

Low Temperature Deactivation of Cu/SAPO-34 Catalysts Synthesized Using Different SDAs During NH₃-SCR Reaction

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Abstract

It is well known that some SAPO-34 materials are sensitive to humidity at ambient condition after removal of their structure directing agents (SDAs). Briend et al. [1] proposed that the choice of SDAs is strongly related with the stability of SAPO-34 framework. In addition, our earlier study also showed that Cu/SAPO-34 using morpholine (MO) as SDA rapidly loss its activity when they were exposed to water vapor at low temperature [2]. The deactivation of Cu/SAPO-34 catalysts is a challenge for auto industry and several research groups have studied Cu/SAPO-34 catalysts in NH₃-SCR applications to understand its failure mechanism [3-4]. In a recent study, we found that species, location, and concentration of Cu in SAPO-34 resulting from using different SDAs, is closely related to their unique catalytic behavior in terms of activity, stability and regeneration in NH₃-SCR application [5]. However, different deactivation mechanisms of Cu/SAPO-34 catalysts exposed to water vapor at low temperature, prepared by different SDAs, during NH₃-SCR reaction is not yet fully understood.

Henceforth, in this study, we investigated the deactivation mechanisms of Cu/SAPO-34 catalysts, caused by water vapor at low temperature, prepared using three different SDAs, morpholine (MO), triethylamine (TEA), and tetraethylammonium hydroxide (TEAOH), during NH₃-SCR reaction through systematic characterization of the deactivated catalysts using various characterization techniques such as: XRD, BET, Solid state NMR, CO-DRIFTS, NO-DRIFTS, H₂-TPR.

Keywords: Cu/SAPO-34; NH₃-SCR; low temperature deactivation; structure directing agent (SDA), Cu mobility, SS-MAS-NMR, DRIFTS, TPR, Chabazite

References

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Biography

- A researcher at Chalmers University of Technology in Sweden with 10 years of catalysis research project experience
- Specializes in synthesis and characterization, in investigation of reaction and kinetic study of mixed metal oxide catalysts for propane ammoxidation to acrylonitrile as well as of Cu/SAPO-34 catalysts for NH₃-SCR reaction