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Molecules to materials: supramolecular synthons and 2D metal-organic nanosheets

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For quite some time now, we have been concerned with exploitation of 'sterics' in the rational design of molecular structure to control both reactivity and molecular order/disorder. As the title portrays, I will discuss two disparate issues, namely, steric control of supramolecular synthon adoption[1,2] and formation of metal-organic 2D nanosheets.[3]

In a large set of analogous sterically-hindered compounds containing drastically different 4 functional groups, namely, acids, alcohols, amides, and boronic acids, sterics overwhelm highly robust synthons and dictate adoption a particular synthon. I will demonstrate how sterics preclude anticipated robust supramolecular synthons to be reproduced in the crystal structures and lead to novel and heretofore unknown new supramoleculat synthons.

Insofar as application to materials is concerned, I will exemplify the concept of 'orthogonal self-assembly' involving metal-ligand coordinate covalent bonding and hydrogen bonding to access 2D metal-organic nanosheets by disruption of interlayer hydrogen bonds in layered metal-organic materials synthesized by de novo design.

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[2] Moorthy, J. N.; Bajpai, A.; Mandal, S.; Savitha, G. Unpublished Results
[3] Chandrasekhar, P.; Mukhopadhyay, A.; Savitha, G.; Moorthy, J. N. (2017) J. Mater. Chem. A., ASAP.

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