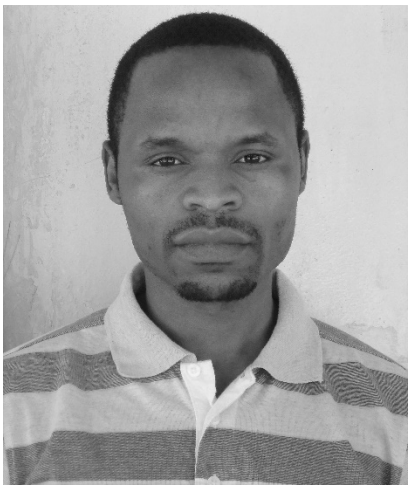


Dr Mehlana

Research Profile

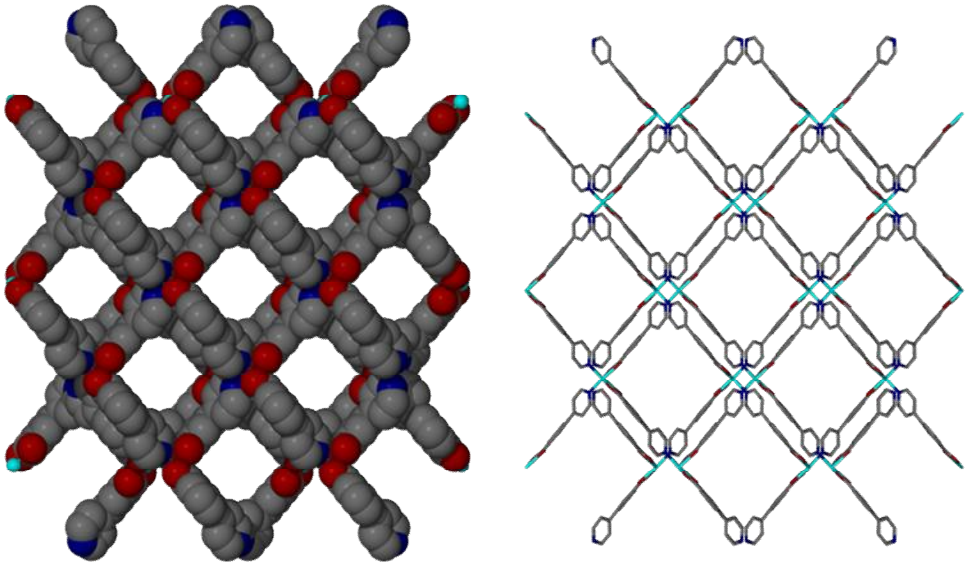
MOFs are crystalline solids that contain extended networks constructed by the linkage of metal atoms by multiply-coordinating polydentate ligands. A rapid growth in the study of these materials has been fuelled from the realization that metal-organic framework synthesis offers considerable flexibility and control over structure and properties, thereby offering rare pathways to rational materials design. This flexibility is derived from the enormous structural and chemical diversities afforded by molecular systems, features that are less prevalent in many other branches of materials chemistry. The inherent porosity in molecular frameworks has led to widespread speculation that such materials may be ideally suited for applications such as molecular separation, drug delivery, and sensing and hydrogen storage. My primary research efforts are being directed towards preparation of novel materials that can be used for catalysis, sensing, separation and hydrogen storage. Current work involves

(i) Preparation of MOF functionalised with Lewis acid and base sites for capturing and catalytic hydrogenation of atmospheric carbon dioxide to methanol and formate.
(ii) Inclusion of pincer complexes in MOF channels and its application in hydrogenation of carbon dioxide.

The benefits of this project are two-fold: The process removes harmful carbon dioxide from the atmosphere, and the methanol can be used as an alternative fuel to gasoline thus contributing to the ZIMASSET agenda. The work represents an important step that could one day lead to a future "methanol economy," in which fuel and energy storage are primarily based on methanol.

(iii) Preparation of MOF functionalised with Lewis acid and base sites for the catalytic hydrogenation of carbon dioxide to methanol and formate.
(iv) Inclusion of pincer complexes in MOF channels and its application in hydrogenation of carbon dioxide.

(a) (b)



Typical Metal-Organic Framework showing channels that can be exploited for gas storage and catalysis.

Five representative publications

- Mehlana, G., Ramon, G. & Bourne, S. A. *The role of C–H···π interactions in modulating the breathing amplitude of a 2D square lattice net: alcohol sorption studies. CrystEngComm 16, 8160 (2014).*
- *Mehlana, G., Wilkinson, C Ramon, G. & Bourne, S. A. Reversible Thermochromic and Mechanochromic behaviour in a 3D hydrogen bonded discrete compound, Polyhedron, 98, 224-229, (2015).*
- *Mehlana, G., Ramon, G. & Bourne, S. A. Methanol mediated crystal transformations in a solvatochromic metal organic framework constructed from Co(ii) and 4-(4-pyridyl) benzoate. CrystEngComm 15, 9521 (2013).*
- *G. Mehlana, V. Chitsa and T. Mugadza, Recent Advances in Metal-Organic Frameworks Based on Pyridylbenzoates: Properties and Applications, RSC Advances, 5, 88218–88233 (2015).*
- *Mehlana, G., Ramon, G. & Bourne, S. A. & Öhrström, L. A, Concomitant Metal Organic Frameworks of Cobalt(II) and 3 (4- Pyridyl)benzoate: Optimized Synthetic Conditions of Solvatochromic and Thermochromic Systems. Cryst. Growth & Des. 13, 633 (2013).*