

SYNTHETIC PHOTOELECTROCHEMISTRY ORIENTED TO THE OBTENTION OF ORGANIC COMPOUNDS. C-H BONDS OXIDATIVE ACTIVATION

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ABSTRACT

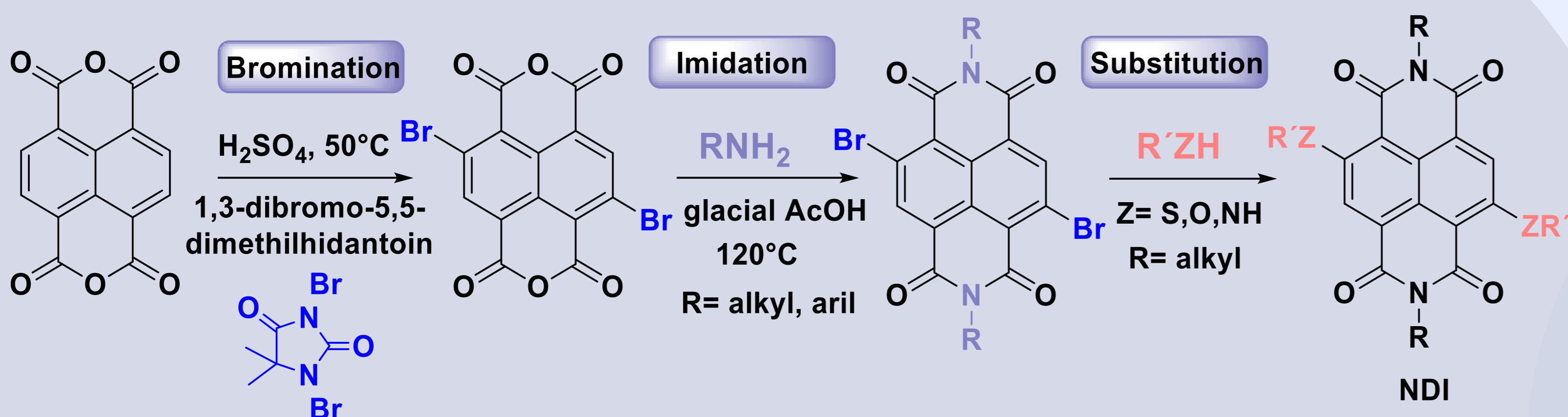
The development of sustainable methodologies for the synthesis of organic compounds is a fundamental challenge in modern organic chemistry. This project is focused on advancing the fields of **photoredox catalysis (PRC)** and **synthetic photoelectrochemistry**, exploring their applications in **oxidative C-H substitution reactions**. In the first place, we propose the synthesis and characterization of **novel photoredox catalysts** derived from **naphthalene diimides**, targeting their ability to form stable radical ions under visible light irradiation. Additionally, the project aims to evaluate the catalytic activity of these catalysts in model reactions, employing **consecutive photoinduced electron transfer (conPET)** and **electro-photoredox catalysis (e-PRC)** mechanisms, where the formation of the excited state of radical ions is the key catalytic step. The ultimate goal is to **optimize reaction conditions** through the exploration of **environmentally friendly solvents**, thereby expanding the applicability of these strategies. This work seeks to contribute to the development of efficient catalytic systems for selective and sustainable organic transformations, highlighting the potential of **visible light and electricity as clean, versatile reagents**.

OBJECTIVES

1. Synthesis of **(electro)photoredox catalysts** derived from **naphthalene diimides (NDI)** with electron donor groups.
2. Characterization of NDI photocatalyst through **spectroscopic and electrochemical techniques**.
3. Evaluate the activity of NDI (electro)photocatalyst in **C-H oxidative activation reactions**.

MATERIALS and METHODS

1. Synthesis of catalysts derived from naphthalene diimides (NDI).



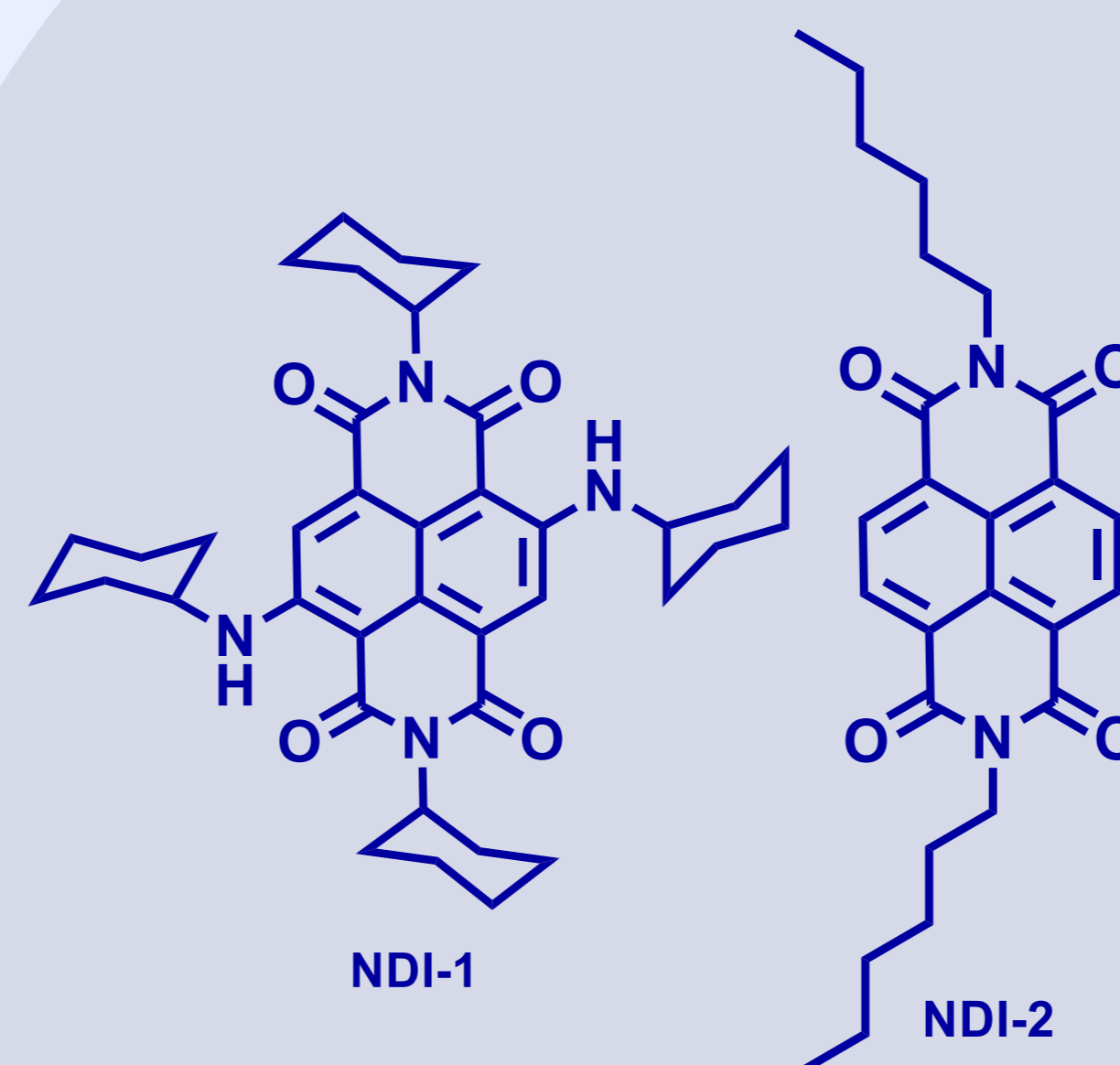
2. Characterization of synthesized NDI catalysts.

- UV-Visible and Stationary Fluorescence Spectroscopy
- Time-Resolved Fluorescence Spectroscopy.
- Cyclic Voltammetry.
- Spectro-electrochemical studies.

Characterization of neutral and radical ion forms of NDI

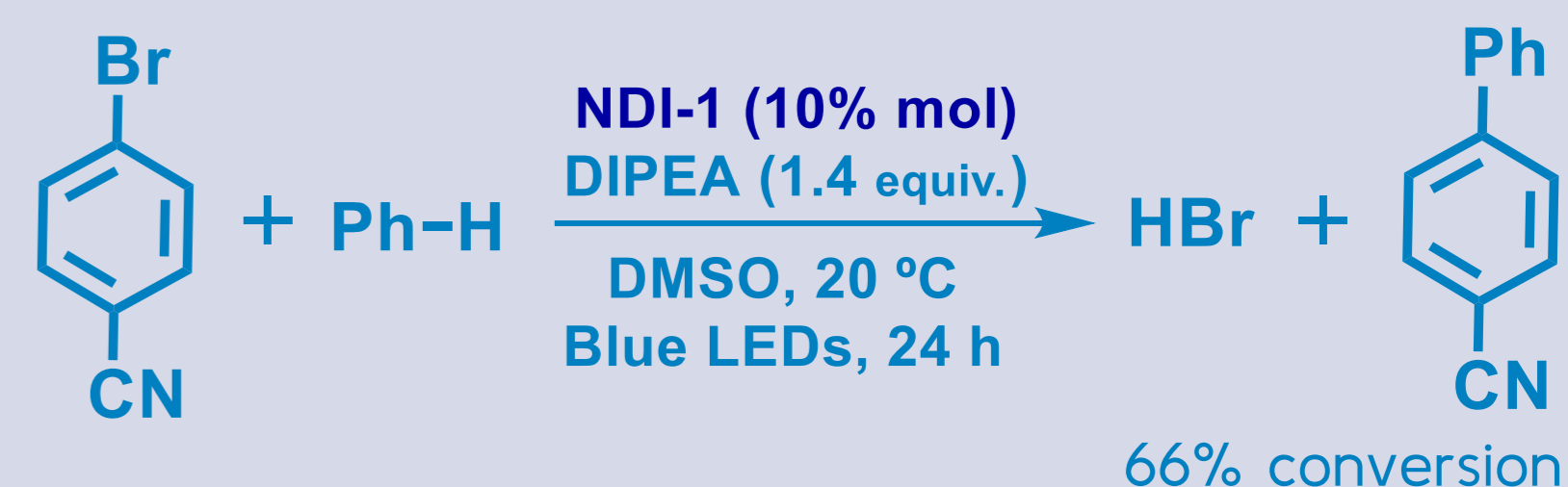
PREVIOUS REPORTS

1. Synthesis of catalysts derived from naphthalene diimides (NDI).

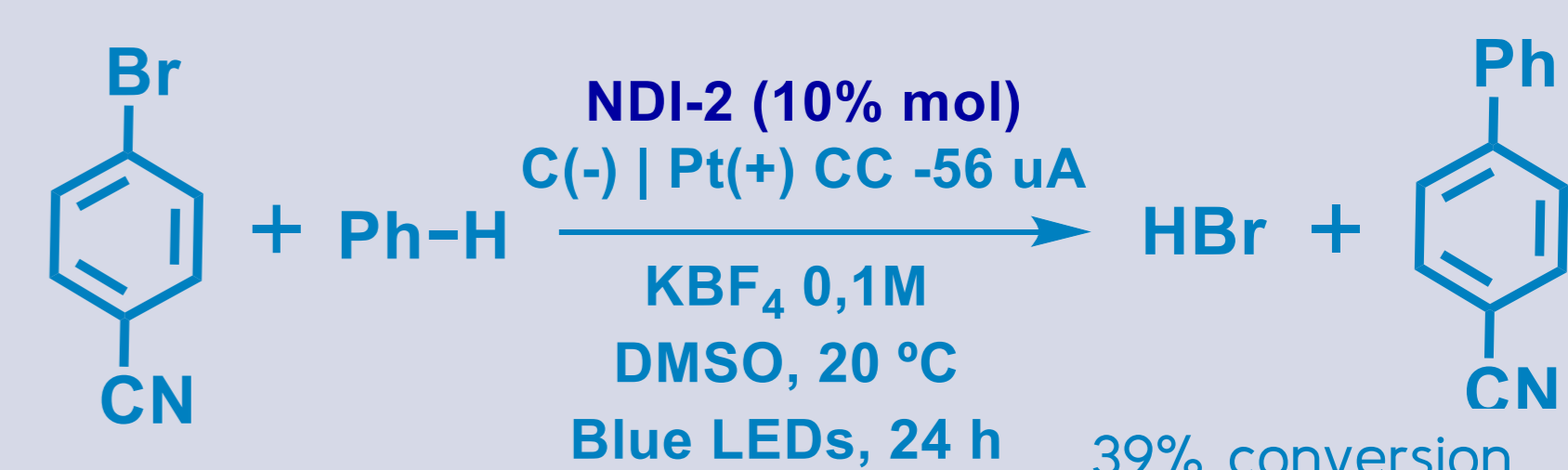


2. Evaluation of NDI as (electro)photocatalysts in C-C coupling reaction.

conPET mechanism:



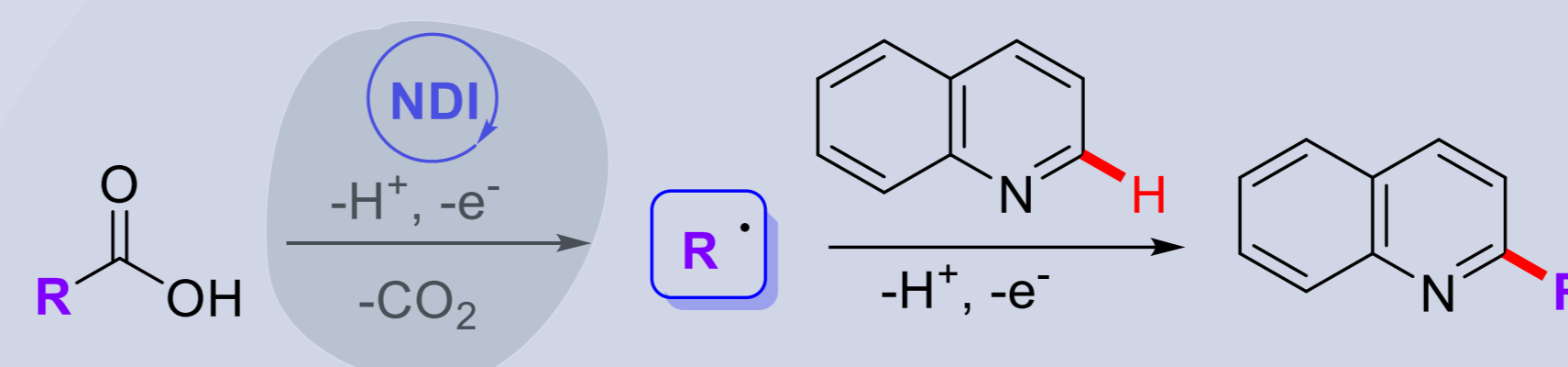
electro-PRC mechanism:



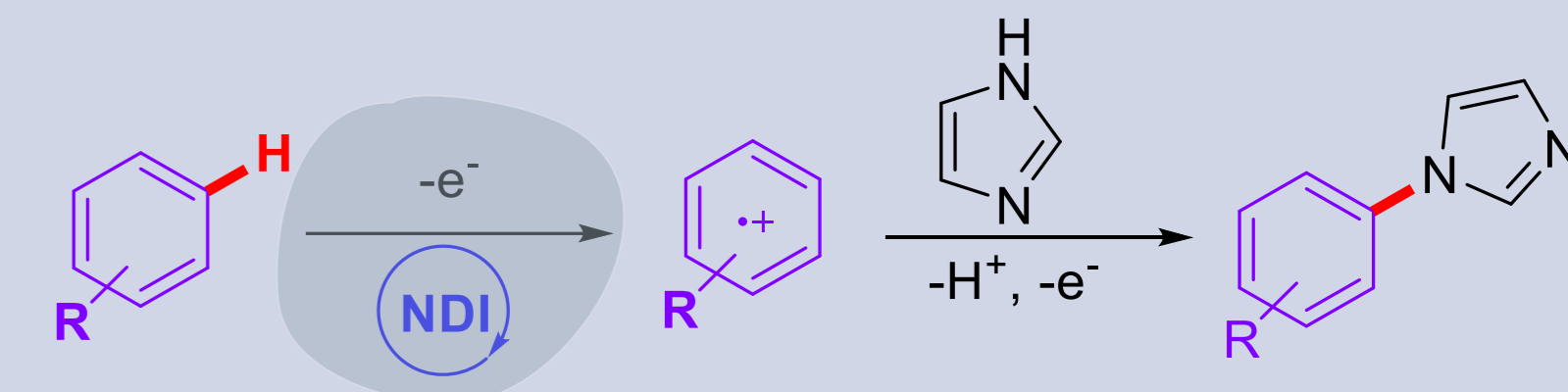
Caby et al., *ChemCatChem*, 2021, 13, 3001- 3009

3. Evaluation of NDI as (electro)photocatalysts in C-H activation model reactions.

Decarboxylation reaction:



Nucleophilic Substitution reaction:



Evaluation of con-PET and electro-PRC approaches

- Excitation wavelength (LEDs).
- Working potential.
- Solvents and co-solvents (alkylcarbonates and water).
- Cell type, electrode materials, supporting electrolyte.

REFERENCES

- ¹ Sasikumar, M. et al. *Asian JOC*. 2013, 2, 693- 791.
- ² Suraru, S.L., Wurthner, F. *Angew. Chem. Int. Ed.* 2014, 53, 7428- 7448



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