S1.3.2 - *Simultaneous Removal of VOCs and PM2.5 by Metal-organic Framework Coated Electret Filter Media under High Humidity*

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It has been reported that relative humidity (RH) has been posing a critical issue on the VOCs capture performance of many adsorbents, e.g. activated carbon, zeolites, metal-organic frameworks (MOFs), etc. This is because, in humid conditions, the adsorption sites of the adsorbent would be competitively occupied by the water molecules. Recently, the electret filter media coated with MIL-125(Ti)-125 (a representative MOFs), named MIL-125(Ti)-125 coated E-MOFilter, has been reported an excellent performance of adsorption for VOCs under dry condition. However, it was found out that the adsorption capacity deteriorated rapidly when the RH reaches high. Therefore, to address the water competitive adsorption issue, two methods were used. On one side, MIL-125-NH2 was modified with alkyl chains to enhance its hydrophobicity, thus anhydrides were chosen to be grafted with MIL-125-NH2 to form amide-functionalized MOFs, which can improve the moisture resistance of the MOFs. On the other side, polydimethylsiloxane (PDMS) was used to form a hydrophobic coating layer on the external surface of MOFs to improve its water/moisture resistance. In the aspect of electret filter, the electret filter with a minimum efficiency reporting value 13 (MERV), i.e., MERV 13 was used as

base substrates for the deposition of MOF particles due to the proper fiber diameter and porosity for the uniformity of MOF particles depositions, according to our previous report. Results showed that the modified E-MOFilter has decent removal efficiency and adsorption capacity for VOCs under high humidity. Meanwhile, the inherent charges on the electret media are maintained and the high filtration efficiency and holding capacity for PM2.5 are kept as well. This work might provide some new insights toward the application of E-MOFilter under high humidity in the HVAC field.

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Yu Zhang, a PhD student working in Dr. Shawn Chen's group in VCU, focuses on metal-organic frameworks (MOFs, a sort of highly porous nanomaterial) coated electret filter media, to simultaneously remove PM2.5 and volatile organic compounds (VOCs) in the indoor air.

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