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SHORT COMMUNICATIONS

Syntesis and Reactivity of 1-Bromomethyl-5-oxo-4-phenyl-1,2,4,5,6,7,8,9-octahydrobenzo[4,5]thieno[3,2-*e*][1,3]oxazolo[3,2-*a*]-pyrimidin-11-ium Bromides

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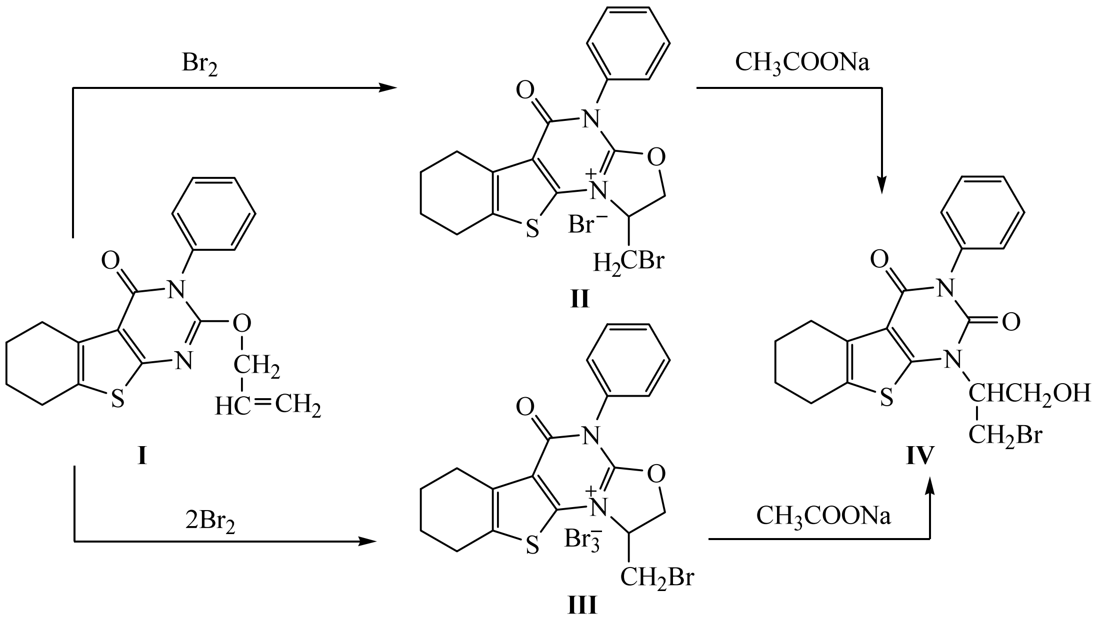
We demonstrated formerly that the N^1-nucleophilic center of unsaturated thio ethers of thieno[2,3-*d*]-pyrimidine could be brought into reactions of electrophilic heterocyclization [1, 2]. The further study of bromination conditions of 2-hydroxy-4-oxo-3-phenylthieno[2,3-*d*]pyrimidine allyl ether (**I**) revealed that notwithstanding the ratio and concentration of initial reagents and the time of the reaction the bromination of compound **I** in acetic acid gave rise to a fused system of salts of benzothieno-oxazolopyrimidinium **II** and **III** of angular structure.

The bromination of allyl ether **I** followed by storage of the reaction mixture for 5 days at the use of low concentration of ether **I** (0.5–1.0%) and at the ratio of the initial compounds ether **I**–bromine equal to 1:1 (or 1:2) gave as a result monobromide **II**. In the event that the bromoheterocyclization is carried out at high concentration of ether I (5.0–10.0%) and at the ratio of the initial compounds ether **I**–bromine equal to 1:4 for 3–4 h the reaction yields tribromide **III**. We showed also that monobromide **II** formed at stirring tribromide **III** for 1 h in acetone or butanone. The direct bromination of salt **II** afforded tribromide **III** in a quantitative yield. In the ^{1}H NMR spectra of salts **II** and **III** lack the signals from the allyl fragment of initial ether **I**, and the resonances of a spin system *ABX* characteristic of the formed oxazolinium ring appear for monobromide **II** and tribromide **III** respectively as follows: a multiplet of the methine proton at 4.85 and 4.84 ppm; two doublet of



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doublets at 4.21, 4.49 ppm (**II**) and 4.20, 4.47 ppm (**III**), corresponding to diastereotopic methylene protons of the oxazolinium ring, and a multiplet of exocyclic methylene protons of the CH_2Br group at 4.06 and 4.07 ppm. The shift to the longwave region of absorption bands from the C=O and $C=N^+$ moieties in the IR spectra of salts **II** and **III** confirms the presence of a positive charge on the nitrogen [1, 2].

In the reaction of salts **II** and **III** with an O-nucleophile like sodium acetate the oxazolinium ring suffered cleavage affording thienopyrimidine **IV**. We observed experimentally that monobromide **II** was more stable against the nucleophilic attack than tribromide **III**. The structure of compound **IV** is confirmed by the changes in the splitting of signals in the spin system *ABX* (upfield shift of resonances as compared to the spectra of salts **II** and **III**) and by an appearance of a singlet at 5.72 ppm from the proton of hydroxy group.

1-Bromomethyl-5-oxo-4-phenyl-,2,4,5,6,7,8,9-octahydrobenzo[4,5]thieno[3,2-*e*][1,3]oxazolo[3,2-*a*]pyrimidin-11-ium bromide (II). (a) In 150 ml of acetic acid was dissolved at heating 1.70 g (0.005 mol) of compound **I** [1]; to the solution cooled to 25°C was slowly dropwise added at constant stirring a solution of 0.53 ml (0.010 mol) of bromine in 15 ml of acetic acid. The reaction mixture was left standing for 5 days, then the precipitate was filtered off and washed with ether.

(b) To 0.66 g (0.001 mol) of tribromide **III** was added 50 ml of acetone, and the mixture was stirred at room temperature for 1 h; the precipitate was filtered off and washed with ether. Yield 2.02 g (81%, *a*), 0.31 g (62%, *b*), colorless crystals, mp. 241–242°C. R_f 0.81. IR spectrum, ν, cm^{-1}: 1710 (C=O), 1640 ($C=N^+$). ^1H NMR spectrum, δ, ppm: 1.72 m (4H, $2CH_2$), 2.70 m (2H, CH_2), 2.76 m (2H, CH_2), 4.01–4.13 m (2H, CH_2Br), 4.16–4.25 m (1H, $CH_{2\ cycle}$), 4.47–4.54 m (1H, $2CH_{2\ cycle}$), 4.85 m (1H, =CH), 7.24–7.54 m (5H, C_6H_5). Found, %: C 45.71; H 3.60; Br 32.49; N 5.53; S 6.39. $C_{19}H_{18}Br_2N_2O_2S$. Calculated, %: C 45.78; H 3.61; Br 32.13; N 5.62; S 6.43.

1-Bromomethyl-5-oxo-4-phenyl-1,2,4,5,6,7,8,9-octahydrobenzo[4,5]thieno[3,2-*e*][1,3]oxazolo[3,2-*a*]-pyrimidin-11-ium tribromide (III). (a) In 50 ml of acetic acid was dissolved at heating 4.10 g (0.012 mol) of compound **I**; to the solution cooled to 25°C was slowly dropwise added at constant stirring a solution of 2.56 ml (0.048 mol) of bromine in 10 ml of acetic acid. The reaction mixture was stirred for 3 h, then the precipitate was filtered off and washed with ether.

(b) To a dispersion of 0.50 g (0.001 mol) of monobromide **II** in 10 ml of acetic acid was slowly dropwise added at constant stirring a solution of 0.11 ml (0.002 mol) of bromine in 5 ml of acetic acid; the reaction mixture was stirred for 1 h, the precipitate was filtered off and washed with ether. Yield 4.57 g (58%, *a*), 0.63 g (96%, *b*), yellow crystals, mp 132°C (*a*), 130°C (*b*) (publ.: mp 125°C [1]). R_f 0.86. IR spectrum, ν, cm^{-1}: 1710 (C=O), 1640 ($C=N^+$). ^1H NMR spectrum, δ, ppm: 1.76 m (4H, $2CH_2$), 2.70 m (2H, CH_2), 2.76 m (2H, CH_2), 4.01–4.14 m (2H, CH_2Br), 4.16–4.23 m (1H, $CH_{2\ cycle}$), 4.42–4.52 m (1H, $2CH_{2\ cycle}$), 4.84 m (1H, =CH), 7.22–7.57 m (5H, C_6H_5). Found, %: C 34.74; H 2.77; Br 48.40; N 4.28; S 4.91. $C_{19}H_{18}Br_4N_2O_2S$. Calculated, %: C 34.65; H 2.74; Br 48.63; N 4.26; S 4.86.

1-(2-Bromo-1-hydroxymethylethyl)-3-phenyl-1,2,3,4,5,6,7,8-octahydrobenzo[4,5]thieno[2,3-*d*]-pyrinidine-2,4-dione (IV). (a) In a minimum amount of DMSO was dissolved 1.00 g (0.0015 mol) of tribromide **III**; to the solution cooled to 25°C was added at constant stirring by small portions a solution of 1.23 g (0.0150 mol) of sodium acetate in 5 ml of water. The reaction mixture was stirred for 2 h, the precipitate was filtered off and recrystallized from acetone.

(b) In a minimum amount of DMF was dissolved 1.00 g (0.0015 mol) of monobromide **II**, and a solution of 4.06 g (0.0495 mol) of sodium acetate in 10 ml of ethanol was added; the reaction mixture was heated on a water bath for 4 h and then poured into 100 ml of ice water, the precipitate was filtered off and recrystallized from acetone. Yield 0.52 g (79%, *a*), 0.46 g (72%, *b*), colorless crystals, mp 196°C (acetone). R_f 0.68. IR spectrum, ν, cm^{-1}: 3450 (O–H), 1680 (C=O). ^1H NMR spectrum, δ, ppm: 1.76 m (4H, $2CH_2$), 2.68 m (2H, CH_2), 2.75 m (2H, CH_2), 3.48–4.56 m (4H, CH_2Br, $CH_{2\ cycle}$), 5.72 s (1H, OH), 7.197.56 m (5H, C_6H_5). Found, %: C 52.43; H 4.37; Br 18.28; N 6.50; S 7.38. $C_{19}H_{19}BrN_2O_3S$. Calculated, %: C 52.41; H 4.37; Br 18.39; N 6.44; S 7.36.

TLC was carried out on Sorbfil plates at 27°C (sorbent silica gel, eluent ethanol–ethyl ether–hexane, 1:3:1, development in iodine vapor). IR spectra were recorded on UR-20 instrument from samples prepared as KBr pellets. ^1H NMR spectra were registered on spectrometer Varian VXR-300 (300 MHz) in DMSO-d_6, internal reference TMS.

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