Advances in Organic 2D Materials

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In the past decade, as inspired by the discovery of graphene, two-dimensional (2D) materials which possess a periodic network structure and with a topographical thickness of atomic/molecular level, have emerged as the new paradigm of materials with enormous potentials, ranging from electronics and optoelectronics to energy technology, membrane, sensing and biomedical applications. Various synthesis/fabrication strategies have been developed to attain high quality 2D materials. Among of them, mechanical exfoliation remains the most popular protocol to isolate single-layer high quality 2D materials for fundamental physical studies.
In contrast to the tremendous efforts dedicated to exploring graphene and inorganic 2D materials such as metal dichalcogenides, boron nitride, black phosphorus, metal oxides and nitrides, the study on organic 2D material systems including the bottom-up organic/polymer synthesis of graphene nanoribbons, 2D metal-organic frameworks, 2D polymers/supramolecular polymers as well as supramolecular approach to 2D organic nanostructures remains under development. In this lecture, we will present our recent efforts on the bottom-up synthetic approaches towards novel crystalline organic 2D materials with structural control at the atomic/molecular-level. 2D conjugated polymers and coordination polymers thus belong to such materials classes. The unique structures with possible tailoring of conjugated building block and conjugation length, adjustable pore size and thickness, as well as interesting electronic structure make them highly promising for a number of applications in electronics and spintronics. Other application potential of organic 2D materials will be also discussed.

REFERENCES
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