Porosity in flexible metal-organic systems

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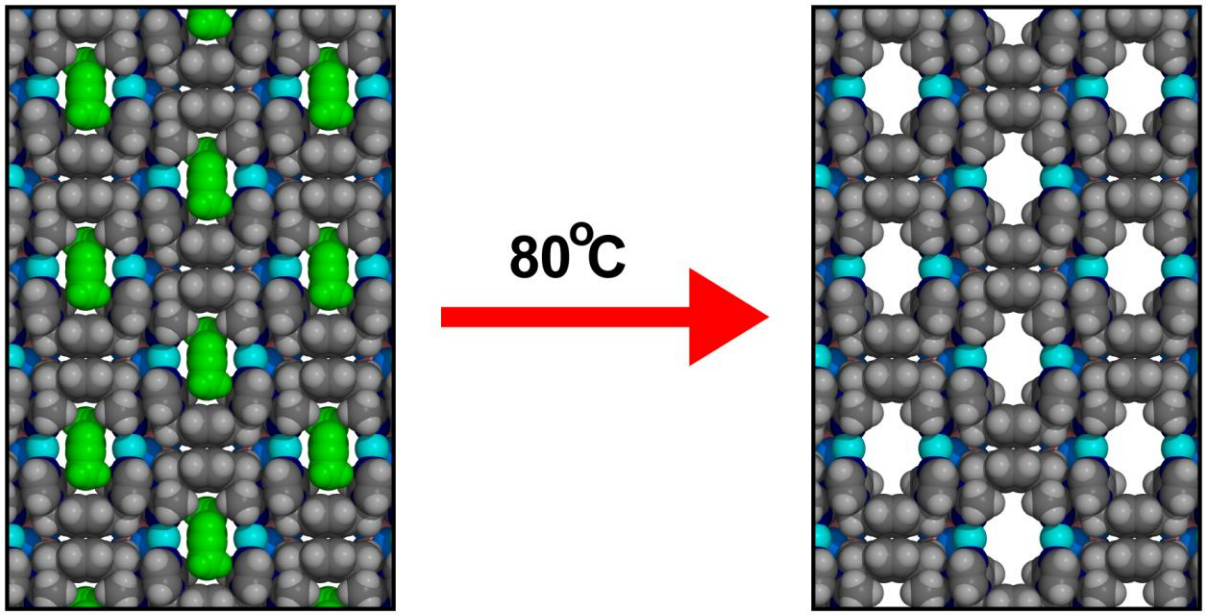
Over the past decade the study of porous crystalline solids has become highly topical, especially with regard to potentially important applications such as gas storage, separation and sensing. Well-known systems include zeolites and metal-organic frameworks and, to a lesser extent, organic molecular crystals. However, discrete metal complexes have received little attention as components of porous materials. One of the basic tenets of the solid state is that molecules tend to pack closely, thus affording minimal free space at the molecular scale. We are attempting to overcome this tendency by designing simple complexes that cannot pack efficiently without including solvent molecules. Indeed, we are specifically interested in forming solvent-templated complexes that do not collapse upon subsequent solvent removal.[1-7] We have recently discovered several systems that behave in this manner; some of these structures can be considered to be porous in the conventional sense, but we have also noted that conventional porosity is not a prerequisite for mass transport in the solid state. These systems have now been studied using a variety of complementary techniques, including X-ray diffraction, isothermal gas sorption and molecular modeling. Non-conventional use of these techniques has enabled us to gain a deep understanding of the relationship between structure and gas sorption dynamics.



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