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Coordination Networks and Hybrid Materials:

What's Different at the Nanoscale?

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The molecule-based nature of coordination polymer solids and hybrid materials differentiates them from other inorganic solids and nano-objects. Assembled from molecular precursors, they offer the ability to change behavior through molecular synthesis, an advantage often attributed to molecular materials or organic polymers, yet they can possess physical properties more commonly associated with the inorganic solid state. At the same time, the "soft material" nature can lead to complex phase behavior, with metastable phases of interest to varied fields. Significant benefits can be anticipated from the ability to control phase behavior in such "soft" materials. This presentation will highlight examples of nanoscale and mesoscale heterostructures that alter solid-state phase properties by modifying either the solid-liquid interface or the solid-solid interface, taking advantage of changing surface energy or mesoscale elastic properties. Examples will be drawn from organic-inorganic hybrid perovskites, cyanometallates and layered metal phosphonates and phosphates, currently of interest for electronic, magnetic, and intercalation chemistry applications.