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Spotlight 342

This feature focuses on a reagent chosen by a postgraduate, highlighting the uses and preparation of the reagent in current research

N-Sulfinyl Imines

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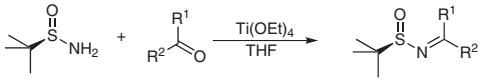
Introduction

N-Sulfinyl imines (sulfinimines) play an important role in asymmetric reactions. They display unique reactivity and stereoselectivity in the synthesis of amino group containing natural products and bioactive compounds. Furthermore, a wide variety of sulfinimines is efficiently prepared for many types of asymmetric reactions, and the chiral sulfinyl in the resultant product is easily removed under comparatively mild conditions.[1]

Preparation

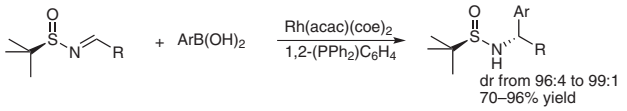
Three synthetic routes were developed, for example, asymmetric oxidation,[2] iminolysis of sulfinate esters,[3] and condensation of a sulfinamide with aldehydes or ketones.[4] The most common and versatile method is the direct condensation of aldehydes or kentones with sulfinamide.



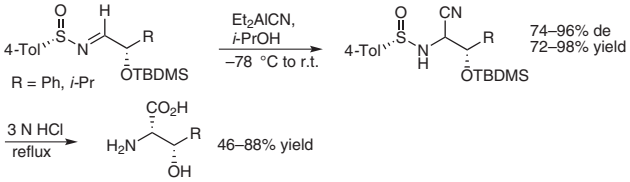
Scheme 1

Abstracts

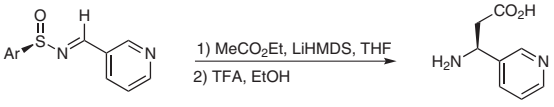
(A) Sulfinimines were used to prepare functionalized amines with high stereoselectivity. Organometallic reagents, such as Grignard reagents[5a] and organolithium,[5] are added to sulfinimines to get the desired products in high diastereoselectivity. Both aliphatic and aromatic sulfinimines proceeded in very high diastereoselective ratios when arylboronic acid was employed.[6]



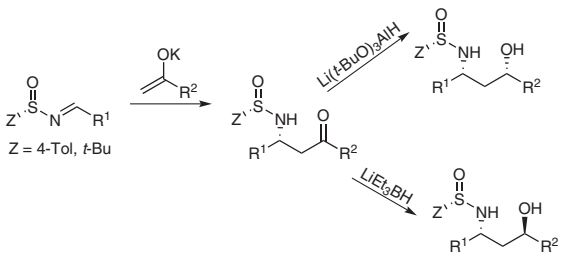
(B) The sulfinimines-mediated asymmetric Strecker reaction provided efficiently chiral α-amino acids.[7] Polyhydroxy α-amino acids were derived from polyhydroxy sulfinimines through smooth deprotection of the sulfinyl.[8] Quaternary α-stereogenic centers of α-amino acids were controlled by tuning the solvents.[9] The (*S*,*Rs*)-product was afforded predominantly in hexane while the contrary (*R*,*Rs*)-isomer was the major product in DMF.



(C) β-Amino esters or acids were prepared efficiently via addition of the sodium enolate of methyl acetate to sulfinimines in high diastereoselectivity.[10a] Lithium enolate effected the better yield.[10b] The stereoselective Michael–nucleophilic addition domino reaction from sulfinimines was another route towards β-amino esters.[11]



(D) β-Amino ketones were prepared by addition of prochiral lithium enolates of Weinreb amides to sulfinimines.[5,12] Reduction of *N*-sulfinyl β-amino ketones led to *syn*- and *anti*-1,3-amino alcohols.[12]



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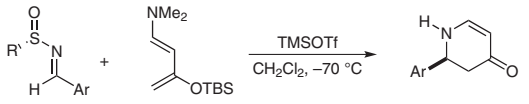
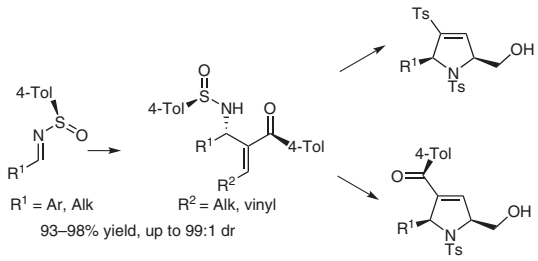
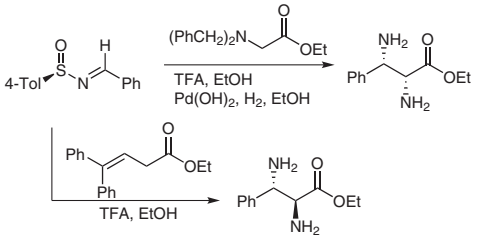
(E) The aza-Diels–Alder reactions of sulfinimines as dienophile with Rawal dienes resulted in dihydropyridones with ee values up to 90%.[13a] When a Lewis acid catalyst was added, both activated and non-activated dienes could be used in this reaction.[13b]



(F) The pure sulfinimines have been applied in the aza-Baylis–Hillman reaction. The resulting allylic amines reacted with electrophiles led to highly functionalized 3-sulfinyl and 3-sulfonyl 2,5-*cis*-dihydropyrroles.[14]



(G) Addition of suitably protected α-amino acid to pure sulfinimines led to *syn*- and *anti*-α,β-diamino esters with high dr and good yields.[15] The water content in THF was an important factor determining the selectivity.[15b]



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