Catalytic Activity and Hydrothermal Stability of Cu-ZSM5 Catalyst for the Reduction of NO by Urea-SCR: ESR and XAFS Studies

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Cu-ZSM5 has been reported as one of the most promising catalysts for the selective catalytic reduction of NOx from light and heavy diesel engines with urea. However, the hydrothermal stability of the catalyst may be another critical issue to be resolved for the commercial application of urea-SCR technology to automotive engine.

In order to elucidate the hydrothermal stability of Cu-ZSM5 by urea-SCR, NO removal activity of a series of the catalyst containing a variety of copper contents ranged from 1 to 5 wt. % has been examined after sintered at high reaction temperature in the presence of 10 % water. The catalysts before and after aging, have been characterized by XAFS, ESR, etc., in order to understand the deactivation mechanism. XAFS and ESR spectra of the catalysts clearly reveal that the square pyramidal Cu^{2+} ions in the framework of ZSM5 migrate to another isolated cupric site. This population change may be responsible for the hydrothermal stability of Cu-ZSM5 catalyst for urea-SCR process.