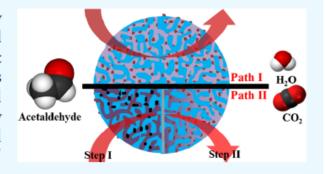


Adsorption and Oxidative Desorption of Acetaldehyde over Mesoporous $Fe_xO_yH_z/AI_2O_3$

Jae Hwan Jeong,[†] Soong Yeon Kim,[†] Jeonghun Kim,[‡] Byeong Jun Cha,[†] Sang Wook Han,[†] Chan Heum Park,[†] Tae Gyun Woo,[†] Chul Sung Kim,*,[‡] and Young Dok Kim*,[†]

Supporting Information

ABSTRACT: Fe_xO_yH_z nanostructures were incorporated into commercially available and highly porous alumina using the temperature-regulated chemical vapor deposition method with ferrocene as an Fe precursor and subsequent annealing. All processes were conducted under ambient pressure conditions without using any high-vacuum equipment. The entire internal micro- and mesopores of the Al₂O₃ substrate with a bead diameter of ~2 mm were evenly decorated with Fe_xO_yH_z nanoparticles. The Fe_xO_yH_z/Al₂O₃ structures showed substantially high activity for acetaldehyde oxidation. Most importantly, Fe_xO_yH_z/Al₂O₃ with a high surface area (~200 m²/g) and abundant mesopores was found to



uptake a large amount of acetaldehyde at room temperature, and subsequent thermal regeneration of $Fe_xO_yH_z/Al_2O_3$ in air resulted in the emission of CO_2 with only a negligibly small amount of acetaldehyde because $Fe_xO_yH_z$ nanoparticles can catalyze total oxidation of adsorbed acetaldehyde during the thermal treatment. Increase in the humidity of the atmosphere decreased the amount of acetaldehyde adsorbed on the surface due to the competitive adsorption of acetaldehyde and water molecules, although the adsorptive removal of acetaldehyde and total oxidative regeneration were verified under a broad range of humidity conditions (0-70%). Combinatory use of room-temperature adsorption and catalytic oxidation of adsorbed volatile organic compounds using $Fe_xO_yH_z/Al_2O_3$ can be of potential application in indoor and outdoor pollution treatments.

Department of Chemistry, Sungkyunkwan University, Suwon 16419, Republic of Korea

[‡]Department of Physics, Kookmin University, Seoul 02707, Republic of Korea