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Abstract

Cu-exchanged zeolites have been under investigation as catalysts for NO decomposition. Among the zeolites tested Cu-ZSM-5 had the highest turnover frequency. The Arrhenius plots for all the catalysts leveled off or inverted near 773 K, and these curves were entirely reversible on decreasing the temperature. The NO decomposition rate was first order in NO pressure and was inhibited by O_2. The kinetics could be described in the Langmuir-Hinshelwood form, with the inhibition being half order in O_2 pressure. The redox capacities of Cu-ZSM-5 measured in microbalance experiments were near 0.5 O/Cu, i.e., 1 ϵ^-/Cu. Interestingly, O_2 could be desorbed isothermally from an initially oxidized catalyst upon flushing the catalyst with He. ESR spectra confirmed that the Cu^{2+} in the catalysts was being reduced to Cu^{1+} during the spontaneous desorption of a corresponding amount of O_2. This spontaneous desorption of O_2 was also observed when pure 02 in the microbalance was replaced by an O_2/He mixture, i.e., when the partial pressure of O_2 over the catalyst was lowered. This phenomenon is regarded as a key requirement for a sustained NO decomposition activity. An interpretation of the kinetics in light of these findings is presented.

There are no figures or tables for this document.