第209回触媒化学研究センター談話会

演　題：Selective catalytic reduction of NOx over Ag/Al_2O_3 catalyst by hydrocarbons

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日　時：２００６年１１月１４日（火）
１３:３０−１４:３０

会　場：北海道大学創成科学研究棟
４階 セミナー室 04-213･214号室

要　旨：

Nitrogen oxides in exhaust gases from automobiles and stationary facilities have been causing serious air pollution in urban areas. The selective catalytic reduction (SCR) of NOx with hydrocarbons is a potential method to remove NOx from oxygen rich exhausts.

Our resent research works on the selective catalytic reduction (SCR) of diesel engine NOx by hydrocarbons over alumina-supported silver (Ag/Al_2O_3) were reviewed. The reaction mechanism of the SCR of NOx by C_2H_5OH over Ag/Al_2O_3 was studied using in situ DRIFTS and DFT calculations. A novel enolic species originating from the partial oxidation of C_2H_5OH and C_3H_6, was found on the surface of Ag/Al_2O_3 during the SCR of NOx by in situ DRIFTS, which was also supported by DFT calculations. Based on this, a mechanism of the NOx reduction was proposed, which can successfully explain the high efficiency of the NOx reduction by C_2H_5OH over Ag/Al_2O_3. The SCR of NOx with various reductants over Ag/Al_2O_3 in the presence of excess oxygen was also investigated in more details. Attention was particularly focused on the mechanistic difference in the SCR of NOx with different reductants over Ag/Al_2O_3, and on the influence of SO_2 on the SCR of NOx with different reductants over Ag/Al_2O_3. The engine bench tests showed that the average NOx conversion was greater than 80% in the diesel engine exhaust temperature range of 300-400　using our catalytic converter with C_2H_5OH as reductant, which represents a leap from the Euro II standard to the Euro III standard for NOx emission control in diesel engines.

In conclusion, the C_2H_5OH-SCR of NOx over Ag/Al_2O_3 catalyst is a kind of potential technology for cleaning NOx in various oxygen-rich exhausts of diesel engine and lean burn gasoline engine.

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