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Photoinduced Cross-Coupling with a Supported Iridium–Nickel Bimetallic Catalyst
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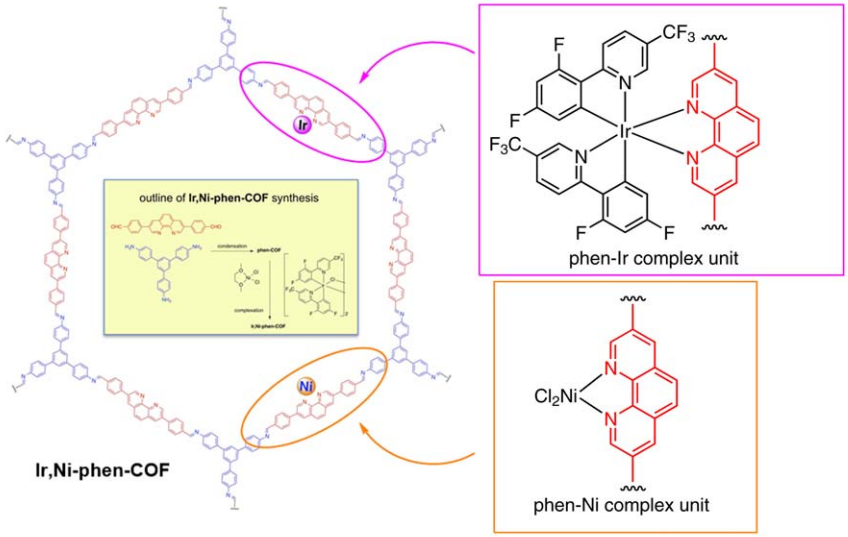
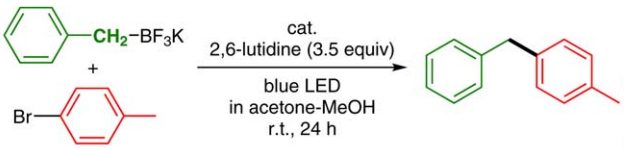
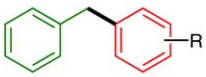
Photoinduced Cross-Coupling with a Supported Iridium–Nickel Bimetallic Catalyst

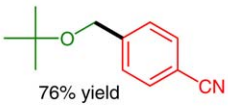




Ir,Ni-phen-COF (0.3 mol% Ir, 0.7 mol% Ni)	90% yield
Ir,Ni-phen-COF (dark)	NRX
phen-COF	NRX
Ir@phen-COF	NRX
Ni@phen-COF	NRX
$[Ir(F_2(CF_3)ppy)_2(bpy)]PF_6$ (0.3 mol%) + $NiCl_2$(phen) (0.7 mol%)	23% yield



R	yield	R	yield
H	87%	4-CN	>99%
4-*t*-Bu	80%	4-CHO	>99%
4-OMe	34%	4-CH=CH_2	>99%



Significance: A covalent organic framework containing phenanthroline units (**phen-COF**) was prepared by condensation of 1,3,5-tris(4-aminophenyl)benzene with 3,8-bis(4-formylphenyl)-1,10-phenanthroline. A heterobimetallic **phen-COF** composite, **Ir,Ni-phen-COF**, was obtained by complexation of **phen-COF** with $\{[F_2(F_3C)ppy]_2Ir\text{-}\mu\text{-}Cl\}_2[F_2(F_3C)ppy]$ = 2-(2,4-difluorophenyl)-5-(trifluoromethyl)pyridine] and $NiCl_2$·glyme. **Ir,Ni-phen-COF** catalyzed the $C(sp^3)$–$C(sp^2)$ bond-forming cross-coupling of alkylborates with aryl bromides under photoirradiation conditions.

Comment: The cross-coupling did not take place in darkness. Heterogeneous **Ir,Ni-phen-COF** exhibited a better catalytic performance than homogeneous bimetallic systems using ppy-Ir and phen-Ni complexes [e.g., 4-MeC_6H_4Bn; yield: 90% (heterogeneous); 23% (homogeneous)]. **Ir,Ni-phen-COF** was recovered by centrifugation and reused seven times with a slight loss of its catalytic activity.

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Category
Polymer-Supported Synthesis

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covalent organic framework
iridium catalysis
nickel catalysis
photocatalysis
cross-coupling

Synfact of the Month

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