Poster Presentation

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Gas Phase Single Crystal Growth of Coordination Networks

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Organic ligands and metal ions can produce several kinds of networks depending on experimental conditions, such as solvent, temperature, reaction speed, and so on.1, 2 While many MOF chemists have used solution phase reaction, recently some unique networking methods have been investigated, e.g. mechanochemical solid state reactions. Here we report a new method for single crystal growth of porous coordination networks via gas phase. In our previous work, we found that heating of interpenetrated network [(ZnI2)3(TPT)2]n (solvent) forms a crystalline powder, [(ZnI2)3(TPT)2]n (1, TPT = 2,4,6-tris(4-pyridyl)triazine).3 We determined a porous saddle-type structure of 1 by ab initio PXRD analysis. Interestingly, we could not prepare 1 by grinding and heating the starting powder materials of ZnI2 and TPT. Therefore, we attempted to prepare coordination networks via gas phase. On heating of ZnI2 and TPT together under reduced pressure in a glass ample at high temperature, single crystal growth of 1 was observed. The single crystal X-ray structure analysis revealed that 1 has the same structure as microcrystalline powder of 1. In gas phase, because there is no solvation effect, network topology is purely based on ligand interactivity and geometry of metal coordination. Therefore, saddle-type network is one of the possible patterns on the basis of geometry of only TPT and ZnI2 without guest molecules. To the best of our knowledge, this is the first example of single crystal growth of porous coordination network via gas phase. In summary, we successfully demonstrated the first gas phase single crystal growth of porous coordination network formation. In this presentation, we will discuss network design by gas phase reaction based on ligand interactivity focusing on weak intermolecular interaction.

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