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Improved NOx reduction by Using Novel Catalysts

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Abstract:

NO_x, which comes from the combustion of fossil fuels and mobile sources, remains to be one of the most dangerous environmental pollutants. So far, great efforts have been done on the development of cost-effective and efficient $DeNO_x$ technologies. Among these technologies, the selective catalytic reduction of NO with NH_3 (NH_3-SCR) have been considered as one of the most promising technologies with the products mainly contain N_2 and H_2O. However, there remains some inevitable problems unsolved for commercial NH_3-SCR catalysts, such as the volatility and toxicity of active species, the narrow operation temperature window, and especially the poor low-temperature operating activity. Herein, we provides a comprehensive review of our current research activities that focus on the rational design, shape control and morphology-dependent properties of nanocatalysts for nitric oxide reduction [1-16].We elaborate on the synthesis strategies of catalysts and mainly discuss their morphology-dependent properties in the catalytic applications. The compositions, morphology and surface physicochemical properties of nanocatalysts are evaluated by traditional characterization methods, *in-situ* analysis as well as surface reaction techniques, and also investigated by catalytic simulations and calculations. The relationship of active components, mophologies, surface physicochemical properties and catalytic performance are established. The adsorption and activation mechanism of the reactants over the catalysts have been deeply investigated. The nature of the active centers as well as geometric and electronic effects are elucidated. The synergistic effects of various components as well as the interactions of various nanostructures have been clarified. Finally, we introduce our recent work on the development of monlith catalyts for selective catalytic reduction of NO by using several *in situ* growth strategies. We believe that our investigation presented here is important to researchers working in catalysts. We feel that the rational design and controllable synthesis of new nanocatalysts with a much better activity and higher stability may open a new way in this field. Besides, the design ideas for nanocatalysts could be also applied in many other catalytic reactions.

References: (if applicable)

1. K. Zha, L. Kang, C. Feng, L. Han, H. Li, T. Yan, P. Maitarad, L. Shi, D. Zhang, Environ Sci: Nano, **2018**, DOI: 10.1039/c8en00226f.
2. L. Huang, X. Hu, S. Yuan, H. Li, T. Yan, L. Shi, D. Zhang, *Appl Catal B-Environ*, **2017**, 203, 778-788.
3. X. Zhao, L. Huang, H.R. Li, H. Hu, X.N. Hu, L.Y. Shi, D.S. Zhang, *Appl Catal B-Environ*, **2016**, 183, 269-281.
4. H. Hu, S. X. Cai, H. R. Li, L. Huang, L. Y. Shi and D. S. Zhang, *ACS Catal*, **2015**, 5,

6069-6077.
5. Y. Liu, J. Xu, H. R. Li, S. X. Cai, H. Hu, C. Fang, L. Y. Shi and D. S. Zhang, *J Mater Chem A*, **2015**, 3, 11543 - 11553.
6. L. Huang, X. Zhao, L. Zhang, L. Y. Shi, J. P. Zhang and D. S. Zhang, *Nanoscale*, **2015**, 7, 2743-2749.
7. H. Hu, S. X. Cai, H. R. Li, L. Huang, L. Y. Shi and D. S. Zhang, *J Phys Chem C*, **2015**, 119, 22924-22933.
8. J. Han, D. S. Zhang, P. Maitarad, L. Y. Shi, S. X. Cai, H. R. Li, L. Huang and J. P. Zhang, *Catal Sci Technol*, **2015**, 5, 438-446.
9. L. Zhang, L. Y. Shi, L. Huang, J. P. Zhang, R. H. Gao and D. S. Zhang, *ACS Catal*, **2014**, 4, 1753-1763.
10. P. Maitarad, S. Namuangruk, D. S. Zhang, L. Y. Shi, H. R. Li, L. Huang, B. Boekfa and M. Ehara, *Environ Sci Technol*, **2014**, 48, 7101-7110.
11. P. Maitarad, J. Han, D. S. Zhang, L. Shi, S. Namuangruk and T. Rungrotmongkol, *J Phys Chem C*, **2014**, 118, 9612-9620.
12. S. X. Cai, D. S. Zhang, L. Zhang, L. Huang, H. Li, R. H. Gao, L. Shi and J. P. Zhang, *Catal Sci Technol*, **2014**, 4, 93-101.
13. S. X. Cai, D. S. Zhang, L. Shi, J. Xu, L. Zhang, L. Huang, H. R. Li and J. P. Zhang, *Nanoscale*, **2014**, 6, 7346 - 7353.
14. D. S. Zhang, L. Zhang, L. Shi, C. Fang, H. Li, R. H. Gao, L. Huang and J. P. Zhang, *Nanoscale*, **2013**, 5, 1127-1136.
15. P. Maitarad, D. S. Zhang, R. H. Gao, L. Y. Shi, H. R. Li, L. Huang, T. Rungrotmongkol and J. P. Zhang, *J Phys Chem C*, **2013**, 117, 9999–10006.
16. H. R. Li, D. S. Zhang, P. Maitarad, L. Shi, R. Gao, J. Zhang and W. G. Cao, *Chem Commun*, **2012**, 48, 10645-10647.

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