

Relationship between mobility and reactivity of Cu ion species in the Cu-SSZ-13 for selective catalytic reduction

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Cu ion exchanged SSZ-13 is a state of the art NH_3 -SCR catalyst successfully commercialized in the industrial field. Recently, many researchers have investigated not only its superior catalytic performance but also its unique nature and behavior under NH_3 -SCR reaction condition. Here, we investigate higher NH_3 -SCR reactivity of 1Al-Cu species than the 2Al-Cu in the Cu-SSZ-13. We modified the Cu-SSZ-13 by using hydrothermal treatment to control the ratio of 1Al-Cu and 2Al-Cu. The ratios of 1Al-Cu and 2Al-Cu were measured by comparing the EPR spectra of hydrated and dehydrated Cu-SSZ-13. As the ratio of the 1Al-Cu which has a higher mobility than the 2Al-Cu increased, low temperature reactivity of catalysts enhanced under dry SCR condition, demonstrating a higher reactivity of the 1Al-Cu. However, the catalysts showed same reactivity regardless of the ratio of 1Al-Cu species under wet SCR condition. The kinetic studies led us to reveal that the superior activity of 1Al-Cu appeared only under the reaction condition limited by diffusion of Cu ion. This result indicates that the higher low temperature reactivity of the catalysts was derived from higher mobility of the 1Al-Cu ion species.