Available online at www.sciencedirect.com
SCIENCE DIRECT®
Tetrahedron Letters 47 (2006) 6393–6396
Tetrahedron Letters

Aqueous phase mono-protection of amines and amino acids as *N*-benzyloxycarbonyl derivatives in the presence of β-cyclodextrin☆

V. Pavan Kumar, M. Somi Reddy, M. Narender, K. Surendra, Y. V. D. Nageswar and K. Rama Rao*

Organic Chemistry Division I, Indian Institute of Chemical Technology, Hyderabad 500 007, India

Received 17 April 2006; revised 16 June 2006; accepted 29 June 2006

Abstract—A simple and selective protection of amines/amino acids with Cbz-Cl has been achieved in aqueous phase with catalytic amounts of β-cyclodextrin in high yields at room temperature. This reaction proceeds without the formation of any by-products and has advantages over existing methods.
© 2006 Elsevier Ltd. All rights reserved.

1. Introduction

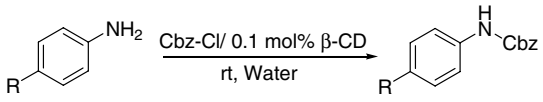
Among the widely used protecting groups for amines and amino acids, the benzyloxycarbonyl (Cbz) group[1] is extensively used since it can be easily removed by catalytic hydrogenation. The Cbz group is stable to basic and most aqueous acidic conditions. The reported methods for the protection of amino groups with Cbz have various limitations such as highly basic conditions, organic solvents, the use of water–organic solvent mixtures, elevated temperatures, extended reaction times, tedious work-up, etc.[2] Apart from these limitations, protection of amines in an aqueous medium is still problematic.[3]

Organic reactions in aqueous media have recently become a topic of focus in organic synthesis since they overcome the harmful effects of organic solvents and are environmentally benign. These aqueous reactions can be made more sophisticated if they can be performed under supramolecular catalysis.

Cyclodextrins which are cyclic oligosaccharides exert microenvironmental effects and catalyze reactions by supramolecular catalysis through noncovalent bonding as seen in enzymes. These attractive features of cyclodextrins in the biomimetic modeling of organic reactions and our earlier expertise developed in this field[4] prompted us to attempt the protection of amines with Cbz-Cl using β-cyclodextrin as the catalyst in water at room temperature (Scheme 1).

In general, the reactions were carried out by dissolving β-cyclodextrin (CD) in water and then adding the amine followed by the addition of Cbz-Cl at room temperature and gave the corresponding carbamates in high yields (89–98%, Table 1, entries 1–13). The reactions were rapid with all the amines studied (1–4 min). This method was also compatible with various types of primary and secondary amines. No by-product formation was observed. These reactions did not take place in the absence of CD. All the products were isolated and characterized by ^{1}H NMR, mass and IR spectroscopy and by comparison with known compounds. The CD can also be recovered and reused.

The successful protection of amino groups with Cbz prompted us to attempt this reaction with amino acids (Scheme 2) since Cbz protection of amino acids is usually carried out under highly alkaline conditions with long reaction times under controlled temperatures.[2]



Scheme 1.

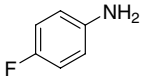
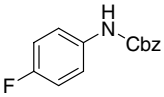
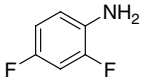
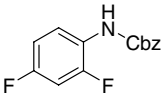
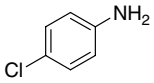
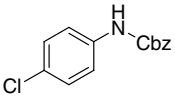
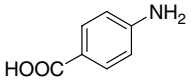
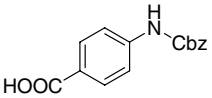
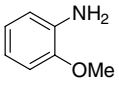
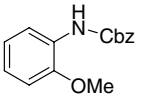
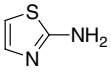
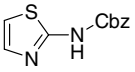
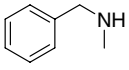
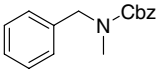
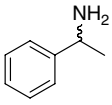
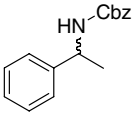
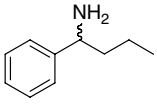
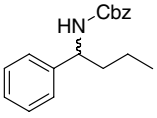
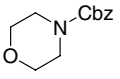
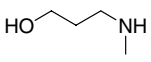
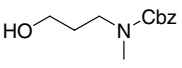
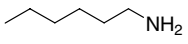
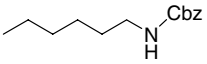
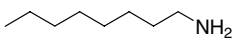
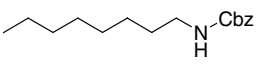
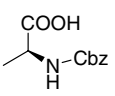
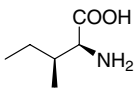
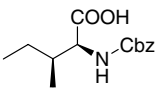
Keywords: Amino acids; Amines; Cbz-Cl; β-Cyclodextrin; Buffer; Water.

☆ IICT Communication No. 060616.

* Corresponding author. Tel.: +91 40 27193164; fax: +91 40 27160512; e-mail: drkrrao@yahoo.com

0040-4039/$ - see front matter © 2006 Elsevier Ltd. All rights reserved.
doi:10.1016/j.tetlet.2006.06.162

Table 1. Protection of amines/amino acids in water/buffer catalyzed by β-cyclodextrin

Entry	Substrate	Product[a]	Time (min)	Yield[b] (%)
1			1	97
2			1	98
3			2	96
4			4	85
5			1	96
6			2	92
7			1	98
8			1	97
9			1	96
10			2	94
11			3	89
12			2	92
13			2	94
14			15	87
15			12	90
16			8	92

Download English Version:

https://daneshyari.com/en/article/5277037

Download Persian Version:

https://daneshyari.com/article/5277037

Daneshyari.com