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HYDRAZINOLYSIS OF COMPOUNDS CONTAINING OXAZOLIDINE RING*

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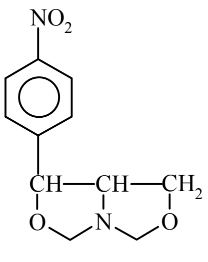
We have studied hydrazinolysis of (4S,5S)-3-benzyl-4-hydroxymethyl-5-(4-nitrophenyl)oxazolidine, (1R,4S,5S)-1-(4-nitrophenyl)-1-aza-3,7-dioxabicyclo[3,3,0]octane, and (1R,4S,5S)-1-benzyl-4-(4-nitrophenyl)-1-azonia-3,7-dioxabicyclo[3,3,0]octane. We have shown that neutral compounds are decomposed with opening of the oxazolidine ring, while quaternary ammonium salts react with hydrazine in several directions.

Keywords: oxazolidines, perhydrooxazolo[3,4-*c*]oxazoles, hydrazinolysis.

Reduction of (1*S*,2*S*)-2-amino-1-(4-nitrophenyl)-1,3-propanediol and (1*S*,2*S*)-2-dimethylamino-1-(4-nitrophenyl)-1,3-propanediol by hydrazine in ethanol in the presence of Raney nickel occurs quantitatively with formation of a single product [1]. In contrast, reduction of (1*R*,4*S*,5*S*)-1-(4-nitrophenyl)-1-aza-3,7-dioxabicyclo[3,3,0]octane (**1**) under the same conditions leads to formation of several compounds, with the corresponding amino derivative as the major product. We have studied the stability relative to treatment with hydrazine in ethanol of a number of compounds **1-3** containing oxazolidine ring that we have described previously in [2,3].



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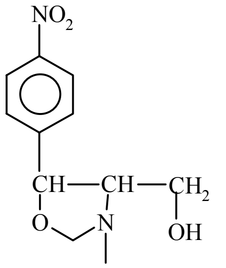

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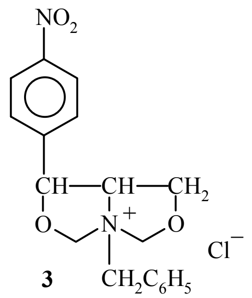

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Compounds **1-3** were treated with excess hydrazine until decomposition was complete, which simplified analysis of the reaction mixtures. The course of the reaction was monitored by TLC. Hydrazinolysis was conducted as follows: each compound was treated with hydrazine in ethanol for 40 h at room temperature and for 1 h at the boiling point. Then the reaction mixture was evaporated down to half volume on a rotary

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* Birthday greetings to our esteemed Mikhail Grigorievich Voronkov! May our collaboration continue for many more years.

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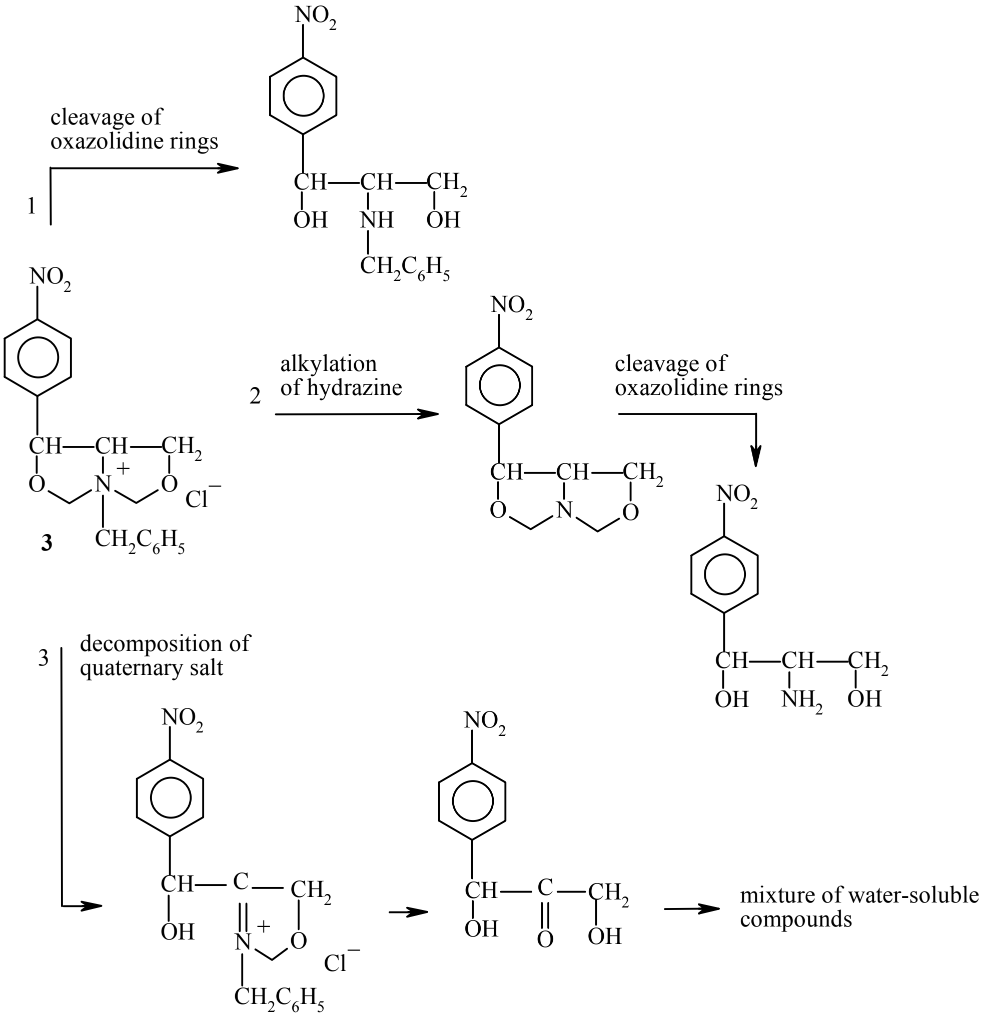
evaporator, and water was added to the residue. The isolated residue (an oil is isolated in the case of compounds **2** and **3**, which was then crystallized) was filtered off and dried. The hydrazinolysis products of compounds **2**, **3** were identified as hydrochlorides.

As we hypothesized, compounds **1** and **2** react with hydrazine with opening of the oxazolidine ring and are converted quantitatively to the corresponding amino diols: (1*S*,2*S*)-2-amino-1-(4-nitrophenyl)-1,3-propanediol and (1*S*,2*S*)-2-benzylamino-1-(4-nitrophenyl)-1,3-propanediol. When compound **3** is treated with hydrazine, the colorless reaction mixture acquires a yellow-orange color, which suggests that more extensive conversions are occurring in this case.

For compound **3**, we may propose several directions for hydrazinolysis, as shown in the following scheme:



In practice, we found that compound **3** decomposes preferably in a third direction to form a complex mixture of mainly water-soluble compounds which were not identified, while the yield of (1*S*,2*S*)-2-benzylamino-1-(4-nitrophenyl)-1,3-propanediol in decomposition via the first direction does not exceed 20%; this compound proved to be identical to the hydrazinolysis product of compound **2**.

We did not detect (1*S*,2*S*)-2-amino-1-(4-nitrophenyl)-1,3-propanediol among the reaction products, which suggests that in the case of compound **3**, the second direction is not realized.

EXPERIMENTAL

The ^{1}H NMR spectra were recorded on a Bruker AC-400 (400 MHz) spectrometer in DMSO-d$_6$, with TMS as the internal standard. The spectra were processed using the MESTREC computer program. The specific rotations were measured on a Jasco DIP-370 polarimeter. The melting points were determined on a Kofler apparatus. TLC was conducted on aluminum oxide plates (ethanol).

Hydrazinolysis of (1*R*,4*S*,5*S*)-1-(4-Nitrophenyl)-1-aza-3,7-dioxabicyclo[3.3.0]octane (1). Compound **1** (1.5 g, 6.4 mmol), hydrazine hydrate (2.0 g, 40 mmol), and ethanol (20 ml) were placed in a round-bottomed flask fitted with a reflux condenser and a magnetic stirrer. The mixture was stirred for 40 h at room temperature and for 1 h at the boiling point. Then the reaction mixture was evaporated down to half volume on a rotary evaporator and water (20 ml) was added. The precipitated crystals were filtered off, washed with water, and dried. Obtained 1.25 g of (1*S*,2*S*)-2-amino-1-(4-nitrophenyl)-1,3-propanediol (95% yield); mp 165-166°C (literature mp: 163-165°C [4]).

Hydrazinolysis of (4*S*,5*S*)-3-Benzyl-4-hydroxymethyl-5-(4-nitrophenyl)oxazolidine (2) was conducted as described above, taking compound **2** (2.0 g, 6.4 mmol) and hydrazine hydrate (2 g, 40 mmol). Obtained 1.88 g of (1*S*,2*S*)-2-benzylamino-1-(4-nitrophenyl)-1,3-propanediol (98% yield), which then was converted to hydrochloride; mp 244-246°C (decomp.), $[\alpha]_D$ +55.5° (*c* 0.52, ethanol). ^{1}H NMR spectrum, δ, ppm, *J* (Hz): 7.65-8.24 (4H, q, *J* = 8.8, H_{arom}); 7.40-7.57 (5H, two m, H_{arom}); 6.75 (1H, br. s, OH); 5.58 (1H, br. s, OH); 5.07 (1H, br. d, *J* = 7.5, CHO); 4.30 (2H, s, CH_2N); 3.63 and 3.33 (2H, two d, *J* = 12.8, CH_2O); 3.17 (1H, br. s, CHN). Found, %: C 56.98; H 5.70; N 8.28; Cl 10.48. $C_{16}H_{18}N_2O_4 \cdot HCl$. Calculated, %: C 56.72; H 5.65; N 8.27; Cl 10.46.

Hydrazinolysis of (1*R*,4*S*,5*S*)-1-Benzyl-4-(4-nitrophenyl)-1-azonia-3,7-dioxabicyclo[3.3.0]octane (3) Chloride was conducted as described above, taking compound **3** (2.6 g, 7.1 mmol) and hydrazine hydrate (2.4 g, 48 mmol). Obtained 0.4 g of (1*S*,2*S*)-2-benzylamino-1-(4-nitrophenyl)-1,3-propanediol (18% yield), which then was converted to hydrochloride; mp 244-246°C (decomp.), $[\alpha]_D$ +56° (*c* 0.52, ethanol). The ^{1}H NMR spectrum is identical to the spectrum of the hydrazinolysis product of compound **2.**

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