# Metal-Organic Framework/α-Alumina Composite with Novel Geometry for Enhanced Adsorptive Separation

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**Abstract**
UiO-66, as a prototypical zirconium-based metal-organic framework (MOF), provides a rapid uptake of arsenic from water when compared to other typical adsorbents with the same order-of-magnitude particle size. This fast kinetics allows an efficient adsorptive separation to be realized within a micro-space. Moreover, α-alumina can be specifically structured into a novel hollow fiber geometry: containing a plurality of open radial micro-channels on the shell side and a very thin barrier layer at the lumen. Through a facile vacuum filtration method, a MOF/α-alumina composite with novel geometry is developed and optimized in this study. The composite leads to a new concept for enhanced adsorptive separation: efficient adsorption occurs within numerous conical micro-channels with no loss of the active adsorbents during the process. As a proof of concept, this composite can effectively remediate arsenic contaminated water producing potable water recovery, whereas the conventional fixed bed requires eight times the amount of active adsorbents to achieve a similar performance. Looking forward, different functional composites can be prepared based on specific adsorptive applications, as a wide range of adsorbents can be loaded into the α-alumina hollow fiber, of which the micro-channel size and barrier layer pore size can be easily manipulated during fabrication.

**Keywords**
MOF, α-alumina, ceramic hollow fiber, adsorption, water remediation

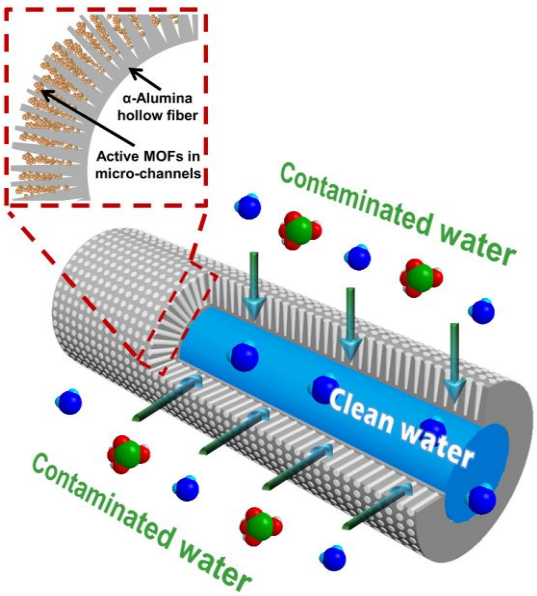


**Figure 1**. Schematic diagram of arsenic contaminated water remediation by the composite. The inset demonstrates an enlarged cross-sectional view of the composite. Blue molecule: water; green molecule: arsenic pollutant.