BENZO[c]PYRILIUM SALTS WITH A CYCLOPOLYETHER SUBSTITUENT

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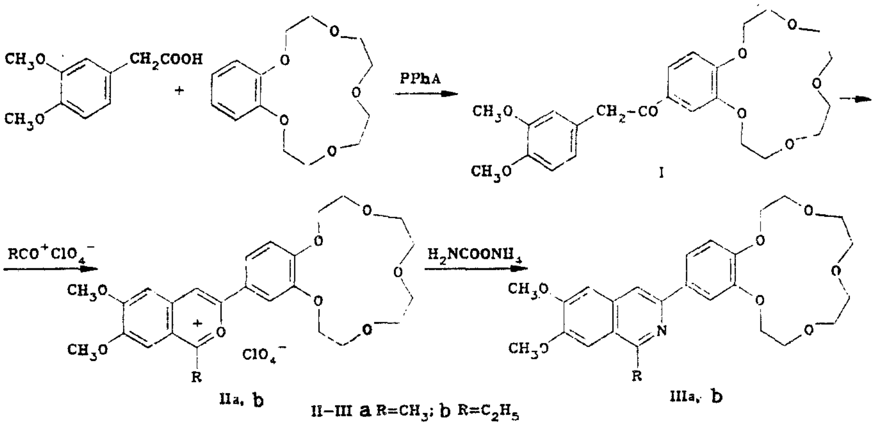
The acylation of 4'-(3,4-dimethoxyphenyl)benzo-15-crown-5 by carboxylic acid anhydrides in the presence of equimolar amounts of perchloric acid gave 1-alkyl-3-[3',4'-(3",6",9",12",15"-pentaoxa-1",2"-cyclopentadeceno)phenyl]-6,7-dimethoxybenzo[c]pyrilium salts, which are converted by the action of ammonia to the corresponding isoquinolines.

A promising method for the preparation of new biologically active compounds capable of penetrating through biological membranes or affecting selective ion transfer in living organisms is the synthesis of crown-containing heterocycles. Undoubted interest in this regard is found in pyrilium salts, which are readily converted by the action of nucleophilic reagents into derivatives of various heterocycles including pyridine and isoquinoline compounds [1].

In a previous communication [2], we reported the preparation of benzo[c]pyrilium salts condensed at positions 6 and 7 with an oxygen-containing macrocycle and the conversion of these products into isoquinolines.

The present communication is devoted to the synthesis of 1-alkyl-3-[3',4'-(3",6",9",12",15"-pentaoxa-1",2"-cyclopentadeceno)phenyl]-6,7-dimethoxybenzo[c]pyrilium salts II and their recyclization to give isoquinoline derivatives III.



Homoveratric acid and benzo-15-crown-5 were used as the starting compounds. The reaction of these compounds in polyphosphoric acid gave ketone I. Treatment of I by carboxylic acid anhydrides in the presence of equimolar amounts of perchloric acid gave virtually quantitative yields of crown-substituted benzo[c]pyrilium salts II. Perchlorates II upon heating their ethanolic solutions with ammonium carbamate are smoothly converted to the corresponding isoquinolines III (Table 1).

The PMR spectra of salts IIa and IIb (Table 1) have a singlet for proton 4-H, which is shifted due to the effect of charge on the nucleus by 0.4-0.5 ppm downfield relative to the multiplet for the benzene ring protons. The signals for the methoxy group protons in I-III and of the methylene group of ketone I are overlapped by the multiplet of the methylene protons of the cyclopolyether fragment.

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TABLE 1. Characteristics of II and III

Compound	Chemical formula	mp, °C	PMR spectrum, δ ,ppm	Yield, %
IIa	$C_{26}H_{31}ClO_{12}$	201 . . . 203	3,20 (3H, с, 1-CH_3); 3,93 . . . 4,37 (22H, м, OCH_3, OCH_2CH_2); 7,38 . . . 7,60 (5H, м $H_{аром}$); 8,15 (1H, с, 4-H)	94
IIb	$C_{27}H_{33}ClO_{12}$	197 . . . 199	1,60 (3H, т, 1-β-CH_3); 3,62 (2H, к, 1-α-CH_2); 3,93 . . . 4,53 (22H, м, OCH_3, OCH_2CH_2); 7,36 . . . . . . 7,67 (5H, м, $H_{аром}$); 8,17 (1H, с, 4-H)	96
IIIa	$C_{26}H_{31}NO_7$	165 . . . 167	2,90 (3H, с, 1-CH_3); 3,40 . . . 3,88 (22H, м, OCH_3, OCH_2CH_2); 6,35 . . . 7,50 (5H, м, $H_{аром}$)	70
IIIb	$C_{27}H_{33}NO_7$	154 . . . 156	1,31 (3H, т, 1-β-CH_3); 3,03 (2H, к, 1-α-CH_2); 6,37 . . . 7,20 (5H, м, $H_{аром}$)	62

The IR spectra of salts IIa and IIb have bands at 1635 (IIa) and 1630 cm^{-1} (IIb) characteristic for the pyrilium cation and a strong band at 110 cm^{-1} corresponding to the ClO_4^- anion. The spectra of all the compounds synthesized have bands at 1285-1249 and 1160-1130 cm^{-1}, corresponding to asymmetric stretching vibrations of the C—O—C groups of the methoxy and polyether fragments.

EXPERIMENTAL

The IR spectra were taken in vaseline mul on a UR-20 spectrometer. The PMR spectra were taken on a Tesla BS-467 spectrometer at 60 MHz. The solvent for IIa and IIb was CF_3CO_2H, while the solvent for IIIa and IIb was $CDCl_3$. TMS served as the internal standard.

The physical indices and PMR spectral data for II and III are given in Table 1. The elemental analysis results for II and III for C, H, N, and Cl corresponded to the calculated values.

4'-(3,4-Dimethoxyphenylacetyl)benzo-15-crown-5 (I), $C_{24}H_{30}O_8$. A mixture of 13.4 g (50 mmoles) benzo-15-crown-5, 12.7 g (65 mmoles) homoveratric acid, and 200 g polyphosphoric acid was stirred for 1 h at 90°C and poured into a mixture of ice and water. The oily layer formed was separated and the aqueous layer was extracted with four 100-ml portions of benzene. The combined organic extracts were washed with aqueous lithium carbonate and dried over magnesium sulfate. Benzene was evaporated. The residue was crystallized from ethanol to give 9.4 g (42%) I, mp 120-122°C. IR spectrum: 1685 cm^{-1} (C=O). PMR spectrum in $CDCl_3$: 3.40-3.80 (24H, m, OCH_3, OCH_2CH_2, CH_2), 6.20-6.97 ppm (6H, m, arom H).

Benzo[c]pyrilium perchorates (IIa) and (IIb). A sample of 4 mmoles ketone I was added with stirring to a mixture of 50 mmoles acetic or propionic anhydride, 8 ml acetic or propionic acid, respectively, and 0.4 ml 70% perchloric acid at room temperature. After 30 min, the precipitate formed was filtered off, washed with acetic acid and ether, and dried.

1-Alkyl-3-[3',4'-(3",6",9",12",15"-pentaoxa-1",2"-cyclopentadeceno)phenyl]-6,7-dimethoxyisoquinolines (IIIa) and (IIIb). A mixture of 0.8 g (10 mmoles) ammonium carbamate and 1 mmole perchlorate IIa or IIb in 25 ml ethanol was heated at reflux for 2 h at 120°C in an autoclave. The cooled reaction mixture was poured into water. The precipitate formed was filtered off and dried.

LITERATURE CITED

1. A. T. Balaban, G. N. Dorofeenko, A. Dinculescu, J. Ficher, V. V. Mezheritskii, and A. V. Koblik, in: Advances in Heterocyclic Chemistry, Supplement 2 (1982).
2. V. I. Dulenko, S. L. Bogza, and Yu. A. Nikolyukin, Khim. Geterotsikl. Soedin., No. 9, 1283 (1984).