

Understanding Nano Effects in Catalysis

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Catalysis, as a key and enabling technology, plays an increasingly important role in fields ranging from energy, environment and agriculture to health care. Rational design and synthesis of highly efficient catalysts has become the ultimate goal of catalysis research. Thanks to the rapid development of nanoscience and nanotechnology, and in particular a theoretical understanding of the tuning of electronic structure in nanoscale systems, this element of design is becoming possible via precise control of nanoparticles' composition, morphology, structure and electronic states. At the same time, it is important to develop tools for in-situ characterization of nanocatalysts under realistic reaction conditions, and for monitoring the dynamics of catalysis with high spatial, temporal and energy resolution. In this talk, I will discuss confinement effects in nanocatalysis, a concept that we have put forward and developed over several years. Taking the confined catalytic systems of carbon nanotubes (CNTs), metal-confined nano-oxides, and two-dimensional (2D) layered nano-catalysts as examples, we summarize and analyze the fundamental concepts, the research methods and some of the key scientific issues involved in nanocatalysis.

References

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Bao's Biography

BAO Xinhe received his PhD in Physical Chemistry from Fudan University in 1987 and then worked as a Fellow of Alexander von Humboldt in Frize-Haber institute of Max-Planck Society in Berlin/Germany. He became a full Professor of the Dalian Institute of Chemical Physics (DICP, CAS) in China in 1995 and group leader of Nano & Interface Catalysis at the State Key Laboratory of Catalysis later. He held the position of the institute director from 2000 to 2007, and was appointed the President of Shenyang Branch of the Chinese Academy of Sciences in 2009.



Bao is the member of Chinese Academy of Sciences, the member of the Academy of Sciences for the Developing World (TWAS) and the fellow of the Royal Society of Chemistry (UK). He is currently the vice President of Chemistry Society of China and the President of Chinese Society of Catalysis. Bao is Editor-in-chief of Journal of Energy Chemistry (JEC, Elsevier), and his name is listed in the editorial board or international advisory board of several international scientific journals, including Angew. Chem. Int. Ed., Energy & Env. Sci., Chem. Sci., Surf. Sci. Report, ChemCatChem, ChemPhysChem, Surf. Sci. and etc.

His research focuses mainly on the fundamental understanding of catalysis, and its application to the development of new catalyst and catalytic process related to energy conversion, in particular clean coal and natural gas utilization. His achievements in catalysis of nanoporous materials, nano-structured carbon materials and nano-sized oxide particles, as well as in fundamental understanding of nano-confined catalysis have been well recognized worldwide. BAO has published more than 500 scientific papers and 1 book (Elsevier) with a citation over 12000 times, and filed 120 patents. He was awarded the prizes of National Science Award (second Class, 2005) , HLHL Prize (Hong Kong, 2012) , top ten scientists in China in 2014 and ZHou Guangzhao award for basic science in 2014.