# EVIDENCES OF COMPETITIVE ADSORPTION OF HYDROCARBONS INTO AN HYDROPHOBIC ZSM-5

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Volatile organic compounds and hydrocarbons constitute a significant fraction of the hazardous air and water pollution. Research on hydrocarbon removal has been mainly focussed on single components from air matrix, whereas the studies involving aqueous dilute solutions are few. However, in most environmental applications, these pollutants are present in the form of mixtures in very dilute aqueous solution. In this study, we report on evidence of 1,2-dichloroethane (DCE), methyl tert-butyl-ether (MTBE) and toluene (TOL) adsorption into ZSM-5 zeolite. A combined diffractometric and gas chromatographic study was used to: 1) investigate the adsorptive properties of ZSM-5; 2) characterise its structure after the adsorption of selected contaminants; 3) localise the organic species in the zeolite pores; 4) compare the adsorption data for a mixture of these contaminants with concentrations in the ppb and ppm range. The ZSM-5 sample is a commercial adsorbents, (SiO2/Al2O3 =280), purchased by Zeolyst International. Kinetics and adsorption isotherm batch data were obtained via Headspace Solid Phase Microextraction -Gas Chromatography. XRD powder patterns were collected on ZSM-5 before and after adsorption on a Bruker D8 Advance diffractometer. Thermal analyses (TG and DTA) were performed in air up to 900°C at 10°C/min. The experimental results prove that the kinetic of adsorption of all components is fast and indicates that competition exists between the organic compounds at low cosolute concentrations. Rietveld refinements indicate that the relevant incorporation of DCE, MTBE and TOL in the ZSM-5 causes significant increase of all unit cell parameters in comparison to those of the untreated material as well as strong distortions of the channel systems where the contaminants are hosted. The very favourable adsorption kinetics along with the effective and highly irreversible adsorption of DCE, MTBE and TOL molecules into zeolite ZSM-5 pores make this cheap and environmental friendly material a tool with interesting applications for the removal of hydrocarbons from wastewater.

Keywords: hydrophobic zeolite, competitive adsorption, hydrocarbons