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Transformation directed functionality in dynamic metal-organic framework based materials

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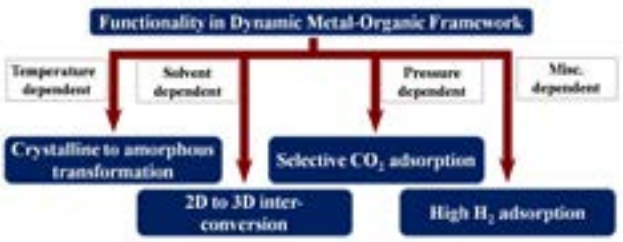
Dynamic metal organic frameworks (MOFs) have become a very promising field in contemporary research not only due to their study in understanding structural features but also for their potential applications in tailoring better functionality. The transformation of phase which is the fundamental thing of such structural dynamicity can be initiated by various external stimuli like heat, light, pressure, solvent etc. This dynamism in the structure of MOF based material can proceeds through physical as well as chemical changes. Interestingly, it has been noted that for such dynamic MOFs, the transformed phase may sometime display stepwise gas and/or solvent adsorption and also show selective gas adsorption. These functionalities in dynamic MOFs might be found pretty useful for gas and/or solvent separation. Moreover, as the change of phase are generally taken place by some external stimuli, monitoring of the change in the structures of dynamic MOF, can be used as a sensor for the responsive stimuli both as qualitative (molecular recognition and/or sensing) as well as quantitative (impurity measurement) way. In many of our recent work, it has been observed that in the study of flexible MOFs with their structural dynamicity most of them show reversible crystalline-to-crystalline transformation whereas in some cases rare reversible crystalline-to-amorphous transformation has also been observed. In every case, various external stimuli like heat, pressure, solvents etc, individually or cooperatively facilitate the transformations to another phase. There are several interesting properties have been observed for these transformed products. For example, one pair of MOFs show interesting solvent mediated inter-conversion from 2D to 3D framework and this change in dimension affects their adsorption properties too. In another endeavour, one pair of nitro functionalized MOFs exhibit selective CO_2 adsorption after the transformation of phase. A polycatenated framework also shows a temperature as well as pressure mediated structural transformation; where the transformed phases are capable to show remarkable H_2 uptake.



Biography

Debajyoti Ghoshal has completed his Doctoral studies at Indian Association for the Cultivation of Science, Kolkata and got his PhD at Jadavpur University, India in 2005. After that he has worked at the University of Gottingen, Germany as an Alexander von Humboldt fellow, to purse his Postdoctoral research. Currently, he is an Associate Professor in the Department of Chemistry at Jadavpur University and his current research interest includes functional metal organic frameworks (MOF) with a special emphasis to the selective gas storage, conducting MOF and phase transformation in dynamic MOF. He has published more than 75 papers in peer reviewed journals which has received 1780 citation with h index of 26. .