**Introduction**

Enantiopure 2-methyl-2-propanesulfinamide (tert-butanesulfinamide) was introduced by Ellman in 1997.\(^1\) As a chiral ammonia equivalent, it can easily condense with aldehydes and ketones to afford tert-butanesulfinyl imines in high yields (Scheme 1).\(^2\) The tert-butanesulfinyl group activates these imines for the addition of many different classes of nucleophiles and serves as a powerful chiral directing group to provide products with generally high diastereoselectivity. Subsequent removal of the tert-butanesulfinyl group under mild conditions cleanly provides the amine products. Many versatile building blocks\(^3\) including syn- and anti-1,2- or 1,3-amino alcohols,\(^4,5\) \(\alpha\),\(\alpha\)-branched and \(\alpha\),\(\alpha\)-dibranched amines,\(^6\) \(\alpha\)- or \(\beta\)-amino acids and esters\(^7,8\) can be efficiently synthesized by using this methodology. In addition, this methodology can also be used in the synthesis of antibiotics, biologically active compounds, and other complex natural products.\(^9\) Furthermore, tert-butanesulfinamide has been used in the synthesis of asymmetric ligands\(^10\) or catalysts\(^11\), and in a few cases, appears as the chirality-bearing component.\(^12\)

**Scheme 1** Synthesis of sulfinyl aldimines or ketimines

Each configuration of 2-methyl-2-propanesulfinamid is readily available in a two-step process of catalytic asymmetric oxidation of tert-butyl disulfide, followed by the reaction of the tert-butanethiosulfinate product 4 with an amide anion (Scheme 2).\(^13\)

**Scheme 2** Preparation of (R)-tert-butanesulfinamide

Abstracts

(A) Ellman and co-workers have demonstrated the facile synthesis of chiral \(\alpha\),\(\alpha\)-dibranched amines through 1,2-addition of organolithium reagents to N-tert-butanesulfinyl ketimines, which proceeds with high yields and diastereoselectivities.\(^6b\)

(B) N-tert-Butylsulfinyl imines have been used in a highly diastereoselective multi-component reaction of phenyl diazoacetates, alcohols, and imines, which provides readily access to \(\beta\)-amino-\(\alpha\)-hydroxyesters in high optical purity.\(^4d\)
(C) Ellman and co-workers have reported the copper-catalyzed addition of bis(pinacolato)diboron to N-tert-butanesulfinyl aldimines with excellent diastereoselectivity for diverse chiral α-amino boronic acids. Furthermore, the N-sulfinyl α-amino boronate ester addition products can be used as intermediates in the asymmetric synthesis of bortezomib.

(D) Morton and co-workers synthesized chiral aziridines using trimethylsulfonium iodide with good yields and diastereoselectivities. Chemla and Ferreira reacted a racemic allenylzinc substrate with various N-tert-butanesulfinyl imines to achieve trans-ethylaziridines as diastereomerically and enantiomerically pure compounds in good yields.

(E) Using N-tert-butanesulfanilamide as starting material, Ellman and co-workers have synthesized a novel bis(sulfinyl)imidoamidine (siam) ligand 5 in three straightforward steps. The complex of bis(pinacolato)diboron with copper(II) catalyzes the Diels–Alder reaction with exceptional levels of enantio- and diastereoselectivity.

(F) Ellman and co-workers have developed a new class of organocatalysts that incorporate the N-sulfinyl urea unit, which is acidifying and serves as a chiral controlling element. The condensation of tert-butanesulfanilamide with the appropriate isocyanate in one step provides urea 6, which is proven to be an efficient organocatalyst in the enantioselective aza-Henry reaction.

References