

Inhibitory effect of NO₂ on the selective catalytic reduction of NO_x with NH₃ over one-pot synthesized Cu-SSZ-13 catalyst

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Electronic Supplementary Information

1. NH₃-SCR performance of Cu_{3,9}-SSZ-13 catalyst

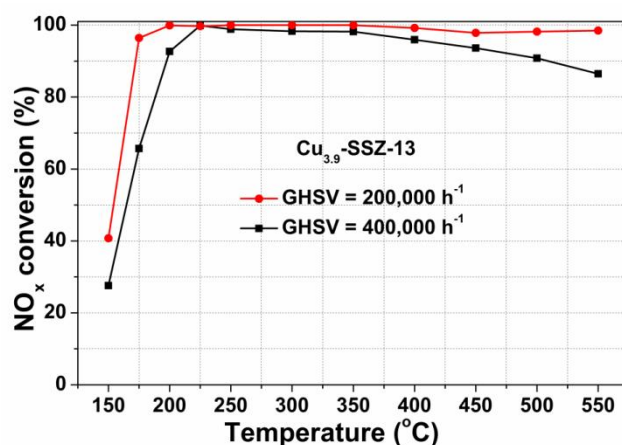


Fig. S1 NH₃-SCR performance of the Cu_{3,9}-SSZ-13 catalyst under different GHSVs.

Cu_{3,9}-SSZ-13 catalyst exhibited excellent NH₃-SCR performance in the whole temperature range, as shown in Fig. S1. The NO_x conversion was higher than 95% from 175 to 550 °C under the GHSV of 200,000 h⁻¹. When the GHSV was improved to 400,000 h⁻¹, high NO_x conversion (> 90%) was also achieved from 200-500 °C. In this study, the activity tests were carried out under a fixed GHSV of 400,000 h⁻¹.

2. N₂O formation over Cu_{3,9}-SSZ-13 in “fast SCR” condition from 200 to 250 °C

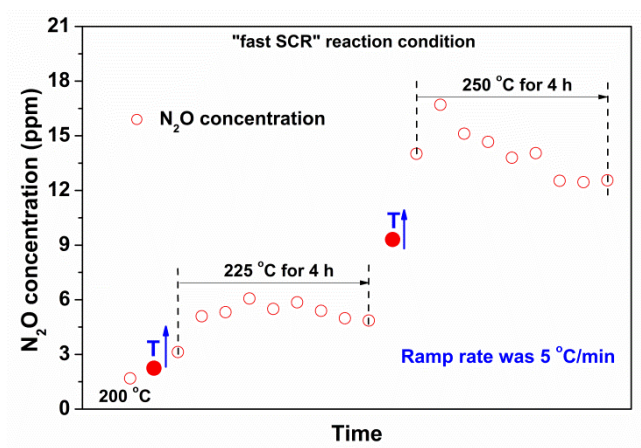


Fig. S2 N₂O formation over Cu_{3,9}-SSZ-13 in “fast SCR” condition from 200 to 250 °C.

3. The effect of H₂O on NH₃-SCR performance of Cu_{3,9}-SSZ-13

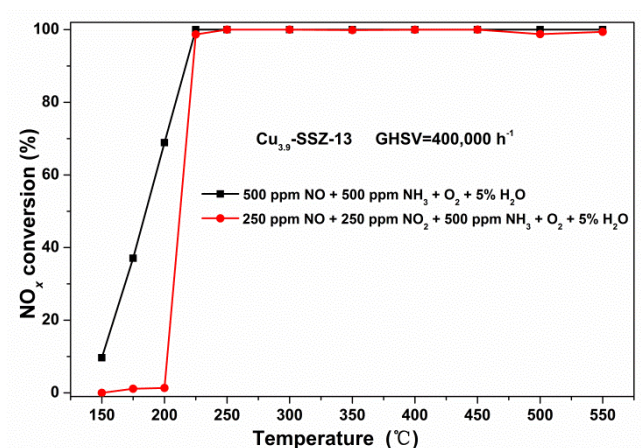


Fig. S3 NH₃-SCR performance of Cu_{3,9}-SSZ-13 under “standard” SCR and “fast” SCR condition in the presence of 5% H₂O.

4. Reactions between pre-adsorbed species of NH₃ and NO + O₂

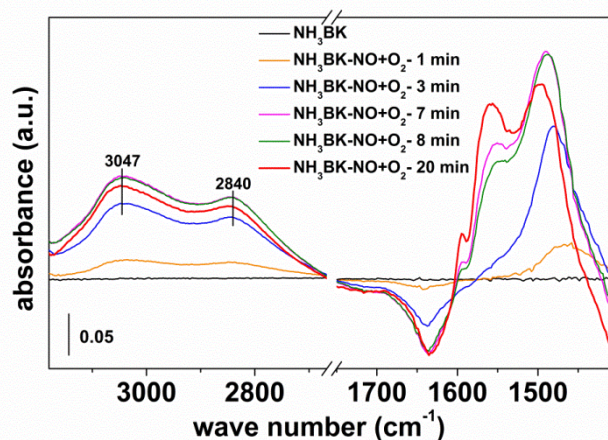


Fig. S4 Reactions between pre-adsorbed NH₃ species and NO + O₂ at 120 °C on the Cu_{3,9}-SSZ-13 catalyst.

The reactions between pre-adsorbed species of NH₃ and NO + O₂ were carried out at 120 °C. As shown in Fig. S2, NH₃ species absorbed on Lewis acid sites (negative peak at ~ 1620 cm⁻¹) were consumed firstly as soon as NO + O₂ was introduced, and nitrate species (positive peaks from 1500 to 1600 cm⁻¹) formed on the sites free of NH₃ species. At the same time, NH₄NO₃ (2840 and 3047 cm⁻¹) was detected on the catalyst surface because of the quick reaction between NH₄⁺ on Brønsted acid sites and nitrate species. With the introduction of NO + O₂, the largest amount of NH₄NO₃ was observed at 7 min. Although NH₄NO₃ could be consumed by NO in the feed gas, large amount of NH₄NO₃ still reserved on the catalyst surface after 20 min. It was obvious that the consumption speed of NH₄NO₃ was much slower than its formation.