Portland State
Chemistry

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Molecular Chemistry at the Intersection of Self-Assembly and Renewable Energy

ABSTRACT: The use of metal-ligand bonding as a driving force for self-assembly reactions enables the construction of polynuclear architectures. Depending on the building blocks used, the resulting assemblies may be discrete molecules or extended frameworks. The Cook Group explores coordination-driven self-assembly with an emphasis on functional designs. By exploiting the presence of multiple metal centers and rigid organic building blocks, it is possible to design metal-organic architectures that are capable of catalysis, electrochemical energy storage, and separations chemistry. We have also studied the so-called emergent properties that result when two or more photoactive building blocks interact within a structure, to give photophysical properties that differ from the parent tectons. This talk will introduce fundamental aspects of coordination-driven self-assembly and then will highlight our advances in the area of oxygen reduction electrocatalysis and other processes of relevance to renewable energy.

BIO: Timothy R. Cook is an associate professor of chemistry at the University at Buffalo. He carried out undergraduate research in the Caradonna Group at Boston University prior to his PhD studies in the Nocera Group at MIT. After a postdoc in the Stang Group at the University of Utah, he began his independent research career at the University at Buffalo in 2014, and later received tenure in 2020. Research in the Cook Lab is centered around synthetic coordination chemistry with an emphasis on functional materials, particularly the formation and study of self-assembled structures. Fundamental studies of their photophysics and electrochemistry underpin interest in small molecule catalysis, electrochemical energy storage, separations chemistry, non-linear optical materials, and magnetic resonance imaging. In 2019, Prof. Cook received an NSF CAREER award to explore polynuclear catalysts of relevance to energy storage and related small molecule activation and in 2020, he received the SUNY Chancellor's Award for Excellence in Teaching.