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Hybrid Materials from the F Elements. Christopher L. Cahill, Lauren A. Borkowski, Daniel T. De Lill, Dept. of Chemistry, The George Washington Univ., Washington, DC 20052.

Our group has been focusing on the synthesis and structural systematics of lanthanide and actinide containing metal-organic framework materials (MOFs) and coordination polymers. Each of these systems displays a unique set of structural features which in turn gives rise to unprecedented topologies as well as tunable electronic properties. For example, Ln-carboxylates exhibit edge sharing of Ln-O polyhedra so that at least one dimension of these structures contains robust Ln-oxide bonding. Further, we are able to manipulate the topologies of these compounds through 'templating' in which non-coordinated, aromatic guest molecules can be utilized to influence both the crystal structure as well as Ln luminescence.

Hybrid materials containing the uranyl cation (UO_2^{2+}) also display a wide range of structure types. Rather than templating, this system employs the use of multiple linker molecules (that is, carboxylate/pyridyl combinations) to promote assembly of extended structures. Interestingly, U-pyridine linkages are quite rare in extended structures, despite their ubiquity in uranyl-containing molecular compounds and transition metal MOFs. We have tailored appropriate pyridyl/carboxylate pairings to crystallize structures in which the aromatic serves as either a linker, or a charge balancing/space filling guest. In all cases, the aromatic component serves to sensitize UO_2^{2+} luminescence. Further, polymerization of uranyl centers to form oligomeric secondary building units is seen as a function of linker geometry.