

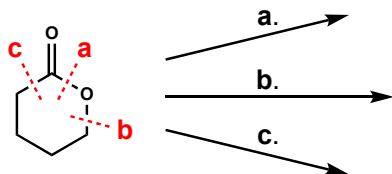
## Problem Set #002 (Roberts)

(1) Is this lactone a substrate for cross-coupling methods that you know of?

Can it be rendered electrophilic at a, b or c sites by simple manipulation?

**List known or proposed reactions that result in the cleavage of bonds a, b, and c.**

Consider cleavage reactions that result in turning the desired bond into an electrophilic functional group.

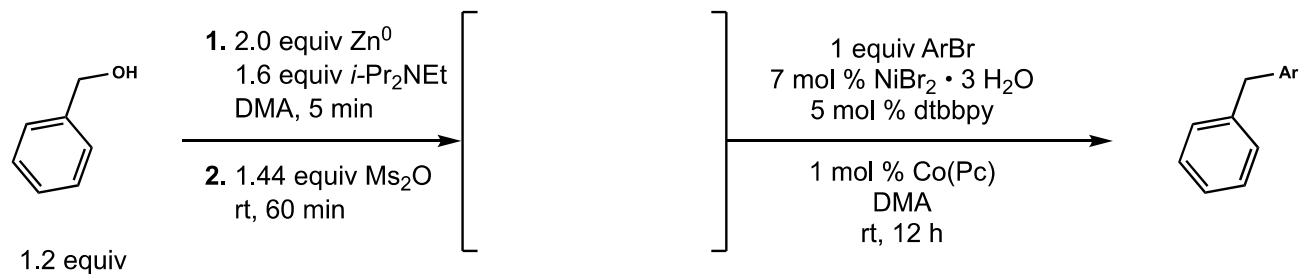


(2) Are alcohols typically considered substrates for cross-coupling?

**List alcohol derived functional groups that render the C–O bond weaker than in the parent alcohol.**

Are your substrates susceptible to nucleophilic attack by a transition metal?

**Propose a plausible intermediate and subsequent mechanism for the following transformation.**



Ackerman, L. K. G.; Anka-Lufford, L. L.; Naodovic, M.; Weix, D. J. "Cobalt co-catalysis for cross-electrophile coupling: diarylmethanes from benzyl mesylates and aryl halides" *Chem. Sci.* **2015**, 6, 1115.

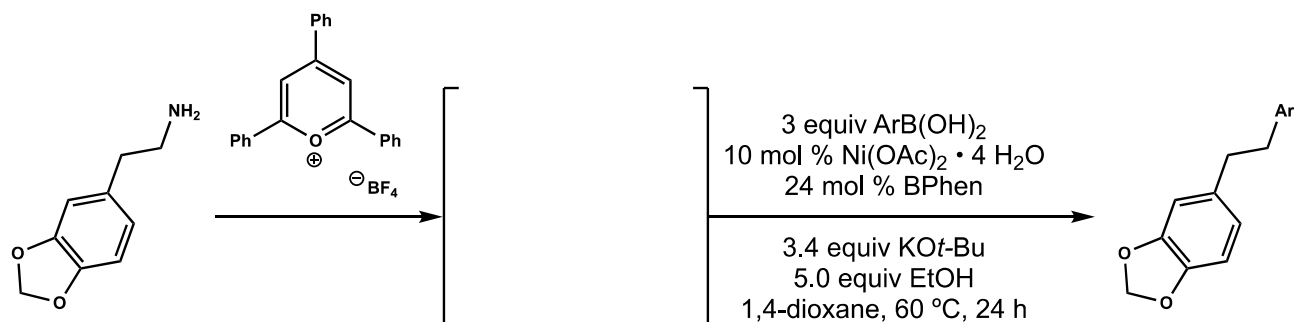
Step order (1,2) can be switched as long as the mesylate is formed before the catalyst is added. The optimized order is procedurally convenient.

What result might you expect if benzyl bromide was used instead of benzyl mesylate?

Cobalt (II) phthalocyanine = Co(Pc), is not necessary but drastically reduces the amount of benzyl mesylate homodimerization. What is a possible role of Co(Pc)?

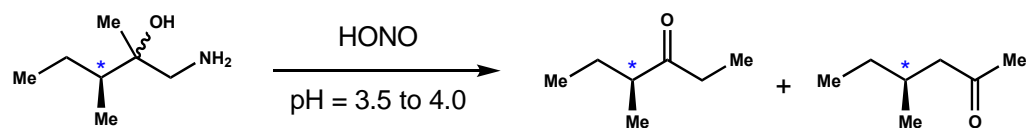
(3) Are alkyl amines typically considered substrates for cross-coupling?

Propose a plausible intermediate and subsequent mechanism for the cross-coupling transformation.



Basch, C. H.; Liao, J.; Xu, J.; Piane, J. J.; Watson, M. P. "Harnessing Alkyl Amines as Electrophiles for Nickel-Catalyzed Cross Couplings via C–N Bond Activation" *J. Am. Chem. Soc.* **2017**, 139, 5313.

(4) Propose a mechanism for the reaction outcome.



Kirmse, W.; Gruber, W. "Stereochemistry of aliphatic carbonium ions. 5. Configuration of the migrating group in the pinacol rearrangement of 1-amino-2,3-dimethyl-2-pentanol" *Chemische Berichte* **1973**, 106, 1365.

Would stereochemistry be preserved?