WIU CENTENNIAL HONORS COLLEGE
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Abstract

Poster

Major: Forensic Chemistry

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Adsorption of Volatile Organic Molecules into Metal-organic Frameworks

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Volatile organic molecules, specifically nerve agents, are the deadliest chemical warfare agents (CWAs) used in terrorist attacks. It is crucial that nerve agents be rapidly detected with high sensitivity. For legal reasons, benign analogs that mimic CWAs are used for research purposes. Carbon dots (CDs) are spherical nanoparticles made from molecules of carbon precursors. Due to their fluorescent properties, CDs are applicable as visual sensors of CNAs. However, CDs do not be able to absorb a significant amount of gaseous CWA from the environment. Metal-organic frameworks (MOFs) are high surface materials consisting of alternating metal-ion clusters and organic linkers. Due to their high surface area, MOFs are able to absorb significant quantities of gasses within their pores. In this work, carbon dots are incorporated into MOFs, presenting a unique structure that may be an effective CWA sensor. Zirconyl chloride octahydrate and 2,5-Dihydroxyterephthalic acid were used to synthesize the UiO-66. Malic acid and thiourea were used to synthesize the CDs. A known analog for sarin, dimethyl methylphosphonate (DMMP), is used to examine fluorescence behavior of carbon dot incorporated MOFs. Fluorescence spectroscopy and surface area analysis indicate the CDs and MOFs are suitable for absorption and detection of DMMP.