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From Templates to Anionic Bridges: Novel Approaches to Metal-Organic Framework Syntheses.

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Zeolites and zeolite-like materials often utilize templates as structure-directing agents and/or charge balance entities. Within metal-organic frameworks, however, the use of such templates has not been exploited as extensively. Through hydrothermal synthesis, successful inclusion of 4,4'-dipyridyl and 1,2-bis(4-pyridyl)ethane into several lanthanide and calcium systems has been achieved. Further, a novel form of connectivity within a Sr-adipate system has been discovered, where an anionic nitrate group is seen to bridge one-dimensional Sr-adipate chains into a three-dimensional framework. This demonstrates that the metal salt used in MOF syntheses may, in certain circumstances, influence overall structure topology. Several new structures have thus been synthesized : GWMOF-6 ($[\text{Ln}_2(\text{C}_6\text{H}_8\text{O}_4)_3(\text{H}_2\text{O})_2] \cdot (\text{C}_{10}\text{H}_8\text{N}_2)$) ($\text{Ln} = \text{Pr}^{3+}, \text{Nd}^{3+}, \text{Ce}^{3+}, \text{Sm}^{3+}, \text{Eu}^{3+}, \text{Eu}^{3+}/\text{Tb}^{3+} (50/50)$), GWMOF-7 ($[\text{Ca}(\text{C}_6\text{H}_8\text{O}_4)(\text{H}_2\text{O})_2] \cdot (\text{C}_{10}\text{H}_8\text{N}_2)$), GWMOF-8 ($[\text{Ca}(\text{C}_6\text{H}_8\text{O}_4)(\text{H}_2\text{O})_2] \cdot (\text{C}_{12}\text{H}_{12}\text{N}_2)$), and GWMOF-9 ($[\text{Sr}_2(\text{C}_6\text{H}_8\text{O}_4)_2(\text{NO}_3)] \cdot (\text{H}_2\text{O})_4$). Synthesis, structure characterization, and luminescent properties will be presented.