DABAL-Me₃: A Versatile Methylating Agent

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Introduction

DABAL-Me₃ is a very suitable, easy to use reagent to methylate a variety of functional groups like aldehydes, imines, enones, amides, etc. Although trimethyl aluminium has been traditionally used as a methylating agent, its pyrophoric nature stands as a major obstacle in its sustainability. Several other Me₃Al·NR₃ species such as Me₃Al·pyridine, Me₃Al·TMEDA (tetramethylethyldiamine) are also reported, but they are too reactive to be used under normal laboratory conditions. DABAL-Me₃, which is actually a 2:1 complex of Me₃Al and DABCO, is free from these shortcomings as it can be manipulated without the need for an inert atmosphere.¹,²

DABAL-Me₃ can be prepared by adding neat AlMe₃ to freshly sublimed DABCO in toluene at 0 °C. The white precipitate is separated from toluene and washed several times with diethyl ether.³ The versatility of the reagent can be easily assessed by its capability to methylate a wide variety of substrates.

Abstracts

(A) Woodward and co-workers reported the first asymmetric synthesis of secondary alcohols from prochiral aldehydes in the presence of nickel(acetylacetone)₂ and a phosphoroamidite ligand.³

(B) Methylation of aryl and vinyl halides is another example of a very efficient route of forming C-C bonds. DABAL-Me₃ is quite capable of carrying out this transformation.⁴

(C) In pursuance of developing a suitable route for addition of an alkyl group to different Michael acceptors, Woodward and co-workers used DABAL-Me₃ in an enantioselective manner employing appropriate ligands.⁵

(D) Direct formation of amides from the corresponding inactivated esters and lactones can be conveniently carried out with DABAL-Me₃ excluding the risk of using other pyrophoric AlR₃ reagents.⁶ Woodward and co-workers later utilized microwave irradiation in DABAL-Me₃-mediated amide bond formation in order to carry out the reaction in a shorter span of time.⁷
References