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Selective catalytic reduction of NOx by CO under oxygen condition over Cu:Ce catalysts supported by carbon nanotubes

Zahra Gholami and **Guohua Luo**
Tsinghua University, China

Flue gas DeNOx process with no ammonia under oxygen condition and moderate temperatures is an ideal process with low cost, but is very challenging. In this work, catalytic activity of a series of carbon nanotubes (CNT) supported catalysts with different molar ratios of Cu:Ce prepared by co-impregnation method were studied for NO reduction by CO. Physicochemical properties of the catalysts were studied by means of SEM, TEM, XRD and XPS. The catalytic performances of these catalysts were evaluated through reduction of NO by CO. The 20wt.% Cu1:Ce_3/CNT catalyst shows the highest NOx conversion of 96% at 220°C. Compared to some literatures results, the catalytic activity of the CNT-supported catalysts was significantly enhanced due to the synergistic interactions between Cu:Ce and good properties of CNTs such as high mechanical strength and electrical and thermal conductivity, adsorption and unique nanostructure. The redox equilibrium ($Cu^{2+}+Ce^{3+}\leftrightarrow Cu^{+}+Ce^{4+}$) was proposed here and the interaction between copper and cerium resulted in the formation of Cu^{+} species on the surface of the CNTs. The synergistic effect between surface oxygen vacancies and Cu^{+} species over the CNT supported catalysts plays an important role in the reduction of NO by CO under oxygen condition and the activity is mainly related to the electronegativity of elements, the reduction and adsorption behaviors of these catalysts. This work can provide some insights into the catalytic reactions among NO and CO under oxygen condition.

Biography

Zahra Gholami is currently a Postdoctoral Fellow in the Department of Chemical Engineering at Tsinghua University, China, where she works on selective catalytic reduction of NOx. She has completed her Bachelor's, Master's and Doctorate in Chemical Engineering. From 2014 to 2016, she continued her research work as a Postdoctoral Researcher at Universiti Teknologi Petronas, Malaysia. She has published 20 original research papers in reputed journals and served as Manuscript Peer Reviewer for several journals. Her research interests includes Catalysis, Heterogeneous Catalysts, Reaction Engineering and Environmental Engineering.

zgholami@gmail.com

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