Adsorption of Sulfur Dioxide by Copper Oxide Supported on Alumina and Mordenite

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Jatuporn Wittayakun
School of Chemistry, Institute of Science
Suranaree University of Technology
Nakhon Ratchasima, 30000, Thailand

Kampanat Mahachanon and Nurak Grisdanurak
Department of Chemical Engineering
Faculty of Engineering, Khon Kaen University
Khon Kaen, 40002, Thailand

ABSTRACT

In this study, copper oxide supported on alumina (CuO/Al_2O_3) and mordenite (CuO/MOR), with Si/Al ratio of 15 and 19, were investigated for SO_2 adsorption. The catalysts were prepared by ion exchange method for 24 hours, washed, and calcined at 550°C and the copper loading was determined by atomic absorption spectroscopy (AAS). Particles of copper oxide on Al_2O_3 could be clearly observed as cylindrical particles by scanning electron microscope (SEM) while those on mordenite possibly resided in the pore structure and could not be clearly seen. The adsorption of SO_2 (1000 ppm in helium) was carried out in a flow system connected with a thermogravimetric analyzer (TGA) where the studied temperature was between 300 and 500°C. The SO_2 adsorption behaviors of freshly calcined and freshly oxidized catalysts were similar and lead to a conclusion that the form of copper was oxide. At constant temperature, adsorption capability increased with copper loading. The highest adsorption was obtained on CuO/Al_2O_3 but it took so much longer adsorption time than CuO/MOR15 and Cu/MOR15. Thus, Cu/Al_2O_3 was not considered as a good candidate for SO_2 adsorption. Both Cu/MOR15 and Cu/MOR19 were effective for SO_2 adsorption and they reached adsorption equilibrium in 15 and 10 minutes, respectively, without any sign of deactivation after 3 cycles.