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TOPIC(s) : Homogenous, heterogenous and biocatalysis / Clean reactions

A Visible-Light-Harvesting Covalent Organic Framework Bearing Single Nickel Sites as a Highly Efficient Sulfur-Carbon Cross-Coupling Dual Catalyst

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PURPOSE OF THE ABSTRACT

Covalent Organic Frameworks (abbreviated as COFs) have recently emerged as light-harvesting devices, as well as elegant heterogeneous catalysts. The combination of these two properties into a dual catalyst has not yet been explored. We report a novel photosensitive imine-linked COF, decorated with single nickel sites to forge a dual catalyst (named as Ace-COF-Ni). In this dual catalyst, the photoactive COF acts as the photocatalyst while the incorporated single nickel sites act as the active transition metal catalyst for the S-C cross-coupling reaction. Due to the ordered structure and proximity of the photosensitizer and the nickel catalytic active sites, the resulting crystalline and highly porous Ace-COF-Ni catalyst exhibits high catalytic activity, broad substrate adaptability, and outstanding recyclability and stability for visible-light-driven catalytic sulfur-carbon cross-coupling reaction. What's more, based upon a combination of Stern-Volmer analysis, photoluminescence, EPR, and cyclic voltammetry, the reaction mechanism is elucidated. This work demonstrates, for the first time, the ability to incorporate transition metal single sites in a photosensitive Ace-COF scaffold and to form a dual catalyst to synergistically perform organic transformations.

FIGURES

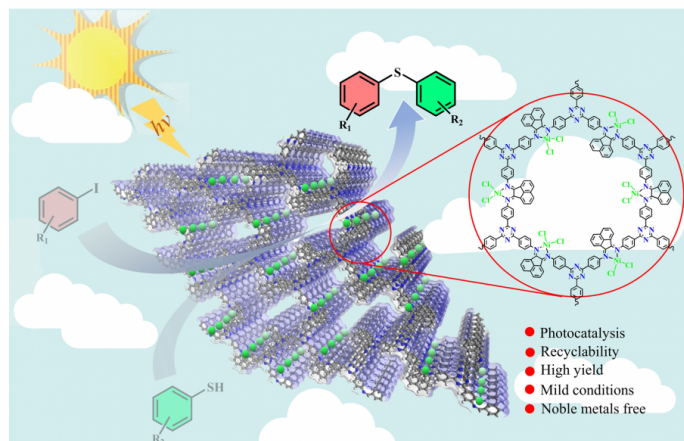


FIGURE 1

COF-based dual catalyst

A heterogeneous catalyst, which is composed of a photosensitive covalent organic framework and single nickel sites, exhibits excellent visible-light and organometallic nickel synergistic catalytic performances for the S-C Cross-Coupling reaction.

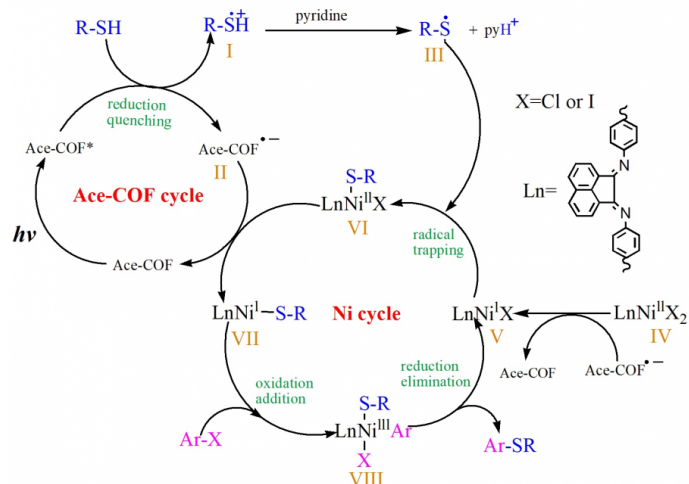


FIGURE 2

Reaction mechanism

Proposed mechanism of Ace-COF-Ni catalyzed S-C cross-coupling reaction.

KEYWORDS

Covalent Organic Frameworks | Single Nickel Sites | visible-light-driven photocatalysis | S-C cross-coupling reaction

BIBLIOGRAPHY

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