

*Dynamic Zn-MOF: Sensing, Dual Emission, ESIPT and Selective CO<sub>2</sub> Sorption*

Arijit Halder<sup>1</sup>, Biswajit Bhattacharya<sup>1</sup>, Debajyoti Ghoshal<sup>1</sup>

<sup>1</sup>Department Of Chemistry, Jadavpur University, Kolkata, India

E-mail: arijit109@gmail.com

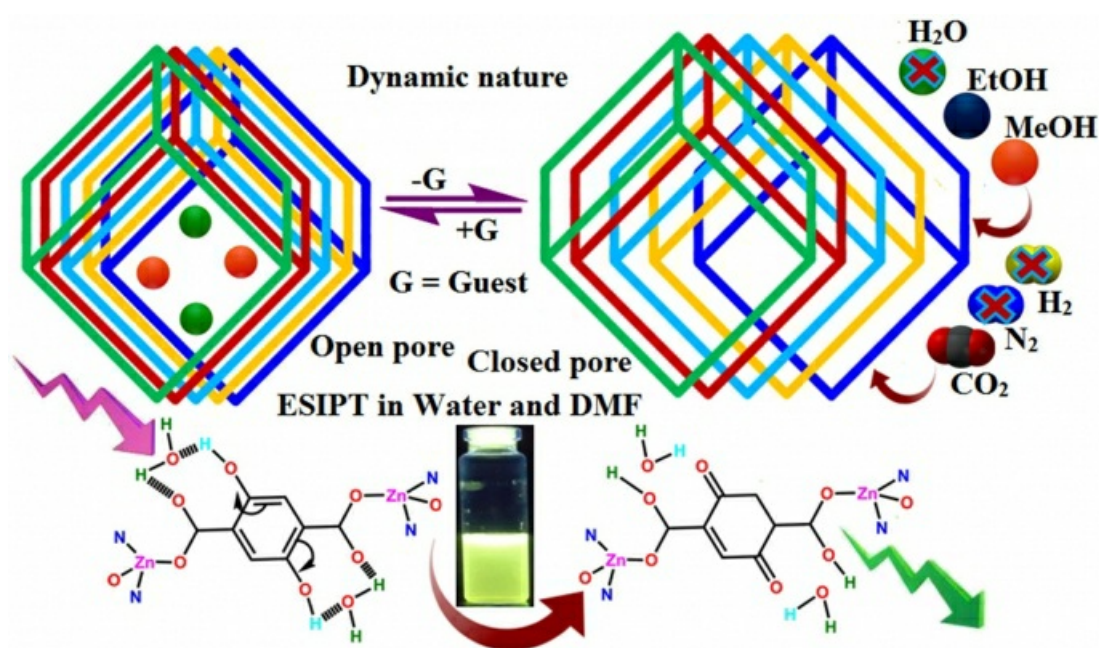
After a long journey in the path of conventional organic and inorganic chemistry, a lane of materials with tunable functionality have been opened as a variety of hybrid materials like metal-organic frameworks (MOFs), with crystalline structure correlated with their physicochemical properties. Eventually, such compounds has drawn a significant attention and their structural features have extensively been investigated due to their appealing prospects with different functionalities namely, gas storage/separation, catalysis, conductivity, magnetism, drug delivery and many more. Recently, MOF have emerged to the field of sensing and several MOFs have also been employed as sensor materials and imaging agents. A wide class of materials have been so far utilised for the sensing applications, however, ideally, chemo-sensors should be a robust material, unaltered irrespective of the molecular environment with high sensitivity to the concerned analytes even in its very low concentration. In this frame of reference, dynamic MOFs are a good choice for the designing of sensors, as the dynamic nature makes them more promising for detection of the incoming analyte molecule as the dynamism is a manifesto of external stimuli, sometimes by the accommodation of guest molecules in their flexible pores through host-guest interactions. Whereas the conventional rigid MOFs fail to do so as the external stimuli have a little effect on them. Thus, this guest dependent dynamic MOFs are under the closest attention of the relevant vigilante for the preparation of the next generation functional materials having controlled sensing application.

Nowadays, instantaneous, reliable and selective detection of water traces has become a significant issue not only for the chemical industry but also to prepare water free bio-alcohol based fuel as the minute of water can hinder the use of such alternative energy recourses. Up to the date, mainly organic sensors have been used for detecting the water traces, but they not up to the mark when the aqua impurity is very low in concentration. Now this limitation can be overcome by the use of dynamic MOFs where water is the stimuli for the dynamism.

In this regard, we are presenting a Zn(II) based dynamic MOF synthesised using 2,5-dihydroxyterephthalic acid (H<sub>2</sub>-DHT). The DHT has already there with its efficiency as a handy linker for the construction of porous MOFs[1] and can show excited-state intramolecular proton transfer (ESIPT) phenomenon. Our system is a five-fold interpenetrated 3D porous MOF, {[Zn(4-bpdh)(DHT)](MeOH)(H<sub>2</sub>O)}<sub>n</sub> of Zn(II) with a neutral N,N'-donor organic ligand (4-bpdh), and shows interesting guest-dependent reversible structural dynamism. [2] Upon desolvation, relative squeezing of the pores occurs which only be opened selectively upon carbon dioxide adsorption. Moreover, the excited state intra-molecular proton transfer chromophore promotes spectacular guest-responsive multicolour dual emission in water and DMF. Interestingly, this guest free MOF detects water at a very low concentration in various organic solvent through luminescent turn on and then dual emission way. The overall observation points out that discussed Zn-MOF has the alluring prospect in chemical industries as a luminescent water sensor.

[1] Bloch, E. D. et. al. (2012). Science, 335, 1606-1610.

[2] Bhattachary, B. et. al. (2016). Chem. Eur. J., 22, 14998-15005.



**Keywords:** [Water Sensor](#), [Dual Emission](#), [Excited State Intra-Molecular Proton Transfer](#)