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Improvement of H_2O and SO_2 tolerance of Nb-modified VOx/CeO_2 catalysts for NH_3-SCR at low temperatures

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Nitrogen oxides have been a major source of air pollution, causing environmentally harmful problems such as photochemical smog, acid rain, ozone depletion and greenhouse effects. Selective catalytic reduction of NOx with NH_3 (NH_3-SCR) has been used extensively for the removal of NOx and the most widely used catalyst is V_2O_5-WO_3 (MoO_3)/TiO_2. However, some problems still remain, such as the narrow operating temperature window of 300-400°C, low N_2 selectivity at high temperatures. Therefore, it is necessary to develop highly efficient low temperature SCR catalyst. In our previous study, we have developed a Nb-VOx/CeO_2 catalyst, prepared by a homogeneous precipitation method, showing better NH_3-SCR activity than VOx/CeO_2 catalyst. In this study, stronger resistance to H_2O and SO_2 over Nb-VOx/CeO_2 catalyst than VOx/CeO_2 was observed. When 5 vol.% H_2O was introduced to the inlet gas at 250°C, the NOx conversion over VOx/CeO_2 decrease rapidly from 92% to 56%,while 100% NOx conversion over Nb-VOx/CeO_2 catalyst was maintained all the time in the test. When 100 ppm SO_2 was introduced to the inlet gas at 250°C, the NOx conversion over VOx/CeO_2 decreased from 95% to 24% in 48 hours and could not recover to the initial activity after the removal of SO_2, while nearly 90% NOx conversion over Nb-VOx/CeO_2 was obtained. The modification of Nb to VOx/CeO_2 inhibited the formation of sulfate on the catalyst surface, resulting in the improvement of SO_2 tolerance.

Biography

Zhihua Lian has completed her PhD in Environmental Science from Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences in the year 2015. She has published 5 SCI papers in reputed journals.

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