abstract: The water gas shift (WGS) reaction ($CO+H_2O=H_2+CO_2$) is an essential process for hydrogen generation/upgrading in various energy-related chemical operations. Normally for a chemical reaction, higher reaction temperature renders higher reaction rate. However, from a thermodynamic point of view, WGS is an equilibrium-limited reaction that is favoured at low temperature. In particular, the potential application in fuel cells requires the commercial WGS catalyst to be highly active, stable and energy-efficient. Under these criteria, decreasing the reaction temperature will not only give a considerable rise in the CO equilibrium conversion but will also exhibit potential in reducing the energy consumption, and match the working temperature of on-site hydrogen generation and consumption units. Here by creating Au layered clusters on an α-MoC substrate, we have successfully constructed an interfacial catalyst system for the ultra-low temperature WGS reaction. Water is activated over α-MoC at 303 K, while CO adsorbed on adjacent Au sites is apt to react with surface hydroxyls formed from water splitting, leading to an unprecedented low-temperature WGS activity.

Bio: Ding Ma read chemistry in Sichuan University (1996), and obtained his Ph.D from the State Key Laboratory of Catalysis, Dalian Institute of Chemical Physics (2001). After his postdoctoral stay in Oxford University and University of Bristol, he started his research career in Dalian Institute of Chemistry as associate professor (2005). He was promoted as a full professor in 2007 and moved to Peking University in 2009. His research interests are heterogeneous catalysis, especially those related with energy issues, including C1 chemistry (methane, carbon dioxide and syngas conversion), hydrogen production/transportation, new reaction route for sustainable chemistry and the development of in-situ spectroscopic method that can be operated at working reaction condition to study reaction mechanism. He is currently the advisory board member or editorial board member of Chinese Journal of Chemistry, Science Bulletin, Journal of Energy Chemistry, Catalysis Science & Technology, Joule, ACS Catalysis etc.