Metal-Organic Frameworks

Porous Crystalline Materials for numerous Applications

Abstract

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Reticular chemistry deals with knitting molecules together to tether them with strong bonds in order to make an extended 3D structure. So, materials with various building blocks are designed as they are linked together by strong covalent bonds to produce a large extended framework structures. This chemistry serves as a merger of two disparate branches of chemistry – inorganic and organic chemistry and thus allows us an access to inorganic and organic hybrid materials, which have a plethora of applications.

Lately, an unparallel rate of progress has been made on a novel class of materials based solely on the principles of this new kind of chemistry. Scientists have designed these materials based on linking various inorganic clusters by different polytopic organic ligands as per their ability to coordinate strongly to the metal ions in the clusters. Structurally, these materials are composed of metals or metal oxides cluster at regular arrangement of a crystal lattice, being joined or linked together by various polytopic organic ligands. Hence they are termed as - metal organic frameworks (MOFs).

This field of chemistry has proliferated more than any other field of chemistry in the past few years with more than 1000 new MOF structures being reported every year. These are highly promising materials with their unusually high porosity and surface area (surface area of $5500 m^2/g$ for a particular structure called MOF 177). Further efforts are being directed to utilize these remarkable properties of these materials in solving many other environmental and health related issues.