

## Accepted Manuscript

Metal-organic frameworks for the adsorption of gaseous toluene under ambient temperature and pressure

Kowsalya Vellingiri, Pawan Kumar, Akash Deep, Ki-Hyun Kim

PII: S1385-8947(16)31249-9  
DOI: <http://dx.doi.org/10.1016/j.cej.2016.09.012>  
Reference: CEJ 15722

To appear in: *Chemical Engineering Journal*

Received Date: 1 July 2016  
Revised Date: 2 September 2016  
Accepted Date: 3 September 2016

Please cite this article as: K. Vellingiri, P. Kumar, A. Deep, K-H. Kim, Metal-organic frameworks for the adsorption of gaseous toluene under ambient temperature and pressure, *Chemical Engineering Journal* (2016), doi: <http://dx.doi.org/10.1016/j.cej.2016.09.012>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



## Metal-organic frameworks for the adsorption of gaseous toluene under ambient temperature and pressure

Kowsalya Vellingiri<sup>a</sup>, Pawan Kumar<sup>b</sup>, Akash Deep<sup>c\*</sup>, Ki-Hyun Kim<sup>a\*</sup>

<sup>a</sup>Department of Civil and Environmental Engineering, Hanyang University, 222, Wangsimni-Ro, Seoul 04763, Korea; <sup>b</sup>Department of Chemical Engineering, Indian Institute of Technology, Hauz Khas, New Delhi 110 016, India; <sup>c</sup>Central Scientific Instruments Organization (CSIR-CSIO), Sector 30 C, Chandigarh, 160030, India;

### Abstract

Enormous efforts have been put to effectively treat or eliminate toluene, one of the most well-known volatile organic compounds (VOCs). Herein, we report its sorptive removal mechanism against metal-organic frameworks (MOFs: UiO-66, UiO-66(NH<sub>2</sub>), ZIF-67, MOF-199, MOF-5, and MIL-101(Fe)) under ambient conditions. Their interactions were assessed by the Henry's law constant ( $K_H$ ) and the heat of adsorption ( $\Delta H_{ads}$ ). Although the equilibrated adsorption capacities of all MOFs were measured from 159 (MOF-199) to 252 mg g<sup>-1</sup> (UiO-66(NH<sub>2</sub>)), those values were reduced considerably with increases in humidity and temperature. Among them, the sorption pattern of UiO-66(NH<sub>2</sub>) was the most reproducible when tested over a three cycle (147 (1<sup>st</sup>) and 133 mg g<sup>-1</sup> (3<sup>rd</sup> cycle)). The behavior of -NH terminated MOFs (UiO-66(NH<sub>2</sub>) and ZIF-67) was distinguished with those of -COOH as explained by a scheme of hypothetical potential energy profiles using mass transfer resistance and surface barrier phenomena.

**Keywords:** *Toluene, Hydrogen bonding, Surface barrier, Physisorption, UiO-66(NH<sub>2</sub>)*

---

Correspondence: [kkim61@hanyang.ac.kr](mailto:kkim61@hanyang.ac.kr), Tel.: +1-82-2-2220-2325; Fax: +82-2-2220-1945

[dr.akashdeep@csio.res.in](mailto:dr.akashdeep@csio.res.in), Tel: +91-172-2657811-452, Fax: +91-172-2657287

Download English Version:

<https://daneshyari.com/en/article/4763519>

Download Persian Version:

<https://daneshyari.com/article/4763519>

[Daneshyari.com](https://daneshyari.com)