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Chemistry and Application of Dynamic MOF/PCP Beyond Rigidity and into the Realm of Soft Porous Crystals

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As the promising materials to address global issues of clean energy technologies and environmental sustainability, the emerging class of crystalline microporous materials, porous coordination polymers (PCPs) or metal-organic frameworks (MOFs),[1] have been applied in fields of gas storage and separation, delivery vessel, sensors, catalysis, supercapacitors, FETs, batteries, proton conduction, and so on. We have found the 3rd generation (3G) PCPs/MOFs (Soft porous crystals, SPCs[2]) that possess flexible or dynamic porous frameworks reversibly respond to external stimuli, not only chemical but also physical, unlike robust PCPs/MOFs (2G).[3,4] In particular, by controlling the local motion of organic ligands that construct the framework, we discovered and developed an effective mechanism for separating gas mixtures with similar properties, such as oxygen/argon,[5] alkane/alkene,[6,7] and light water/heavy water isotopologue mixtures.[8] This talk provides an essential and accessible overview of the chemistry of SPCs, their current features, and the outlook of further developed materials as 4th generation PCPs/MOFs, which exhibit multi-functions simultaneously or alternately in combination.[9,10]

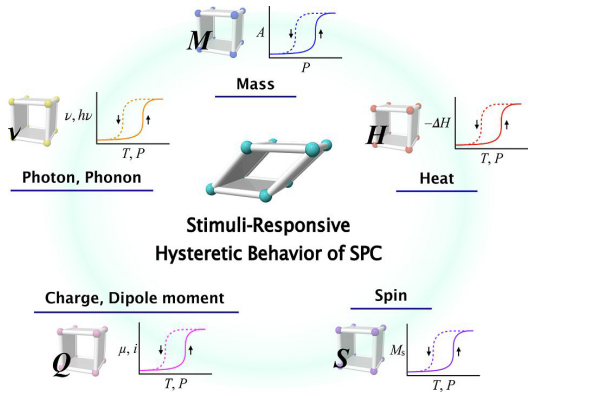


Figure 1. PCP/MOF-based soft porous crystals with superior features that differentiate them from other porous materials

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