Contaminant Removal from Fuel Cells for Aerospace Applications

by Jack Y. Lu

ABSTRACT—UHCL researchers focused on the rational design and synthesis of new MOF materials for a PEM FC fuel processing system in which the MOF material is an integral component and the key for contaminant removal in hydrocarbon or ammonia fuel processors. Design and synthesis of desirable MOF materials for uses in fuel processors will have immediate impact on a wide range of space applications.

Synthesis of functional materials represents one of the great challenges in current research. The coordination polymers have been found with wide range of applications such as molecular separation and pollution prevention in air, liquid and water systems, where they can be used as ion exchangers and molecular sieves. The objective of the proposal was to design and develop robust metal-organic framework (MOF) materials that may selectively remove small molecule contaminant(s) produced by the fuel processing system of a fuel cell.

Experimental Activity, Results and Discussion

The reactions of $Cd(NO_3)_2 \cdot 4H_2O$ with imidazol-4,5-dicarboxylic acid and 4, 4'- bipyridine under hydrothermal reaction conditions resulted in two new metal-organic polymers.[1] The hydrogen-bonding linked a 3-D structure of complex 2 composed of covalent pleated sheets. The pleated sheet conformation here is derived from the bonding-mode of the tetradentate $HIDC^{2-}$ ligands and the rigid BPY spacers. The rectangular grids (BPY-Cd-$HIDC^{2-}$-Cd-$HIDC^{2-}$-Cd-BPY-Cd-$HIDC^{2-}$-Cd-$HIDC^{2-}$-Cd) in the 2-D covalent pleated sheet conformation network have corner metal to metal distances of 13.564 x 11.754 Å (Fig. 1).

References

[1]J. Y. Lu and Zh. Ge, "Synthesis and Structures of Two New Metal-Organic Polymers Containing Imidazoldicarboxylate Ligands for Hydrogen Bonding Networks, One with a Covalent Pleated Sheet Conformation," *Inorg. Chim. Acta*, 358 (2005): 828-33.

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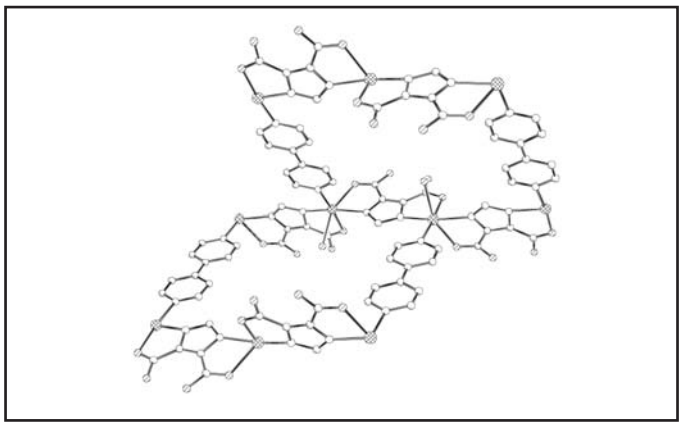

Figure 1. View of the Rectangular Grids in the Structure

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FLUID DESIGN—Prof. Jack Y. Lu stands at the Masuru Takiguchi marble sculpture, "The Ocean," in the UHCL Bayou Building.