

Separation of Nitrate Anion from Water Using a Shaped MOF-Polymer Composite

(¹Graduate School of Environmental Science, Hokkaido University, ²Faculty of Environmental Science, Hokkaido University) ○ Aditya Irfan Witono,¹ Xin Zheng,² Shin-ichiro Noro^{1,2}

Keywords: Metal-organic framework; Nitrate adsorption; MOF-polymer composite; Water purification

Nitrate anion is one of the potential contaminants in groundwater or freshwater because nitrate can cause eutrophication and blue baby syndrome if consumed by humans. Therefore, removing the nitrate anion from water is necessary, and adsorption is one of the removal methods. Metal-organic frameworks (MOFs) have attracted much attention in adsorptive separation applications because they have a high surface area and structural tunability. Recently, we found that some water-stable MOFs are potentially applicable for nitrate adsorption. But, using MOF powder is inefficient in removing water pollutants. Thus, in this study, we aim to fabricate a shaped MOF-polymer composite and use it for nitrate adsorption from water.

We selected a water-stable MOF, $[\text{Zr}_6\text{O}_4(\text{OH})_4(1,4\text{-benzenedicarboxylate})_6]$ (UiO-66) (Figure 1),¹ as an adsorbent because of comparable nitrate anion adsorption amount to commercial anion exchange resins. On the other hand, chitosan was selected as a shaping agent. Chitosan is a well-known polysaccharide frequently used to shape adsorbents to beads, thin films, and so on and adsorb the nitrate anion in water.² The effect of shaping by chitosan on nitrate adsorption properties will be discussed.

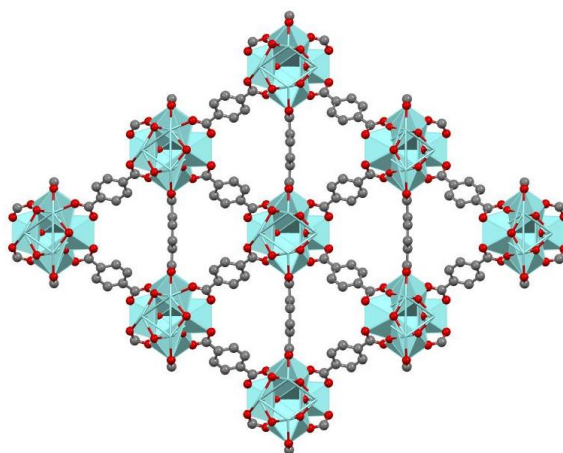


Figure 1. Porous structure of UiO-66.

1) C. Wang, X. Liu, J. P. Chen, K. Li, *Sci. Rep.* **2015**, 5, 16613. 2) S. Chatterjee, S. H. Woo, *J. Hazard. Mater.* **2009**, 30, 1012.