

University of Louisville  
Department of Chemistry  
**Nura Fahmida Sultana**  
**Literature Seminar**

When: April 20, 2023

Time: **12:00 p.m.**

Location: CBL-16

## **Atmospheric Water Harvesting using Metal-Organic Frameworks**

### **Abstract:**

Life depends on water, but it's concerning that almost half of the world's population is projected to live in regions with water scarcity or insufficient access to safe drinking water by 2050, whether caused by arid conditions or contamination. Atmospheric water harvesting (AWH) offers a powerful and promising solution to address the problem of global freshwater scarcity.<sup>1</sup> It's possible to collect water from the atmosphere, not just in humid regions where humidity is high, but also in more arid areas where access to clean water is crucial. The materials used to gather water from the air in these climates could be used globally and at any time of the year. Recently several works have been reported on AWH using metal organic framework (MOF). This seminar will focus on both design of MOFs and their use in AWH which can work at high to low relative humidity (RH) (range 100% - 10%). Yaghi and his team conducted research on Metal-organic frameworks (MOFs), which are a distinctive type of porous materials as well as they have the ability to capture water even at relative humidity levels as low as 10%, and can easily release and absorb it due to their fast kinetics. <sup>2</sup> Several generations of devices have been tested using kilogram quantities of MOFs, from laboratory experiments to field trials in the most arid deserts. While it is possible to locate the positions of water molecules within porous crystals of MOF, determining the order in which they were filled presents a significant challenge. Hanikel and coworkers worked on evolution of water structures in metal-organic frameworks for improved atmospheric water harvesting.<sup>3</sup> Peng and his team developed MOF supraparticles for atmosphere water harvesting at low humidity.<sup>4</sup> This seminar will conclude the effect of tuning the pore size and liker molecule of MOF in AWH and the challenges.

### **References:**

1. Ao Ma, Hengjiang Cong, Hexiang Deng. Multivariate MOF for optimizing atmospheric water harvesting. *Green energy and environment* 7 (2022) 575-577.
2. Wentao Xu and Omar M. Yaghi. Metal-Organic Frameworks for Water Harvesting from Air, Anywhere, Anytime. *ACS Cent. Sci.* 2020, 6, 8, 1348-1354.
3. Nikita Hanike, Xiaokun Pei, Saamil Chheda, Hao Lyu, WooSeok Jeong, Joachim Sauer, Laura Gagliardi, Omar M. Yaghi. Evolution of water structures in metal-organic frameworks for improved atmospheric water harvesting. *Science* 2021, 374, 454-459.
4. Yue Hu, a Yuqi Wang, a Zhou Fang, a Xinyi Wan, a Mengyang Dong, a Zhizhen Yeab and Xinsheng Peng. MOF supraparticles for atmosphere water harvesting at low humidity. *J. Mater. Chem. A*, 2022, 10, 1511.