EXTENDED ABSTRACT

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A Brief Review on Synthesis of B-Amino Alcohols by Ring Opening of Epoxides

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Abstract

β-amino Alcohols are the versatile intermediates in the preparation of many biologically active compounds as well as in pharmaceutical industry. The synthesis of these structures is achieved by various routes but the simplest way is ring opening of epoxide by an amine. There are several difficulties in making these molecules viz reaction conditions, role of catalyst, stereo effects etc. This review focuses on ring opening of epoxides under different conditions to achieve amino alcohols.

Introduction

β-AMINO ALCOHOLS COMPOUNDS β-amino alcohols are the versatile intermediates for many organic compounds in the making of natural and synthetic originated biologically active compounds. They are widely used as β-blockers, insecticidal agents, and chiral auxiliaries. The most common class of naturally occurring compounds containing β-amino alcohol subunit are hydroxy amino acids. For example, the vancomycin class of antibiotics contains an aryl serine moiety and the antifungal agent sphingofungin contains a hydroxyl amino acid moiety in the polar head group. Another group of naturally occurring biologically active products is the cyclic amino alcohols, like quinines that are used in the treatment of malaria. One important class of cyclic amino alcohols is the poly hydroxylated alkaloids, also known as aza-sugars, e.g. castanospermine that was found to be a potent inhibitor of α- and β-glucosidases. Peptidomimetics constitutes a large group of synthetically produced pharmacologically active amino alcohols, most commonly Renin and HIV-1 protease inhibitors, for example Saquinavir.

2-aminoalcohols represent a broad range of β-adrenergic blockers widely used in the management of cardiovascular disorders, including hypertension, anginapectoris, cardiac arrhythmias, and also other disorders related to the sympathetic nervous system. The versatility of this transformation is recognized well as it constitutes the key step for synthesis of β2-adrenoceptor agonists, novel anti-HIV agents, 4-demethoxydaunomycin, protein kinase C inhibitor balanol, glycosidase inhibitor, antimalarial agents, liposidomycin B class of antibiotics, naturally occurring brassinosteroids, taxoid side chain, diverse heterocycles, for example, benzodiazepinones/benzoxazines/ benzoxazepinones and indoles a vast range of biologically active natural and synthetic products, unnatural amino acids , and chiral auxiliaries.

β-Amino alcohols also play an important role as chiral ligands and chiral auxiliaries in asymmetric catalysis, most commonly derived from natural sources. The amino alcohols are generally derivatized to improve their chelating ability or to increase their steric directing effect. Depicts common β-amino alcohol derivatives used in asymmetric synthesis.

There are a few methods for synthesizing racemic mixtures of β-amino alcohols (both enantiomers present). Enantiomerically pure β-amino alcohols are available only through reductions of amino acids, kinetic resolution of racemic mixes of amino alcohols, or chromatographic methods. That already contains a stereogenic center. In the latter case, amino acids are natural compounds that are also readily available. The method of choice is often reduction of the parent amino acid. The reduction of amino acids to the corresponding amino alcohols is economically feasible only for the naturally occurring L-amino acids. On the other hand, nucleophilic additions to an imine and oxime chemistry can also be used to provide amino alcohols.

The only synthetic methodologies available for the direct synthesis of amino alcohols in high yields are the amination of chiral epoxides and the asymmetric hydrogenation or reduction of prochiral-amino ketones. In turn, this also demands a stereo- selective method to open the epoxide ring. There are number of means to achieve this with simple alkenes. With unsymmetrical epoxides, the regioselectivity can be controlled through reagent choice. Nucleophilic attack tends to prefer reaction at the least hindered center with concurrent inversion, as observed with primary and secondary amines.

Here in this review, we would like to present the various approaches to achieve β-Amino Alcohols by ring opening of epoxides.

It consists of ring opening of epoxide by conventional methods and solvent free methods.

CONCLUSION

In this review article, we have demonstrated the importance of amino alcohols in biological applications and the various methods to synthesize β-amino alcohols. The review is focused on the developments in synthesizing the β-amino alcohols in the last 20 years.