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LETTERS TO THE EDITOR

Synthesis of 6-Bromo-6-dezoxy-β-cyclodextrin from Its Silyl and Tosyl Derivatives

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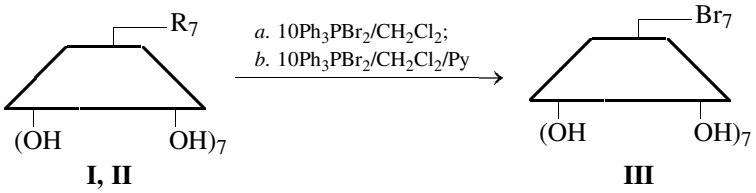
6-Bromo-6-dezoxy derivatives of β-cyclodextrin attract a permanent interest owing to their high alkylating properties toward N-containing organic nucleophiles because they allow to prepare numerous alkylammonium derivatives of cyclodextrins that significantly extends the possibility of cyclodextrins practical usage, for example for the synthesis of β-cyclodextrin cationic derivatives [1–3]. Bromodezoxy derivatives of cyclodextrins are usually prepared by the reaction of spare cyclodextrins with Riden [4] and Wilsmier–Haack [5] reagents. These methods being widely practiced in carbohydrate chemistry, give not reproductive results in the reactions with free cyclodextrin because of the significant inculsion of the named reagents and the products of their conversion into the cyclodextrin cavity (for example, of triphenylphosphine oxide). Continuing our research in the field of the synthesis of bromodezoxy derivatives [6] we found that easily available per-6-*O*-(*tert*-butyldimethylsilyl)-β-cyclodextrin (**I**) and per-6-*O*-tosyl-β-cyclodextrin (**II**) containing free secondary hydroxyl groups, under the treatment with 10 mol equivalent of dibromotriphenylphosphorane readily undergo desilylation (method *a*) or detosylation (method *b*) with the formation of per-6-bromo-6-dezoxy-β-cyclodexrtrin (**III**).



I, II **III**

I: R = $OSiMe_2$–*t*-Bu; **II**: R = OTs.

Note that this synthetic route to compound **III** has been described, but only for the silylated derivative **I** containing completely methylated secondary hydroxyl groups, without description of detailed experimental procedures for the desilylation [7]. In the case of our reaction, isolation of the product **III** is carried out by its precipitation by chloroform from DMF allowing us to obtain the target compound not contaminated with triphenylphosphine oxide, which often is necessary for further functionalization of bromodezoxycyclodextrin [3].

Per-6-bromo-6-dezoxy-β-cyclodextrin (III). *a*. To 1 g (0.516 mmol) of silyl derivative **I** in 5 ml of methylene chloride, 2.62 g (6.202 mmol) of dibromotriphenylphosphorane was added. Then the reaction mixture was stirred for 24 h, and centrifuged. The solution was decanted, and the obtained precipitate was dissolved in 2 ml of DMF. Then 8–10 ml of chloroform was added to this solution, the solution was stirred for 24 h and then centrifuged. The precipitate formed was washed with chloroform, and dried in a vacuum (1.5 mm Hg) for 8 h at 60°C to yield 0.524 g

(62%) of compound **III**, mp 220–223°C (decomp.). ^{1}H NMR spectrum (DMSO-d_6), δ, ppm, (*J*, Hz): 3.34 d.d (7H, H^6, $^3J_{H^5H^6}$ 9.86, $^2J_{H^6H^{6'}}$ 14.26), 3.41 d (7H, H^2, $^3J_{H^1H^2}$ 4.02), 3.66 d.d (7H, $H^{6'}$, $^3J_{H^5H^{6'}}$ 9.87, $^2J_{H^6H^{6'}}$ 14.26), 3.71 d.d (7H, H^4, $^3J_{H^4H^5}$ 9.14, $^3J_{H^3H^4}$ 10.23), 3.85 m (7H, H^5, $^3J_{H^4H^5}$ 9.14, $^3J_{H^5H^{6'}}$ 9.87, $^3J_{H^5H^6}$ 9.86), 3.99 d (7H, H^3, $^3J_{H^3H^4}$ 9.87), 4.98 d (7H, H^1, $^3J_{H^1H^2}$ 4.02), 5.89 d (7H, C^2OH), 6.03 d (7H, C^3OH). Found, %: C 32.53; H 4.01; Br 35.00. $C_{42}H_{63}Br_7O_{28}$. Calculated, %: C 32.02; H 4.03; Br 35.51.

b. To a solution of 1 g (0.457 mmol) of tosyl derivative **II** in 5 ml of methylene chloride and 2 ml of pyridine, 1.93 g (4.570 mmol) of dibromotriphenylphosphorane was added. Then the reaction mixture workup was similar to the described in method *a*. Yield of compound **III** is 0.418 g (58%), mp 220–223°C (decomp.). The ^{1}H NMR spectrum in DMSO-d_6 is identical to the listed in method *a*. Found, %: C 32.58; H 4.010; Br 35.29. $C_{42}H_{63}Br_7O_{28}$. Calculated, %: C 32.02; H 4.03; Br 35.51.

The ^{1}H NMR spectra were recorded on a Bruker WP-250 spectrometer (external reference TMS).

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