

Mechanistic Investigation of the Rhodium-catalyzed Transfer Hydroarylation between Tertiary Alcohols and Ketones

Marius D.R. Lutz, Valentina C.M. Gasser, Sven Roediger, Bill Morandi

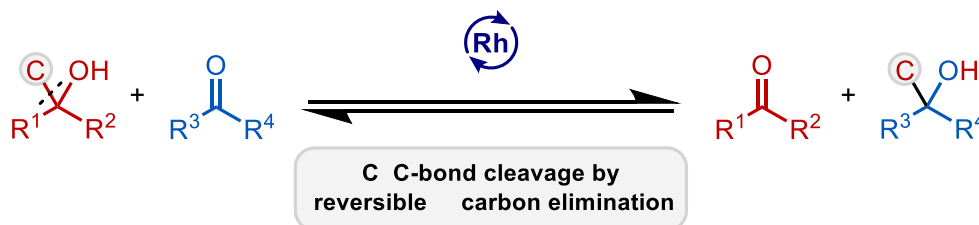
Laboratory of Organic Chemistry, Department of Chemistry and Applied Biosciences, ETH Zürich,
Vladimir-Prelog Weg 2, 8093 Zürich, Switzerland
marius.lutz@org.chem.ethz.ch

Carbon–carbon bonds are among the most abundant yet least reactive chemical bonds in organic molecules. The targeted activation of these bonds in a general sense remains challenging yet offers great potential to break down and reorganize small molecules without the need for prefunctionalization. While progress has been made in the C–C bond activation of strained carbocycles and molecules with directing groups, methods to activate unbiased molecules are sought after. Inspired by the well-studied transfer hydrogenation reaction, we envisioned developing a catalytic manifold that could enable a catalytic transfer hydroarylation using tertiary alcohols.

In this work, we present a catalytic shuttle arylation reaction to interconvert triaryl alcohols and ketones by realizing C–C bond activation via β -carbon elimination.^[1] Using this method, unprotected alcohols serve as a benign alternative to stoichiometrically employed organometallic reagents to access value-added alcohol products from ketones. Our method exhibits high chemoselectivity and tolerates functional groups that are vulnerable to traditional nucleophilic and basic reagents encountered in carbonyl addition.

The mechanistic details of this isofunctional transformation were investigated by experimental and computational methods. Kinetic studies, *in situ* reaction monitoring, and scrambling experiments support a fully reversible β -carbon elimination/insertion mechanism. Moreover, potential catalytic intermediates were independently synthesized and their kinetic competence was evaluated. The identity of the resting state was further corroborated by ¹³C labeling experiments and diffusion-ordered spectroscopy (DOSY) analysis.

This work highlights the advantages of using alcohols as mild aryl donor reagents in carbonyl addition and sheds light on the mechanism of rhodium-catalyzed C–C bond activation, possibly initiating the development of novel chemical transformations using alcohols as latent carbon-centered nucleophiles.



- Activation of unstrained alcohols
- Mild arylation of unactivated ketones
- First example of transfer hydrocarbylation
- In depth mechanistic studies

[1] Lutz, M. D. R.; Gasser, V. C. M.; Morandi, B. *Chem* **2021**, *7*, 1108.