



Nickel-Catalyzed Cross-Dehydrogenative Coupling of Aldehydes and Alkenes toward Skipped Enones

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Abstract

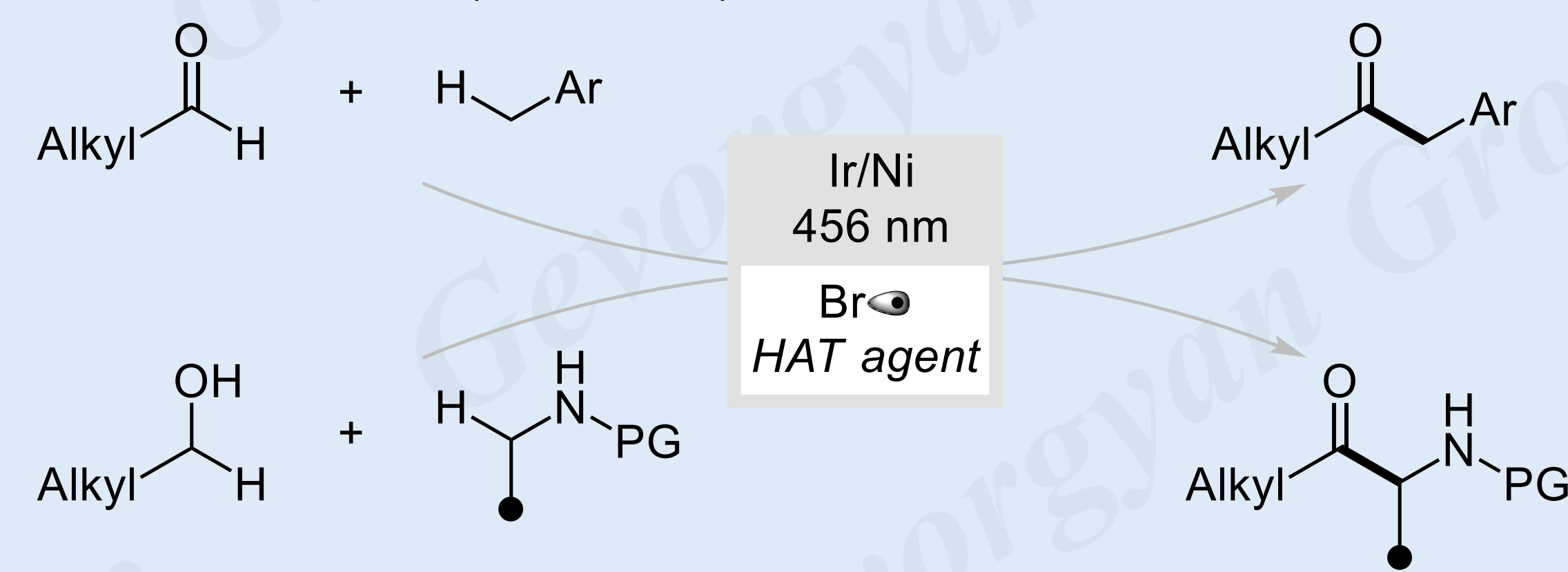
Cross-dehydrogenative coupling (CDC) of C–H bonds provides a direct route to C–C bond formation without prefunctionalization; however, most existing methods rely on polar pathways or prior activation of one of the coupling partners. We describe a nickel-catalyzed CDC of aldehydes and alkenes that delivers skipped enones through a radical-mediated hydrogen atom transfer (HAT) strategy. Key to this transformation is the *in-situ* generation of aryl radicals from aryl bromides, which selectively abstract hydrogen atoms from both aldehydic and allylic C–H sites to generate acyl and allylic radicals. These radicals undergo nickel-catalyzed radical–radical cross-coupling to furnish the skipped enone products. The reaction features broad substrate scope, high chemoselectivity, and compatibility with a wide array of functional groups, highlighting its utility for late-stage modification and the streamlined synthesis of valuable skipped enone frameworks.

Background and Ni-Catalyzed CDC Reaction

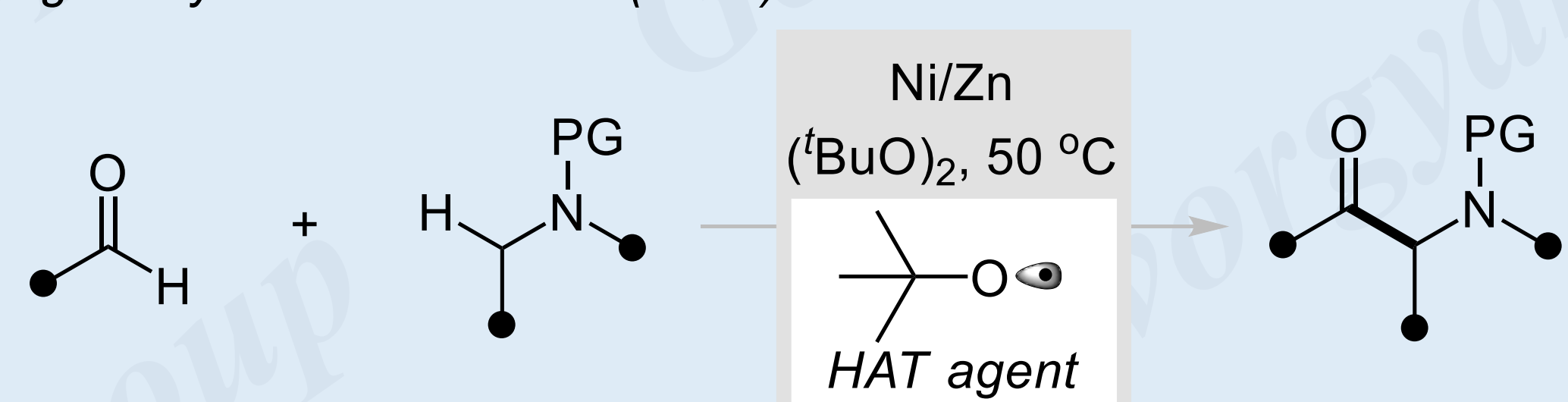
A) Cross-Dehydrogenative Coupling via Intermolecular HAT

Existing Methods

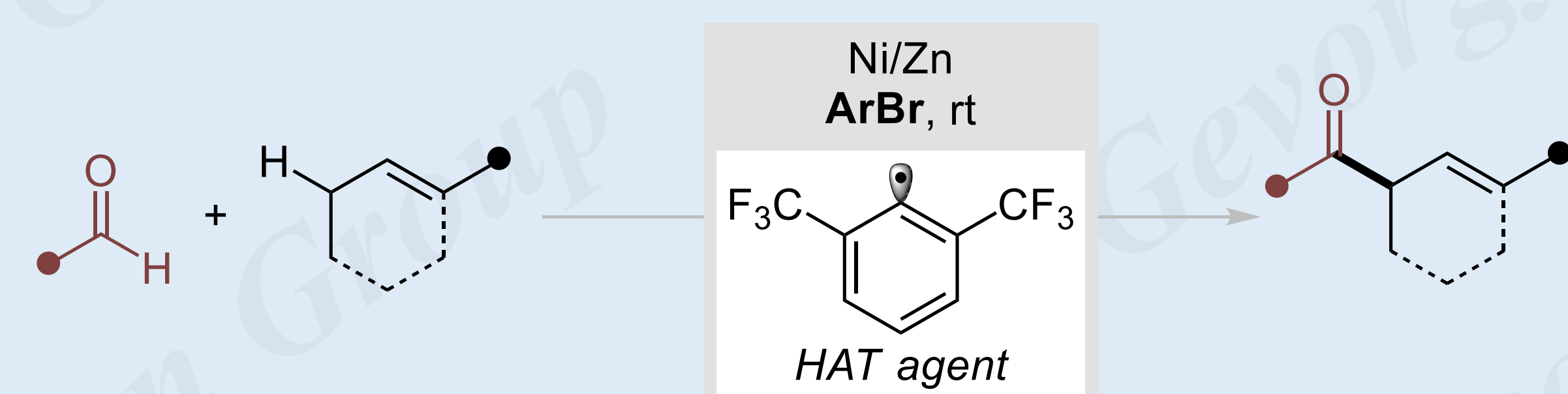
Murakami and Ishida (2020, 2024)



Montgomery and Zimmerman (2023)

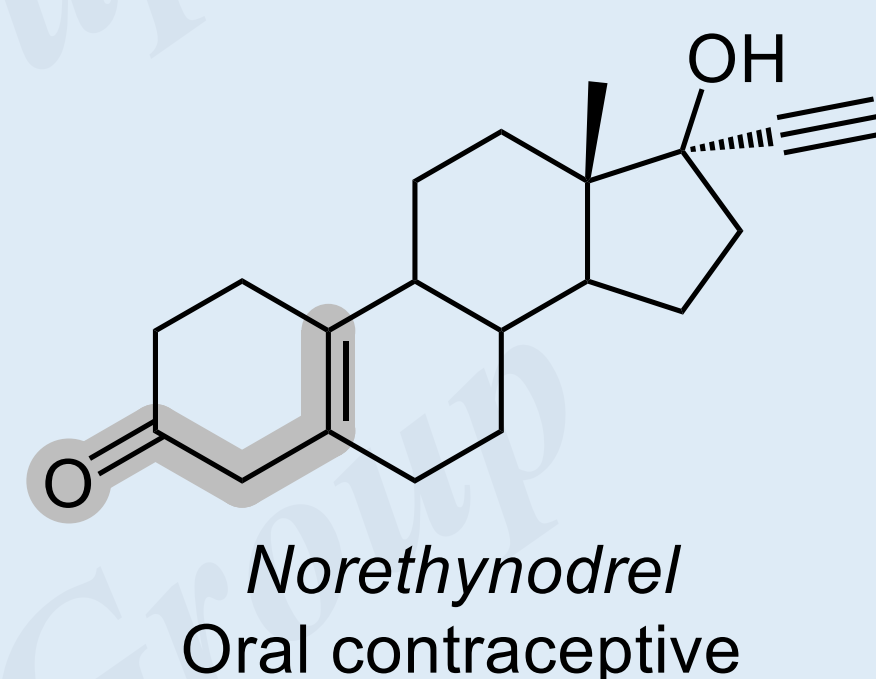
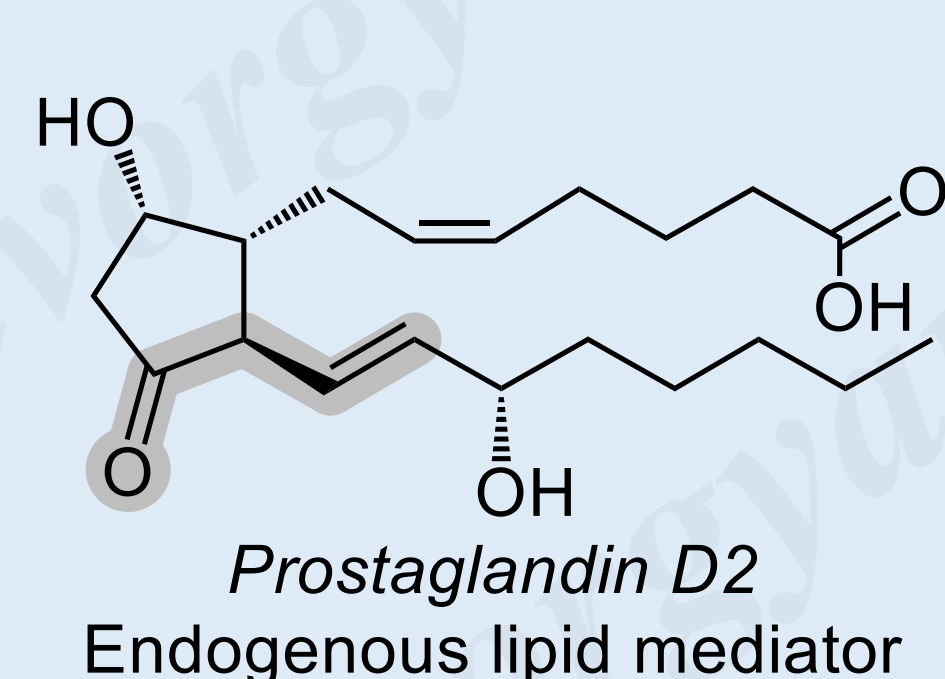


B) This Work: Aryl Radical Mediated CDC Toward Skipped Enones

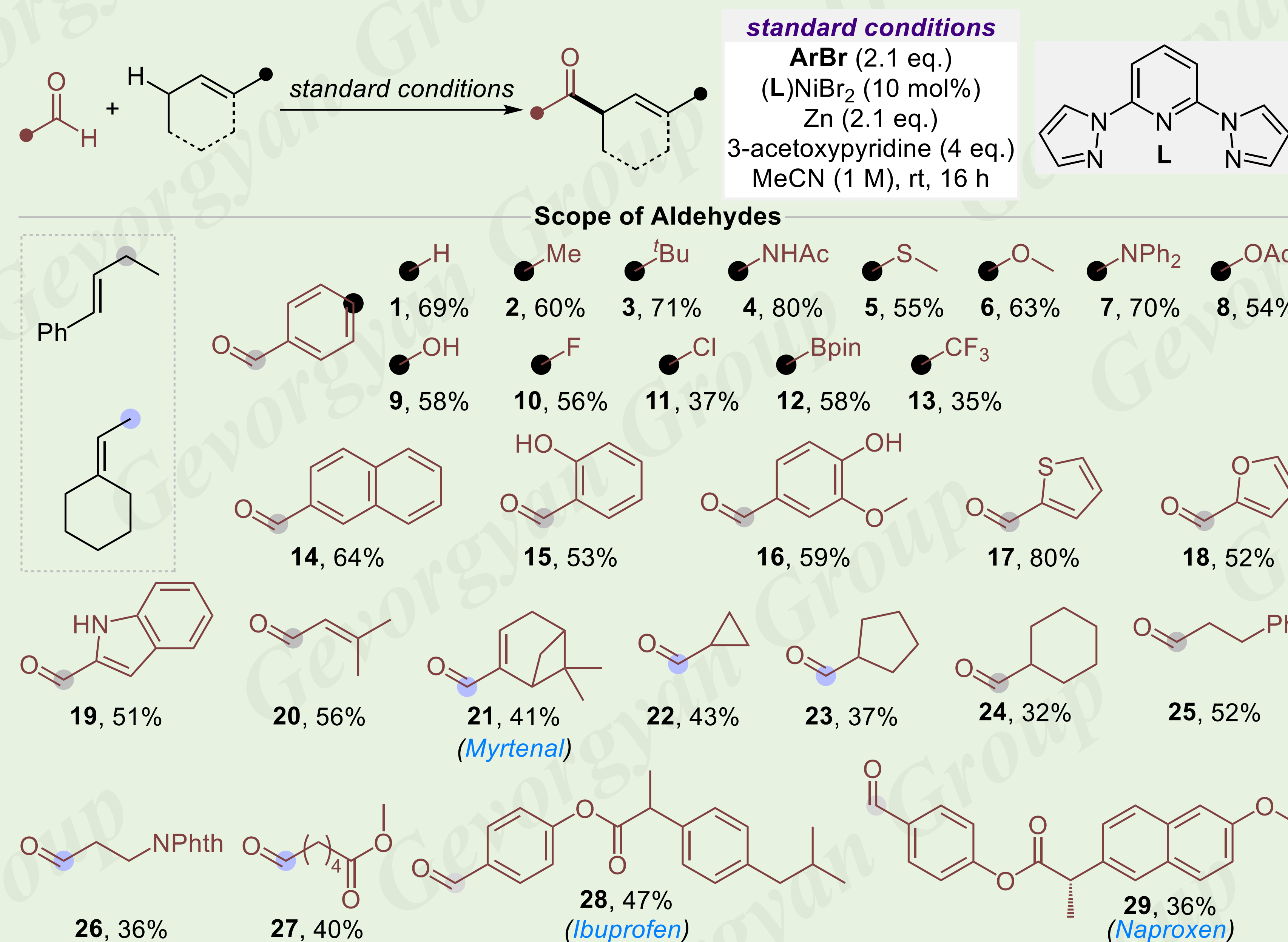


- ✓ Ni-catalyzed CDC featuring aryl radical as HAT agent
- ✓ Structurally and electronically diverse alkenes
- ✓ Aromatic and aliphatic aldehydes
- ✓ Practical and mild method

C) Representative Examples of Skipped Enones

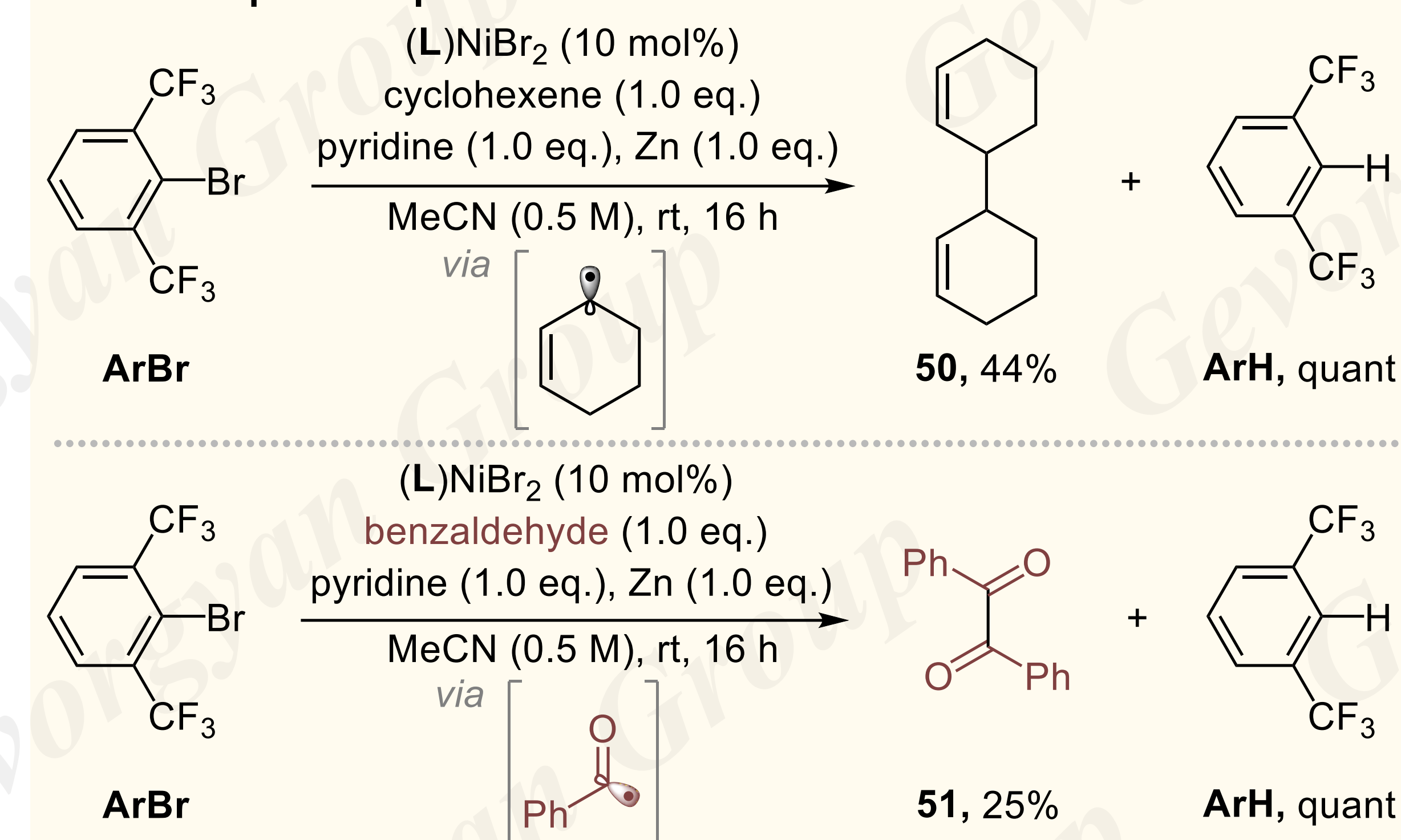


Substrate Scope

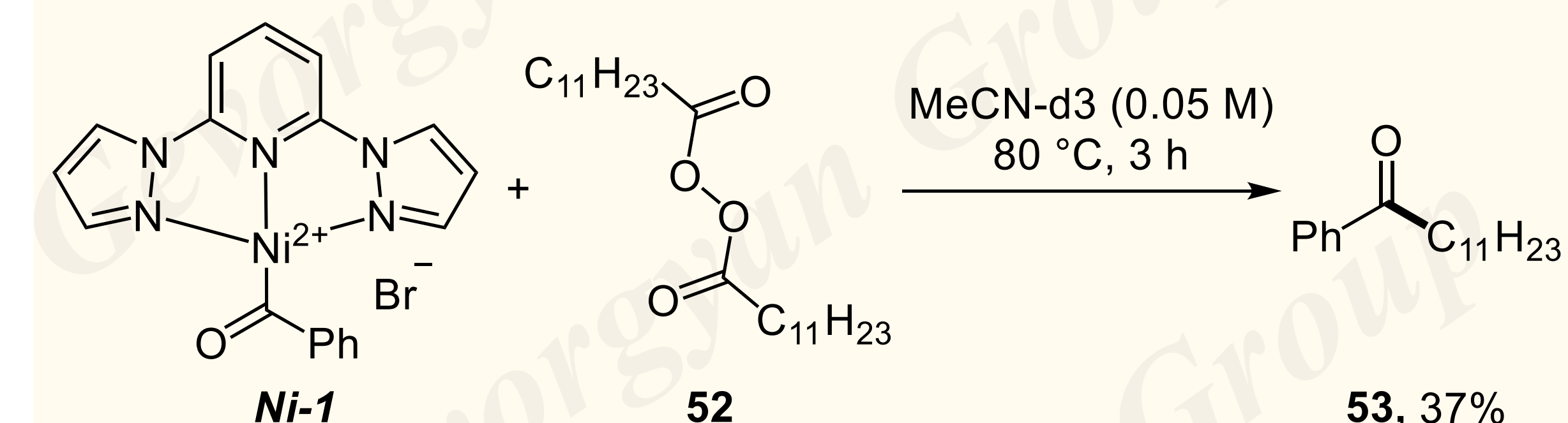


Mechanistic Studies

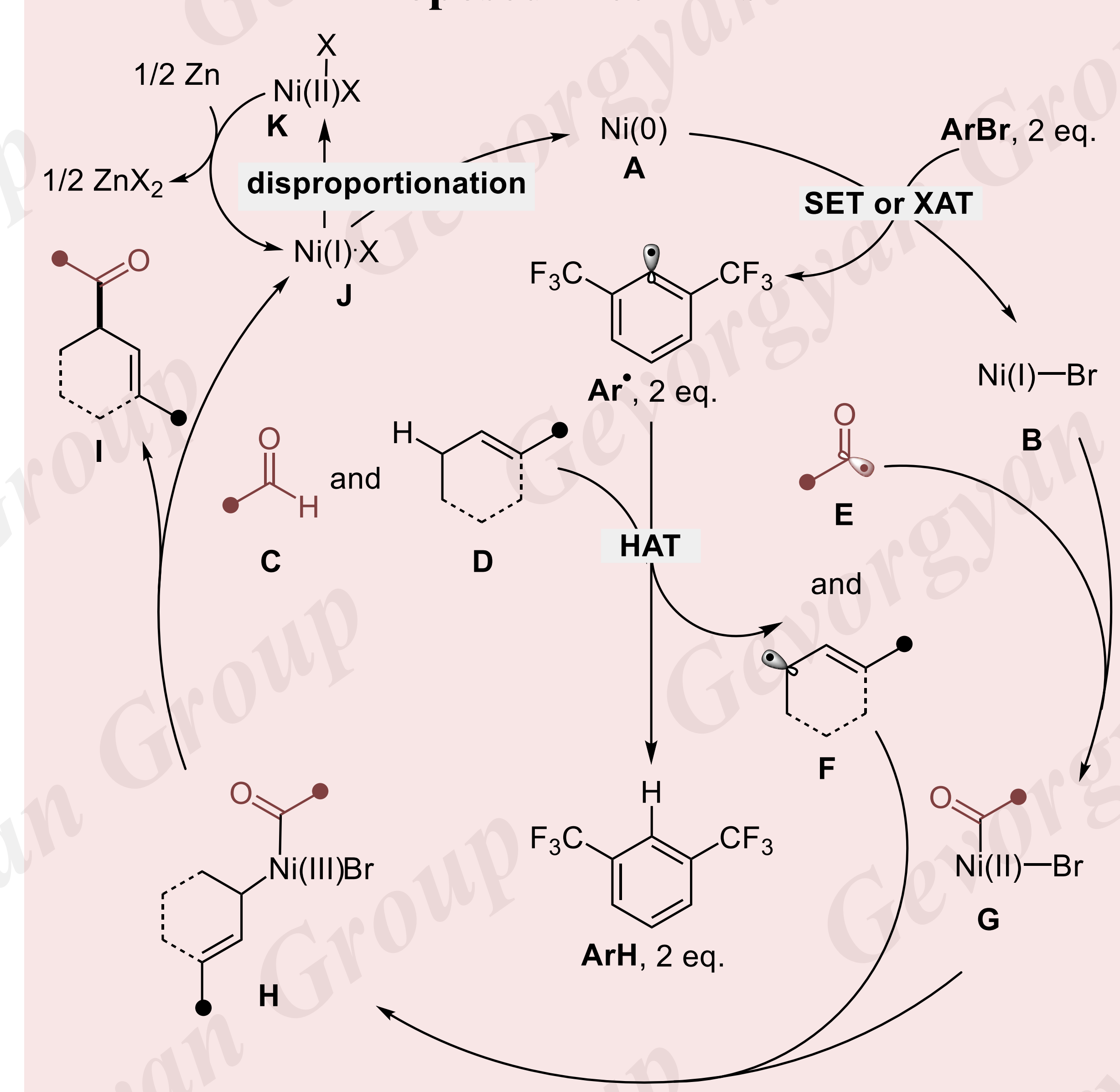
A. Radical probe experiment



B. Stoichiometric reaction of Ni-1



Proposed Mechanism



Acknowledgments

We thank the National Institute of Health (R35GM156632) and Welch Foundation (Chair, AT-0041) for financial support.