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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 sulfimine with aldehydes or ketones.4 The most common and versatile method is the direct condensation of aldehydes or ketones with sulfinylamide.

Scheme 1

Abstracts

(A) Sulfinimines were used to prepare functionalized amines with high stereoselectivity. Organometallic reagents, such as Grignard reagents5a 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,R)-product was afforded predominantly in hexane while the contrary (R,R)-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.10b 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
(E) The aza-Diels–Alder reactions of sulfinimines as dienophile with Rawal dienes resulted in dihydropyridones with ee values up to 90%. When a Lewis acid catalyst was added, both activated and non-activated dienes could be used in this reaction.

(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.

(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. The water content in THF was an important factor determining the selectivity.

References