

SYNLETT Spotlight 285

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

Lithium tri-*sec*-Butylborohydride (L-Selectride): A Powerful and Highly Stereoselective Reducing Reagent

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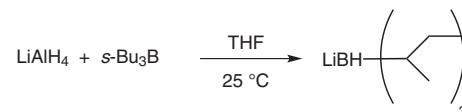


Introduction

Lithium tri-*sec*-butylborohydride (L-Selectride) is known to be an exceptionally powerful and highly stereoselective reducing agent. It has been used for the diastereoselective reduction of the ketones to give the alcohol,^{1–10} selective 1,4-reduction of the enones by conjugate addition of hydride to afford ketones^{11,12} or alcohols,¹³ conjugate reduction of exocyclic acrylonitrile derivatives,¹⁴ reduction of the double bond¹⁵ and iodide.¹⁶ It was also found to be an efficient reagent for the desymmetrization of *meso*-diesters,¹⁷ dehalogenation of monohalopyridines,¹⁸ rearrangement of 5-trimethylsilylthebaine,¹⁹ reductive cleavage

age of exoxides,²⁰ and deprotection of *N*-carbomethoxy-substituted opioids to *N*-noroniods.²¹

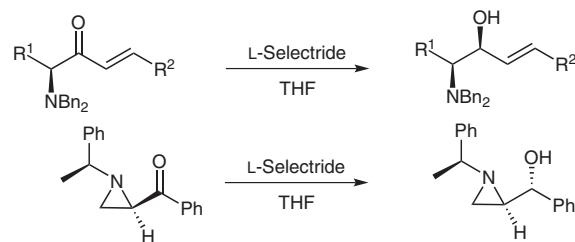
Lithium tri-*sec*-butylborohydride is commercially available, but can also be readily prepared by addition of tri-*sec*-butylborane to a tetrahydrofuran solution of lithium aluminium hydride at room temperature. It is obtained as colorless solution in tetrahydrofuran.²²



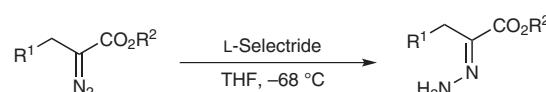
Scheme 1

Abstracts

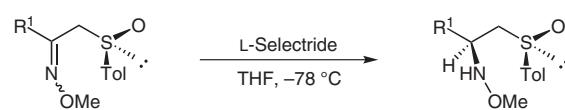
(A) Reduction of Carbonyl Compounds to the Corresponding Alcohols: L-Selectride can be applied for the diastereoselective reduction of α' -amino enones to afford chiral β -amino alcohols.²³ Various enantiomerically pure aziridino ketones can be stereoselectively reduced by L-Selectride to provide the corresponding alcohols with high diastereoselectivities and yields.²⁴ L-Selectride is also employed for the reduction of steroid aldehydes.²⁵



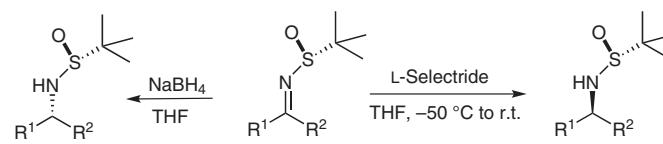
(B) *Reduction of α -Diazo Esters to Hydrazones*: L-Selectride reduces α -diazo esters to give *anti*-hydrazones as the major products in THF solution.²⁶



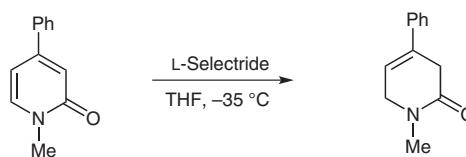
(C) *Diastereoselective Reduction of α -Sulfinylketoximes:* An efficient procedure for stereoselective reduction of various α -sulfinylketoximes to the corresponding (*S*)-(N-methoxyamino)sulfoxides in THF solution is achieved with L-Selectride.²⁷



(D) *Reduction of N-tert-Butanesulfinyl Imines:* Andersen and co-workers²⁵ reduced *N*-*tert*-butanesulfinyl imines with L-Selectride in THF to provide the corresponding secondary sulfin-amides in high yield and diastereoselectivity. Reductions of the same sulfinyl imine afforded the opposite diastereomer in high yield and selectivity by changing the reductant to NaBH₄.²⁸



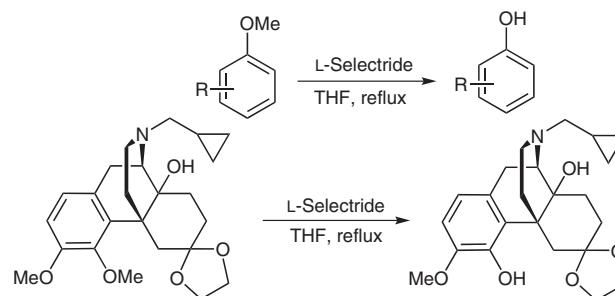
(E) *Selective Reductions of 1-Methyl-4-phenyl-2-pyridone:* Mabic and Castagnoli reported that the reaction of 1-methyl-4-phenyl-2-pyridone with L-Selectride in THF gave exclusively the 1,4-reduction product.²⁹



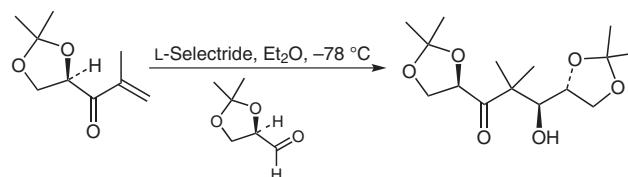
(F) *Selective Cleavage of Carbamates:* A mild method for the cleavage of a variety of carbamates has been developed using L-Selectride. The selective cleavage of methyl carbamates in the presence of more sterically demanding carbamates can be accomplished efficiently.³⁰



(G) *Demethylation of Methyl Phenyl Ethers:* L-Selectride has successfully been used for the deprotection of methyl phenyl ethers.³¹ L-Selectride is also an efficient agent for the 3-O-demethylation of opioids.³²



(H) *Asymmetric Reductive Aldol Reaction:* Ghosh et al. have demonstrated that L-Selectride can be used to mediate reductive aldol coupling of enones and optically active α -alkoxy aldehydes to provide α,α -dimethyl- β -hydroxy ketones with excellent diastereoselectivity.³³



References

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