



Selective adsorption of volatile organic compounds from humid air using surface-modified activated carbon

Kulthida Wasino and Varong Pavarajarn*

*Center of Excellence in Particle Technology, Faculty of Engineering
Chulalongkorn University, Bangkok, Thailand*

*e-mail: Varong.P@chula.ac.th

In the wastewater treatment of a petrochemical plant, volatile organic compounds (VOCs) may be released together with high humidity. The current technology to trap the VOCs relies on adsorption on conventional activated carbon. However, due to non-specific nature of the physical adsorption on the activated carbon, majority of the adsorbed species is water. In this study, surface modification of activated carbon by 3-aminotrimethoxysilane (APTMS) was conducted to enhance selective adsorption of VOCs out of the humid air. The surface modification includes oxidation of the activated carbon by hydrogen peroxide to produce hydroxyl group on the surface, reduction by sodium borohydride to remove aldehyde and ketone groups from the surface, and tethering of APTMS onto the surface. The results from Fourier transform infrared spectroscopy confirmed the modification of the surface by the appearance of absorption bands at 1474, 1423 and 1100 cm^{-1} corresponding to Si-O-CH₃ functional group. It makes the surface to become hydrophobic. The effect of the hydrophobicity of the surface on adsorption/desorption isotherms of VOCs at various temperatures are presented and discussed.

Keywords: Volatile organic compounds (VOCs); 3-aminotrimethoxysilane (APTMS); hydrophobic surface; adsorption of VOCs