Au/α-MoC catalyst for water gas shift reaction

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The water gas shift (WGS) reaction (CO+H2O=H2+CO2) 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 favored 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.