AN ENTRY TO ENANTIOENRICHED ALLYLAMINES VIA PHOTOCHEMICAL CROSS-COUPLING AND ICHIKAWA REARRANGEMENT

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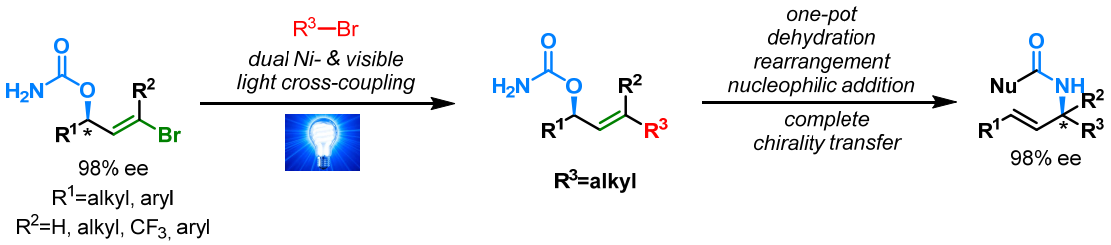
Herein, we present an efficient, and general synthesis of highly functionalized, structurally diverse allylamines via dual nickel- and visible light catalyzed synthesis of allyl carbamates followed by allyl cyanate-to-isocyanate rearrangement.[1]



The growing interest in visible light-mediated chemical transformations inspired us to further extend applications of Ichikawa rearrangement and simplify synthetic route towards alkyl-substituted allylamines. Therefore, we developed new synthetic route of allyl carbamates through dual Ni and photoredox catalytic cross-coupling of vinyl bromides and alkyl halides. Most modern photocatalysts are based on sophistically ligated precious metals such as Ir and Ru. However, we have found that readily available organic photocatalyst 4CzIPN provides comparable results and allows for significant reduction of costs. Unlike Pd-catalyzed couplings, Ni shows tolerance towards vinyl precursors bearing primary carbamate, a feature which allows for late introduction of desired substituent. Both 1°, 2° and 3° alkyl bromides are readily coupled and functional group scope is impressing. Vinyl bromides are prepared from commercially available, enantioenriched propargylic alcohols via regio- and diastereoselective reduction and/or appropriate couplings. Both disubstituted and trisubstituted alkenes regardless of E/Z stereochemistry are suitable coupling partners.

Allyl carbamates are transformed to allylamines in three-step, one-pot manner. First carbamate is dehydrated to form allyl cyanate, which rapidly undergo [3,3]-sigmatropic rearrangement to allyl isocyanate, which is trapped by nucleophile to obtain allylamine derivative. The rearrangement proceeds with full chirality transfer and geometry of alkene determines which enantiomer is obtained. Synthetic opportunities utilizing proposed methodology and mechanistic details will be discussed.

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[1] M. Garbacz, S. Stecko, *submitted*