

## Adsorption and Desorption Characteristics of Nanozeolites as Adsorbent for Dimethyl Methylphosphonate

Xinming Ji\*, Wei Yao, Yuanyuan Hu<sup>1</sup>, Nan Ren<sup>1</sup>,  
Jia Zhou, Yiping Huang and Yi Tang<sup>1</sup>

ASIC and System State Key Lab, Department of Microelectronics,  
Fudan University, Shanghai 200433, P. R. China

<sup>1</sup>Department of Chemistry, Fudan University, Shanghai 200433, P. R. China

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The selective adsorption of dimethyl methylphosphonate (DMMP) onto zeolites is described in this paper. Three types of zeolite, silicalite-1, ZSM (Zeolite Socony Mobil)-5, and Cu-ZSM-5, were synthesized and assembled onto the surface of a quartz crystal microbalance (QCM) covered with a Au film. The QCM was adopted as an effective tool to analyze the adsorption and desorption characteristics. The optimum desorption conditions were determined experimentally as a desorption temperature of 523 K and a desorption time of 30 min. Good repeatability could be obtained under these optimal desorption conditions. Adsorption capacity was determined by comparing the different zeolites as selective adsorbents for DMMP. Cu-ZSM-5 had the highest adsorption capacity and the best selectivity for the three zeolites. The effect of copper ions on the adsorption of DMMP was tested by synthesizing five Cu-ZSM-5 zeolites with different copper ion contents. Adsorption sensitivity increased in proportion to copper content before saturation. The sensitivity and detection limit of a QCM coated with Cu-ZSM-5 reached about 8.8 Hz/ppm and 0.3 ppm, respectively, confirming that Cu-ZSM-5 zeolite is a promising adsorbent for DMMP detection.

\*Corresponding author: e-mail: xmji@fudan.edu.cn