

# SYNLETT Spotlight 319

## Sodium Triacetoxyborohydride

Compiled by Lakhinath Saikia



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

Lakhinath Saikia was born in 1983 in Jorhat, Assam, India. He received his B.Sc. degree in Chemistry from the Dibrugarh University, Assam in 2004, and his M.Sc. degree in Organic Chemistry from the same university in 2006. Presently, he is working towards his Ph. D. degree under the supervision of Dr. A. J. Thakur, Associate Professor, Department of Chemical Sciences, Tezpur University. His current research interests focus on radical cyclizations for the synthesis of pyrimidine derivatives.

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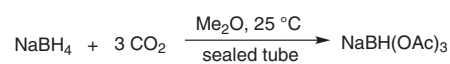
### Introduction

Sodium triacetoxyborohydride [Na(OAc)<sub>3</sub>BH, abbreviated as STAB-H] is a versatile reagent in organic synthesis. In addition to its superior ability in effecting reductive amination of aldehydes and ketones, it can reduce N-heterocycles (indoles, quinolines, and isoquinolines), imines, enamines, oximes, amides, aryl ketones, acetals, and other substrates.<sup>1</sup>

STAB-H is a milder and more selective reducing agent than NaBH<sub>4</sub>. The mild nature of STAB-H may be attributed both to the bulky nature of the reagent and to the inductive electron-withdrawing ability of the three acetoxy

groups which stabilize the boron–hydrogen bond.<sup>2</sup> It has more advantages over Na(CN)BH<sub>3</sub> also due to the lack of toxicity.

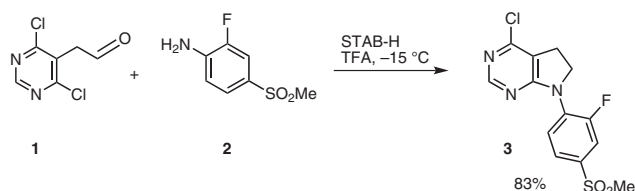
The preparation of triacetoxyborohydride was first performed by Wartik and Pearson through the reaction of NaBH<sub>4</sub> and CO<sub>2</sub> (Scheme 1).<sup>3</sup> Furthermore, it can be also generated in situ from NaBH<sub>4</sub> and acetic acid. Aldehydes, but not ketones, are smoothly reduced to alcohols with STAB-H, prepared from sodium borohydride and acetic acid in benzene<sup>4</sup> or in *N,N*-dimethylacetamide.<sup>5</sup>



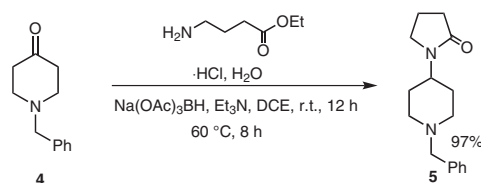
Scheme 1

### Abstracts

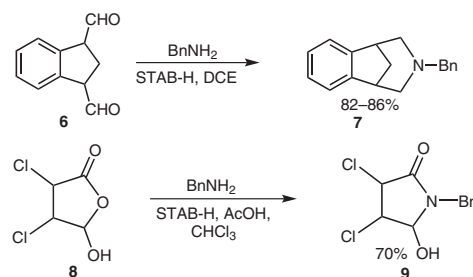
(A) Boros et al. recently reported the synthesis of diazaindoline **3**, where the key step involved rapid reductive amination of aldehyde **1** with aniline **2** by sodium triacetoxyborohydride (STAB-H) and TFA.<sup>6</sup>



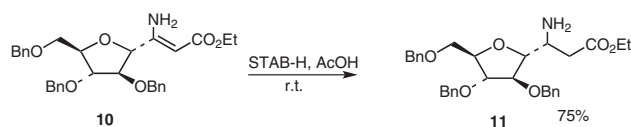
(B) A tandem reductive amination–lactamization strategy using STAB-H, 1-benzyl-4-piperidone (**4**) and  $\gamma$ - or  $\delta$ -amino esters or acids resulted in lactam **5**.<sup>7</sup>



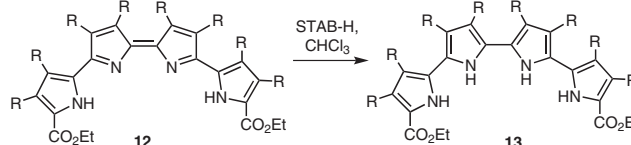
(C) Dialdehyde **6** can be converted into amine **7** with STAB-H and benzylamine, whereas lactol **8** likewise affords lactam **9** under similar conditions.<sup>8,9</sup>



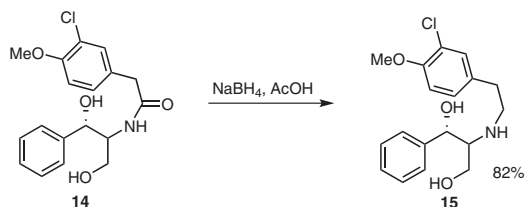
(D) As mentioned already, STAB-H is a milder reducing agent than  $\text{NaBH}_4$  and hence selective. It can reduce vinylogous carbamate **10** selectively without affecting other functionalities.<sup>10</sup>



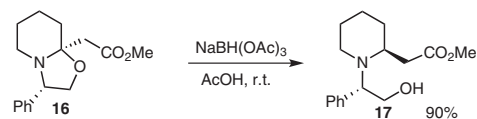
(E) The reduction of an imine can be effected by STAB-H. The reduced form of the quarter pyrroles **13** can be obtained by using STAB-H from the stable oxidized form **12**.<sup>11</sup>



(F) It is shown that STAB-H effectively reduced amide **14** to **15** in the total synthesis of a selective D1 antagonist useful in the treatment of psychoses, depression, and D1-dependent neurological disorders.<sup>12</sup>



(G) Cleavage of oxazolidines **16** can easily be carried out with STAB-H<sup>13</sup> to provide **17** and this tactic was featured in the first enantiospecific synthesis of salinosporamide A.<sup>14</sup>



## References

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