Title:	Design and Synthesis of Porous Organic Polymers for Sensing and Visible Light Photocatalytic Applications
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Abstract:	Accumulating the knowledge form porous structures found in nature, scientists have made a great progress in constructing various extended porous structures which differ in chemical compositions and pore architectures. Among all the porous materials, porous organic polymers (POPs) with well defined pores and very high surface area received a great attention. Being purely organic materials, POPs can be easily designed using rich organic synthetic tools and can be processed from molded monolith to thin films, which is nearly impossible in the case of other inorganic/hybrid porous structures. In addition, made of light elements, POPs are very useful materials where low density materials are required. Decorated with these many advantages, POPs have strengthened their way to various applications such as adsorption, separation, catalysis, proton conduction, solar cells, drug delivery etc. Among all POPs, covalent organic frameworks (COFs) devised through reticular chemistry approach are very interesting porous materials due to their crystalline structures and open voids. Further, conjugated microporous polymers (CMPs) are widely explored amorphous POPs because of their synthetic simplicity and low band gap. This presentation will describe three examples of strategic design and synthesis of new COFs and CMPs for sensing and visible light photocatalytic applications. The first example will address design and synthesis of boronic ester linked Truxene based highly porous crystalline COF and its application in humidity sensing.1 The COF shows change in impedance with varying relative humidity in very short response and recovery times due to boronic ester linkage decorated nanochannels generated by periodic layers. The second example will demonstrate a bottom-up approach to design highly fluorescent self-exfoliable ionic covalent organic nanosheets (iCONs) via condensing an intrinsic ionic linker with a fluorophore.2 These fluorescent iCONs, due to their cationic nature and well-exposed active sites, can selectively sense F^- ion down to ppb level via fluorescence turn-off mechanism. A closer look at the quenching mechanism reveals a unique proton triggered fluorescence switching behaviour of the iCONs. These results provide a fundamental approach to develop photo-luminescent artificial molecular switches based on 2D organic nanosheets. The third example will describe the synthesis of Truxene based CMP for heterogeneous photocatalytic applications under direct sunlight.3 This work opens the door for the employment of various CMPs as metal-free heterogeneous photocatalysts for effective harvesting of natural sunlight to drive many organic transformations. Fundamental challenges and technological opportunities will be highlighted in each of these examples
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