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Metal-Organic Polygons, Polyhedra, and Extended Frameworks Derived from Molecules Constructed in the Solid State. Leonard R. MacGillivray, Giannis S. Papaefstathiou, Tamara D. Hamilton, Qianli Chu, Tomislav Friscic, Dept. of Chemistry, Univ. of Iowa, 423B Chemistry Bldg. Iowa City, IA 52242 USA.

Reactions that occur in the solid state can produce molecules difficult, or impossible, to achieve in the liquid phase. In this context, we have described a method to construct molecules in the organic solid state using ditopic molecules that function as linear templates. The templates act as molecular equivalents of two hands, grabbing pyridine handles attached to stilbenes, via hydrogen bonds, and assembling the olefins in positions suitable for single- and multiple [2+2] photodimerizations. The method has provided stereocontrolled access to cyclobutanes based on cyclophane and ladderane frameworks in 100% yield and gram quantities.

We believe that molecules derived from linear templates in the solid state represent potentially intriguing ligands in coordination chemistry. That the cyclobutane products are lined with at least two pyridyl groups means that such molecules may serve as organic building units of discrete (e.g. polygons) and infinite (i.e. polymers) metal-organic frameworks with applications in areas such as catalysis and separations. In this presentation, we describe the design and synthesis of metal-organic frameworks derived from organic molecules constructed in the solid state using linear templates. Examples include polygons (e.g. squares), polyhedra (e.g. trigonal antiprism), and extended frameworks (e.g. grids). These frameworks represent rare applications of molecules derived from linear templates and the solid state.