

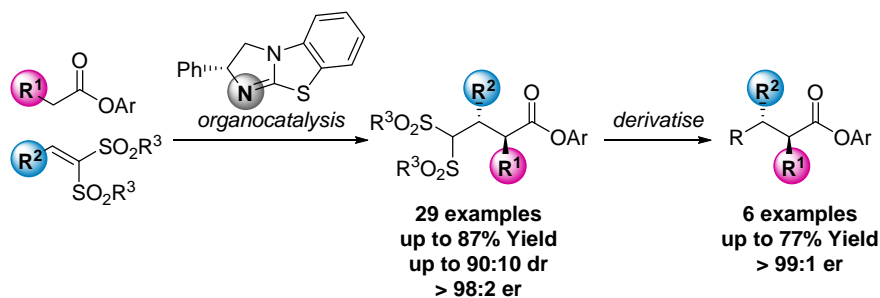
INTERMOLECULAR CATALYST TURNOVER IN ENANTIOSELECTIVE AMMONIUM ENOLATE CATALYSIS: A SYNTHETIC AND MECHANISTIC STUDY

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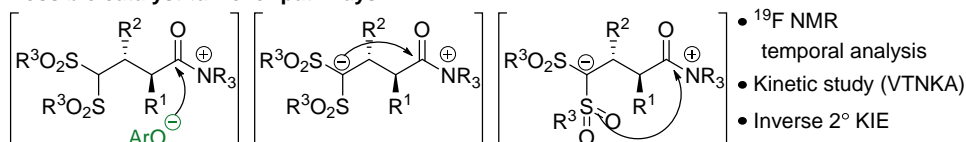
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C1-ammonium enolates, generated *in situ* from tertiary amine catalysts upon reaction with a carboxylic anhydride or ketene, have emerged as powerful synthetic intermediates for asymmetric bond formation at the carboxylic acid oxidation level [1]. Traditionally, this methodology employs an *intramolecular* catalyst turnover approach where the ammonium enolate reacts with an electrophile bearing a pendant nucleophile in formal [4+2], [3+2] and [2+2] cycloadditions. Recent work has focused on using electron deficient aryl esters as ammonium enolate precursors [2]. These starting materials are proposed to operate *via intermolecular* catalyst turnover of the post-reaction acyl ammonium intermediate by the aryloxide anion, enabling access to acyclic ester products. Despite recent advances, these processes are mechanistically not well understood in terms of identification of reaction intermediates, reaction order with respect to reactants and the rate-determining step.

To investigate these mechanistic questions and expand the scope of compatible electrophiles, we have developed a new isothioureia-catalysed enantioselective Michael addition of aryl esters to vinyl bis-sulfones to form α -alkyl aryl esters in high yield and stereoselectivity. The sulfone group functional handle in the product allows for further functionalisation such as reaction with an electrophile or can be unmasked using magnesium. Mechanistic investigations have been carried out to analyse the temporal concentrations of the reaction mixture and to determine the order of each component.



Possible catalyst turnover pathways



[1] L. C. Morrill and A. D. Smith, *Chem. Soc. Rev.*, 2014, **43**, 6214–6226.

[2] W. C. Hartley, T. J. C. O’Riordan and A. D. Smith, *Synthesis*, 2017, **49**, 3303–3310.

[3] J. Burés, *Angew. Chem. Int. Ed.*, 2016, **55**, 16084–16087.