Pergamon

Tetrahedron Letters, Vol. 38, No. 9, pp. 1627-1628, 1997

0040-4039/97 $17.00 + 0.00

PII: S0040-4039(97)00105-6

Guanidine/Guanidinium Nitrate; a Mild and Selective *O*-Deacetylation Reagent that Leaves the *N*-Troc Group Intact.

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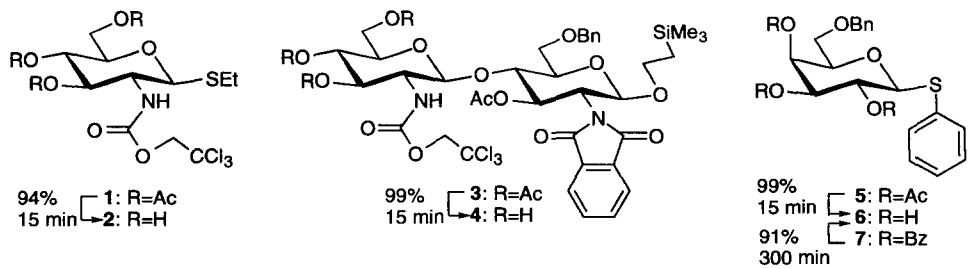
Abstract. Treatment of *O*-acetyl-protected sugars with a methanolic solution of guanidine/guanidinium nitrate caused the removal of the acetyl groups (91-99% isolated yield), without affecting other protecting groups. Removal of *O*-benzoyl groups required a longer reaction time. Of special merit is the stability of the 2,2,2-trichloroethoxycarbonylamino (*N*-Troc) group under these weakly basic reaction conditions.

Protection of the amino group of 2-deoxy-2-aminosugars by the 2,2,2-trichloroethoxycarbonyl (Troc) group to give an *N*-Troc carbamate, is a good alternative to e.g. phthalimides, both during glycoside synthesis and subsequent deprotection.[1-5] The *N*-Troc group is relatively stable under acidic conditions, which permits removal of *O*-acetyl groups by methanolic HCl (e.g. **1**→**2**).[6] However, attempted selective *O*-deacetylation of **1** under basic conditions (MeONa/MeOH, EtONa/EtOH, tBuOK/tBuOH, MeONa/MeOH/H_2O, NH_3/MeOH, KCN/EtOH, K_2CO_3/MeOH/H_2O) was unsuccessful; the *N*-Troc group was transformed into the corresponding carbamate.

Kunesch introduced guanidine (liberated from guanidinium chloride by the addition of one equivalent of sodium ethoxide) as an efficient *O*-deacetylation reagent.[7] Later, Wong used guanidinium carbonate for the same purpose.[8] Attempted *O*-deacetylation of **1** by the Kunesch procedure failed to spare the *N*-Troc group and the corresponding carbamate was formed. However, when the amount of MeONa was lowered to 0.2 equivalents, clean *O*-deacetylation of **1** gave **2** in 94 % yield, without any cleavage of the *N*-Troc group (Chart 1). Similarly, the disaccharide **3** was *O*-deacetylated to give **4** in 99% yield; the acetyl group in the 3-position was unaffected, probably due to steric hindrance by the *N*-Phth group. The guanidine/guanidinium

Chart 1.



nitrate reagent (G/$GHNO_3$) was investigated further with a number of *O*-acylated sugar derivatives, carrying various additional protecting groups. Both *S*- and *O*-glycosides were unaffected by the G/$GHNO_3$ reagent. In addition, a number of standard protecting groups (NPhth, $PhCHO_2$, BnO, Me_2CO_2, $Ph_2{}^tBuSiO$) were equally stable. The differences in steric hindrance by these groups was demonstrated by the varying reaction times (15-120 min) needed for full *O*-deacetylation. In contrast to the rapid (15 min) *O*-deacetylation of **5** (→**6**, 99%), *O*-debenzoylation of **7** (→**6**, 91%) required a reaction time of 300 min. The average isolated yield of *O*-deacylated products was 97%, using ten differently protected sugars. The tetrachlorophthalimido, *N*-Fmoc, and *O*-Troc protecting groups were unstable against the G/$GHNO_3$ reagent.

General O-deacylation procedure. A clear stock solution of the G/$GHNO_3$ reagent was prepared by dissolving guanidinium nitrate (622 mg, 5 mmol) in MeOH/CH_2Cl_2 (50 mL, 9:1) and adding methanolic MeONa (1 mL, 1 M). The stock solution was kept at room temperature for several weeks without any observed decrease in activity.

The *O*-acylated sugar derivative (0.1 mmol) was dissolved in an aliquot of the stock solution (6 mL). The reaction was monitored by TLC (SiO_2, heptane/EtOAc 1:1 and CH_2Cl_2/EtOH 10:1). When the *O*-deacylation was complete, the mixture was neutralized by addition of Amberlite IR 120 H^+ and the solvent was removed. The residue was chromatographed (SiO_2, CH_2Cl_2/EtOH 10:1) to give the *O*-deacylated saccharide (e.g. Chart 1). The *O*-deacylated compounds were *O*-acetylated to recreate the starting materials **1**, **3**, and **5**. The identity of all new compounds was shown by NMR and HRMS.

Acknowledgement. This work was supported by the Swedish Natural Science Research Council.

REFERENCES

1. Windholz, T. B.; Johnston, D. B. R., *Tetrahedron Lett.*, **1967**, 27, 2555-2557.
2. Kusumoto, S., Yoshimura, H., Imoto, M., Shimamoto, T., Shiba, T., *Tetrahedron Lett.*, **1985**, 26, 909-912.
3. (a) Mukayama, T., Matsubara, K., *Chem Lett.*, **1992**, 1755-1758. (b) Matsubara, K., Mukayama, T., *Chem Lett.*, **1993**, 2145-2148.
4. Schultz, M., Kunz, H., *Tetrahedron Lett.*, **1992**, 33, 5319-5322.
5. Ellervik, U.; Magnusson, G. *Carbohydr. Res.* **1996**, 280, 251-260.
6. Ellervik, U.; Magnusson, G., unpublished results.
7. (a) Kunesch, N., Miet, C., Poisson, J., *Tetrahedron Lett.* **1987**, 28, 3569-3572. (b) Kunesch, N., Miet, C., Poisson, J., *Liebigs Ann. Chem.* **1994**, 1059-1063.
8. Babiak, K. A., Ng, J. S., Dygos, J. H., Weyker, C. L., Wang, Y.-F., Wong, C.-H., *J. Org. Chem.* **1990**, 55, 3377-3381.

(*Received in UK* 14 *November* 1996; *revised* 10 *January* 1997; *accepted* 17 *January* 1997)