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Synthesis of new Zirconium-based Metal-organic Frameworks for “matrix isolation”

Metal-organic frameworks (MOFs) are highly porous and tuneable solid-state materials formed from metal nodes connected by organic linkers. MOFs can accommodate additional metal centres by post synthetic metalation (PSMet). The natural crystallinity of MOFs and their ability to undergo PSMet makes them great isolation matrixes to study metal complexes, potentially in unusual coordination environments, by single crystal X-ray diffraction (SCXRD). An example of this approach is our work on a manganese-based MOF (MnMOF-1), which possesses free bis-pyrazolyl moieties that could be metalated with wide range of metal salts and used to study transformations about the metal coordination sphere by SCXRD. However, its application is somewhat limited by relatively poor water and chemical stability.
Herein, we present the synthesis of a new family of more robust Zirconium-based MOFs using related organic linkers, which introduce the same bis-pyrazolyl moiety as the linker used to form MnMOF-1. The dimensionality of the new MOFs can be predicted by the linker connectivity and their flexibility rationalised by the linker arm length. A flexible, 4-connecting linker with rotatable arms generates a 3D MOF. This is a rare example of a MOF that can be metalated to form transition metal dimers and then characterised by SCXRD. Presently, we are examining the reactivity of these “matrix isolated” transition metal dimers and testing them as potential (pre-)catalysts.

Level of Expertise

Student

Presenter Gender

Man

Pronouns

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In person - Melbourne

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Yes

Students Only – Do you wish to take part in the Student Poster Slam

Yes

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Yes

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