Engineering Oxygen Vacancies into ZSM-5@MnOx catalysts for Efficient Benzyl Alcohol Oxidation

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Abstract

In this paper, ZSM-5@MnOx catalyst was firstly prepared by in situ growth for the selective oxidation of benzyl alcohol to benzaldehyde. The coating effects of MnOx on ZSM-5 and OV formation mechanism at the ZSM-5-MnOx interface were investigated. Results showed that the sodium ions of ZSM-5 are found to be conducive to the better coating for MnOx. Hydrogen protons of zeolite can dehydrate with the OH groups on MnOx to generate the OVs where the oxidation of benzyl alcohol occurs. Besides, the deep dehydration at the ZSM-5-MnOx interface via increasing post-treatment temperature can further enrich the OV concentrations. The ˜100% benzyl alcohol conversion and ˜100% benzaldehyde selectivity over the ZSM-5@MnOx catalyst can be obtained within 3 h at 383 K. The findings of the structure-activity relationship of zeolite's surface properties and OVs over MnOx can provide important guiding principles for the rational design of oxidation catalysts.

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