# TANDEM CATALYTIC FORMATION AND ENANTIOSELECTIVE [2,3]-REARRANGEMENT OF FUNCTIONALISED ALLYLIC AMMONIUM YLIDES

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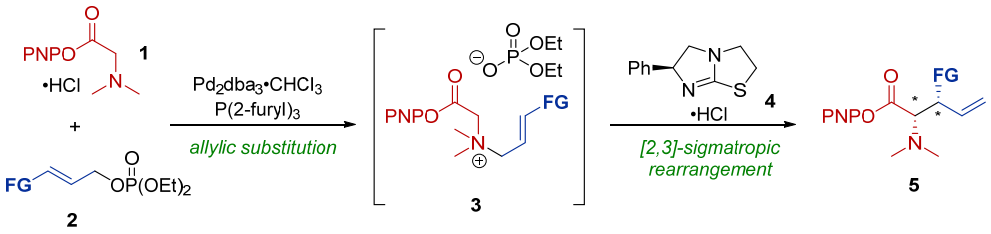
The [2,3]-sigmatropic rearrangement of ammonium ylids offers great synthetic utility as an efficient and potentially stereoselective route to α-functionalised amino acid derivatives bearing two contiguous stereocenters. Typically, enantioselective [2,3]-sigmatropic rearrangements rely on the use of chiral auxiliaries or stochiometric amounts of chiral ligands.[1,2] In 2014, the first catalytic enantioselective variant was reported in our laboratory followed by a tandem catalytic ylid formation/[2,3]-rearrangement process in 2017.[3,4] Although this tandem process led to an improvement in yield and stereoselectivity, the scope was still limited to allylic phosphates derived from cinnamyl alcohol derivatives or heteroaryl containing substrates.

This project describes the extension of the substrate scope tolerated in this process to alternative allylic functionalities. Based on the previously developed methodology, a palladium catalysed allylic substitution on allylic phosphate **2** with 4-nitrophenyl amino ester **1** yields allylic ammonium ylid **3** in situ (Scheme 1). In the presence of isothiourea catalyst **4** the intermediate undergoes a stereoselective [2,3]-sigmatropic rearrangement to afford α-amino ester **5**. Allylic phosphates containing ester, amide and silyl functionalities have been tested in this process. Substrates containing amide functionalities have been most successful, affording the corresponding 1,4-dicarbonyl compounds in high yields and good stereocontrol.




Scheme 1: Tandem catalytic [2,3]-rearrangement of functionalized allylic ammonium ylides

Derivatisation of the products with various nucleophiles led to a range of α-amino acid derivatives in excellent yields with no loss in integrity. Current work focuses on further derivatisation of the products to access target molecules.

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[2] West, T. H.; Spoehrle, S. S. M.; Kasten, K.; Taylor, J. E.; Smith, A. D. *ACS Catal.* **2015**, *5*, 7446−7479.

[3] West, T. H.; Daniels, D. S. B.; Slawin, A. M. Z.; Smith, A. D. *J. Am. Chem. Soc.* **2014**, *136*, 4476–4479.

[4] Spoehrle, S. S. M.; West, T. H.; Taylor, J. E.; Slawin, A. M. Z.; Smith, A. D. *J. Am. Chem. Soc.* **2017**, *139*, 11895–11902.