

Tunability of Covalent Organic Frameworks towards Catalytic Efficiency

Isaiah Duplessis

Ames Laboratory, U. S. Department of Energy, Iowa State University, Ames, IA

Abstract:
Covalent organic frameworks (COFs), are crystalline microporous polymers made from a variety of organic linkers. The tuneability of COF structures has made these materials promising in a wide array of applications including catalysis. A current problem in the synthesis of new crystalline COF material is that some cannot be synthesized via traditional methods.

Recent advances have demonstrated a heterogeneous linker exchange method to synthesize mixed-linker COFs. Using this method, we propose the synthesis of previously inaccessible COFs not able to be synthesized through traditional methods (solvothermal/ grinding), as well as study the effect of density of active sites on the catalytic efficiency in a mixed-linker COF.

To do this, we have constructed a robust, recyclable COF with a metal-loaded bipyridine ligand arranged in the backbone of the polymer for use in catalytic transformation. Specifically, an iridium-loaded COF as an active catalyst for the borylation of aromatic C-H bonds with B$_2$(pin)$_2$. 