

In situ Catalytic Generation of Allyl Copper Species and its Direct Use for Asymmetric Allylation

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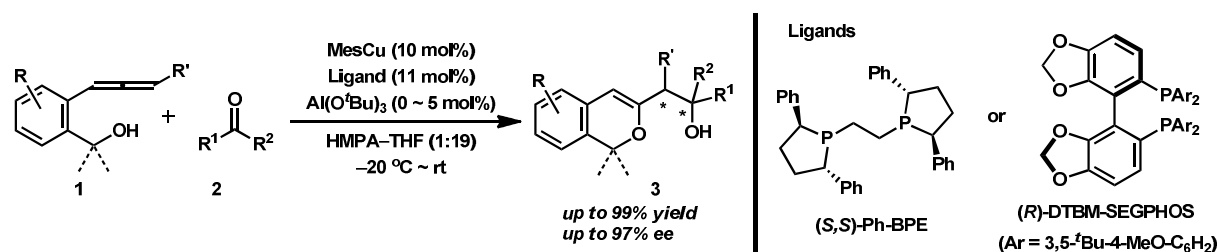
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Asymmetric allylation of carbonyl compounds has been extensively studied, due to its versatility of enantiomerically enriched homoallylic alcohols. Although significant progress has been made in the past decades, most of the methods rely on prefunctionalized substrates, such as allyl bromide and allyl acetate. Here we want to present our novel methodology to generate nucleophilic allyl copper species *via* oxy-cupration of stable allenes, which could lead to waste minimal protocol.

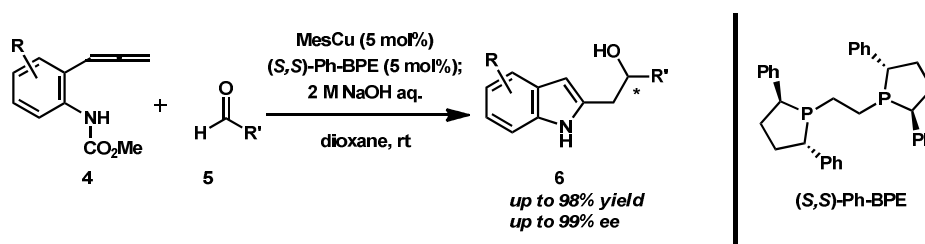
We first investigated the formation of 1*H*-isochromene ring system,¹ which is widely observed in many biologically important compounds. After extensive investigations, we found that mesitylcopper (MesCu)/bidentate diphosphine ligand (Ph-BPE or DTBM-SEGPHOS) catalysts gave the optimal results. Variety of allenes and aldehydes could be utilized as coupling partners, and even a ketone, which has substantially lower reactivity than aldehydes, could react under the optimized conditions.

Scheme 1. Catalytic asymmetric construction of 1*H*-isochromene derivatives



In situ generation of allyl copper could be extended to facile indole synthesis.² The active allyl copper species were generated from allenyl anilides, and subsequent asymmetric allylation produced 2-position substituted indole scaffold.

Scheme 2. Catalytic asymmetric construction of indole derivatives



1. Kawai, J.; Chikkade, P. K.; Shimizu, Y.; Kanai, M. *Angew. Chem. Int. Ed.* DOI: 10.1002/anie.201302027
2. Chikkade, P. K.; Shimizu, Y.; Kanai, M. *manuscript in preparation*