Aerogel Catalyst for Selective Oxidation of Ammonia

By

CHEN Hao

Abstract

Ammonia is an important source of malodor associated with the transportation, processing and storage of organic and biological wastes. Power plants are an important source of ammonia malodor, and new diesel engine vehicles fitted with selective catalytic reduction (SCR) systems are also becoming potential popular source of ammonia emission.

The purpose of this study is to develop effective catalysts for selective oxidation of ammonia (NH₃-SCO) with high selectivity of N₂ and H₂O at low temperature, and investigate the pathway of NH₃ oxidation via mechanism study. Secondly, to improve the catalyst tolerance for natural humidity as NH₃ are highly soluble in H₂O which poisons catalyst. Thirdly, to optimize the catalyst according to the mechanism such as doped catalyst and bifunctional catalyst, in order to increase catalyst reactivity for NH₃ remediation.

Supported vanadia catalysts and its aerogel catalysts were designed, prepared, modified and tested systematically. Rotary evaporation and ethanol supercritical drying methods were used to prepare supported catalysts and aerogel catalysts respectively. Monolayer vanadia supported titania catalysts are demonstrated having reactivity at low temperature (< 100 °C) as well as high selectivity. Based on vanadia/titania catalyst, the aerogel catalysts present better reactivity and humid tolerance. Zirconia-vanadia/titania catalysts and bifunctional catalysts were modified and successfully increased the conversion efficiency of NH₃-SCO. The mechanism of NH₃-SCO was also discussed through the reaction pathway.

Date: 12 August 2015 (Wednesday)
Time: 10:00am
Venue: Room 6573 (Lift 29-30)

Examination Committee:
Prof. Jingshen WU, Chairman
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- ALL ARE WELCOME -