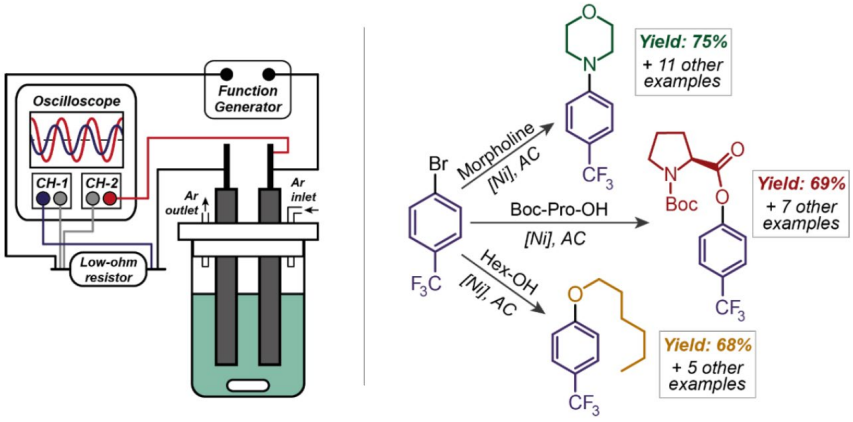
Coupling of Alternating Current to Transition Metal Catalysis

Material Science

Reference Number: **2050** \ Principal Investigator: **Prof. Sergey Semenov** \ Patent Status: **US-2023-0407492-A1, EP4214355**

The coupling of transition-metal and photoredox catalytic cycles via single-electron transfer has become a powerful strategy in modern catalysis. While synthetic electrochemistry typically relies on direct current (DC), this technology introduces a method for coupling alternating current (AC) electrolysis with transition-metal catalysis, enabling enhanced catalytic reactions with improved yields and selectivity.



Demonstrated setup and AC-enabled Ni-catalyzed cross-coupling reactions

APPLICATIONS

- Catalytic systems where one or several steps can be accelerated by electrochemical oxidation/reduction
- Transition-metal catalytic reactions

DEVELOPMENT STAGE

The method is at TRL of 4. It has been used for a variety of catalysis processes, producing different amines, aryl bromides, carboxylic acids and alcohols.

DIFFERENTIATION

Expanded Potentials beyond the solvent electrochemical window

Efficient Redox Reactions on the same electrode

Adjustable Selectivity

Innovative Stirring-free Reactor Design

Prevents electrode fouling

REFERENCES

- Bortnikov, E.O. & Semenov J. Org. Chem. 2021