Zinc Borohydride

Compiled by Ivson Lelis Gama

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Introduction

Zinc borohydride is a neutral reagent employed for the reduction of several types of carbonyl compounds. It is commercially available, but it is also easily prepared by reacting ZnCl₂ with NaBH₄. Kotsuki et al. described the selective reduction of thioesters in the presence of other functional groups using Zn(BH₄)₂ and Oishi and Nakata described the reduction of chiral β-keto esters with Zn(BH₄)₂ leading to the corresponding alcohols with high stereoselectivity. This Spotlight summarizes further reactions of zinc borohydride.

Abstracts

(A) Kotsuki et al. reported a facile method to selectively reduce various benzenethiol esters to the corresponding alcohols in high yields.²

(B) The addition of a solution of Zn(BH₄)₂ in diethyl ether to a mixture of carbonyl, amine and silica gel is an efficient methodology for the reductive amination of α,β-unsaturated aldehydes and ketones. Ranu et al. developed a one-pot reaction for the formation of imines and an in situ subsequent reduction leading to alkylated amines.³

(C) Yakura et al. reported the reaction of β-hydroxyphenyl ketones and β-benzyletherphenyl ketones with zinc borohydride to yield the corresponding syn alcohols stereoselectively in high yields.⁴

(D) Dias et al. developed the reduction of 4-N-Boc-amino-3-hydroxy ketones with Zn(BH₄)₂ to obtain 1,3-syn diols in moderate to high levels of diastereoselectivity and in good yields.⁵
(E) Liu et al. described the use of zinc borohydride as a selective reducing agent. The treatment of a mixture of 6-alkyl-5-benzyloxy-6-hydroxy-2-piperidones and their chain tautomers with Zn(BH₄)₂ led exclusively to the corresponding ring-opening products in high anti diastereoselectivities.⁶

(F) Targeting the enantioselective synthesis of the antitumor natural product anamarine, Gao and O’Doherty treated the α-hydroxy ketone with zinc borohydride leading to the anti diol as major product in a 5:1 ratio.⁷

(G) Zhang et al. reported an economical and effective synthesis of polyfluorinated benzyl alcohols, important intermediates in the synthesis of pharmaceutical and other kind of materials, from adequate substituted polyfluorobenzenes with zinc borohydride in diglyme.⁸

(H) Towards the total synthesis of the marine alkaloid sarain A, Hong and colleagues employed Zn(BH₄)₂ as reduction agent of two important intermediates. They observed the reduction of the ketone carbonyl in good yields leading to the single stereoisomer.⁹

References