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Structural dynamism in metal-organic framework leading to their better functionality

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Flexible 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 pivotal 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.
Recently we are actively engaged in the study of flexible MOFs with their structural dynamicity.[1-3] 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 carbon dioxide 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 hydrogen adsorption up to 1.94 weight percent.
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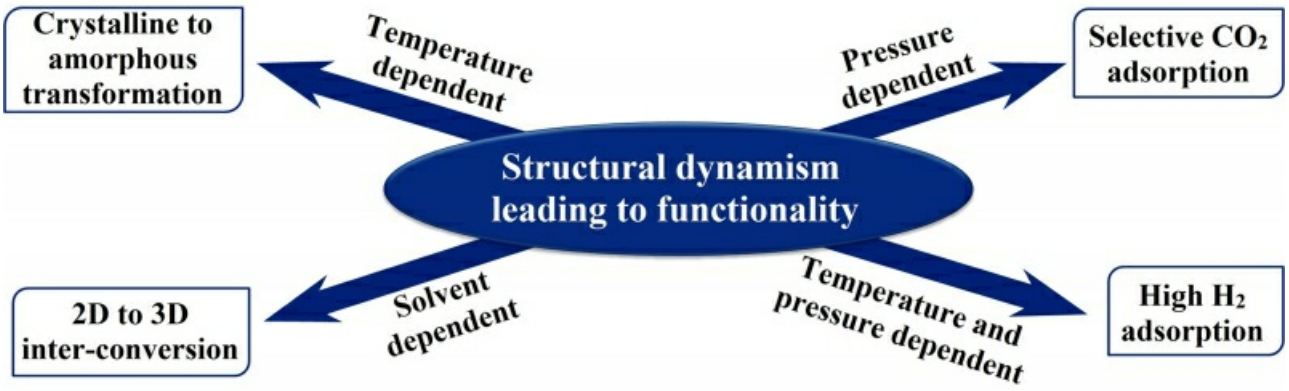

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