Ausanee Thinthaworn 2011: Study of Volatile Organic Compounds Adsorption Capacity of Silica-Zeolite Composite. Master of Engineering (Chemical Engineering), Major Field: Chemical Engineering, Department of Chemical Engineering. Thesis Advisor: Associate Professor Metta Chareonpanich, D.Eng. 94 pages.

This work studied the adsorption abilities of volatile organic compounds (VOCs) on MSZ-1 silica-zeolite composites, MCM-41mesoporous silica and ZSM-5 zeolite which have different physical characteristics. ZSM-5 and MCM-41 have a single pore size of 0.50 and 2.74 nm, respectively, whereas MSZ-1 has two pore sizes of 2.42 and 3.81 nm. The BET surface areas and pore volumes of MSZ-1, MCM-41 and ZSM-5 were 1610, 1400 and 179 m^2/g, and 2.05, 3.16 and 0.13 ml/g, respectively. These adsorbents were applied for the adsorption of hexane, methanol, ethanol, benzene, toluene, and xylene. The adsorption conditions were as follows: temperature, 40°C; carrier gas, N_2; pressure, 1 atmosphere; and gas flow rate, 30 ml/min. The adsorption capacities of each VOC on the synthesized adsorbents were compared by means of breakthrough curves and equilibrium adsorption isotherms. It was found that among these adsorbents, MSZ-1 showed the highest capacity for oxygenate hydrocarbons (methanol and ethanol) adsorption at the capacity of 0.223 and 0.246 $g_{VOC}/g_{adsorbent}$, respectively. Moreover, MCM-41 showed the highest capacity for hydrocarbons (benzene, toluene, xylene and hexane) adsorption at the capacity of 0.158, 0.207, 0.156 and 0.098 $g_{VOC}/g_{adsorbent}$, respectively. Then the effect of VOCs concentration on MSZ-1 adsorption was studied. The adsorption isotherms of methanol, ethanol, benzene, and hexane on MSZ-1 were the favorable isotherm, whereas those of toluene and xylene were the strongly favorable isotherm. It can be concluded that factors affecting the VOCs adsorption ability were specific surface area and pore size of adsorbents, and polar/non-polar characteristics and concentration of adsorbates.

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