O_2 activation and low temperature CO oxidation at the metal-oxide interface

Fan Yang[1], Xinhe Bao[1]

[1] *State Key Laboratory of Catalysis, Dalian Institute of Chemical Physics, Chinese Academy of Sciences, Dalian 116023, China*
Email: fyang@dicp.ac.cn

Despite tremendous importance, the metal-oxide interface remains poorly understood in catalysis since interfacial sites are of trace amount and difficult to measure. Recently, the FeO-Pt interface has been suggested to exhibit remarkable activity in the preferential oxidation of CO (PROX) in excess H_2 [1]. Combining microscopic and spectroscopic methods, CO oxidation was investigated at the Pt-FeO interface, to understand the mechanism of low temperature CO oxidation and the catalytic property of the metal-oxide interface. Size effect was further investigated using different-sized FeO nanostructures as the model system. Although our capability to measure the size-dependent geometric or electronic properties has reached the atomic level, these properties were usually measured statically and in the absence of reactive gases. By resolving the interaction between nanostructures and reactants at the atomic level, we demonstrate a dynamic size effect that could govern the chemical properties of nanostructures and the catalytic process [2]. We demonstrate further how the interplay between dynamic size effect and interfacial confinement [3] could enable the exceptional catalytic properties of supported nanoclusters.

References:
[1] Q. Fu, W. Li, X. Bao et al., Interface-Confined Ferrous Centers for Catalytic Oxidation, Science 2010, 328, 1141-1144.
[2] Y. Liu, F. Yang, X. Bao et al., Enhanced oxidation resistance of active nanostructures via dynamic size effect, Nat. Commun., 2017, 8, 14459.
[3] G. Zhao, F. Yang, Z. Chen, Z. Niu, Y. Li et al., Metal/oxide interfacial effects on the selective oxidation of primary alcohols, Nat. Commun., 2017, 8,14039.