

Controlled Synthesis of π -Conjugated Materials Beyond 1D

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Extension of π -conjugation beyond 1-dimension results in materials with novel optical, electronic, and optoelectronic properties. However, strong π - π intermolecular interactions hamper solution phase synthesis of 2D- π -conjugated materials. A common theme in the Gavvalapalli group is controlled synthesis of higher dimensional π -conjugated materials using novel building blocks. My talk is divided into two parts. Part-1 focuses on developing π -face masked aryl monomers to generate soluble 1D- and 2D- π -conjugated materials without pendant solubilizing chains. Cycloalkyl straps mask the polymer π -face and therefore reduce interchain π - π interactions. The unique advantages rendered by the cycloalkyl straps enabled diverse materials including soluble conjugated microporous polymers and 1-D polymers with spatially controlled binding sites. Part-2 focuses on developing novel n-type linear polymers and the corresponding nanoladder polymers using pyrazinacenes. Astonishingly, despite a century since their discovery, there have been no reports on the conjugated polymers of pyrazinacenes. Breaking through these challenges, we established the synthesis of previously undiscovered and highly coveted conjugated polymers of pyrazinacenes. Pyrazinacene polymers are converted into nanoladder polymers and the resultant nanoladder structures are imaged using scanning tunnelling microscope.