Flexible or 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 flexibility 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 flexible MOFs, the transformed phase may sometime display stepwise gas and/or solvent adsorption and also show selective gas adsorption. These functionalities in flexible 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 flexible 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 works, it has been observed that in the study of flexible MOFs with their structural flexibility 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, a polycatenated framework also shows a temperature as well as pressure mediated structural transformation; where the transformed phases are capable to show remarkable H2 adsorption. In another endeavor, one pair of nitro functionalized MOFs exhibit selective CO2 adsorption after the transformation of phase. It has been also found that some flexible MOF shows excellent emission properties and those may be useful to detect the traces of water in solvents, and may sense the polarity of different organic solvents.