SYNTHESIS OF 4, 4, 5-TRIMETHYLTHIENO[2, 3-b]PYRROLENINE AND 5, 6, 6-TRIMETHYLTHIENO[3, 2-b]PYRROLENINE

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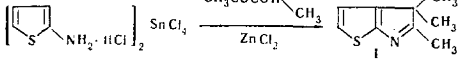
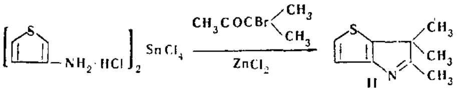
New heterocyclic bases—4, 4, 5-trimethylthieno[2, 3-b]pyrrolenine and 5, 6, 6-trimethylthieno[3, 2-b]pyrrolenine—have been obtained by the condensation of the double salts of stannic chloride and the hydrochlorides of, respectively, 2- and 3-aminothiophenes with methyl α-hydroxyisopropyl ketone and methyl α-bromoisopropyl ketone.

We have previously described isomeric heterocyclic bases containing a condensed thiophene ring: 2-methylthienothiazoles [1, 2], 4- and 7-methylthienopyridines [3], and 5- and 6-methylthienopyridines [4]. We based the synthesis of new heterocycles containing a condensed thiophene ring—4, 4, 5-trimethylthieno-[2, 3-b]pyrrolenine (I) and 5, 6, 6-trimethylthieno[3, 2-b]pyrrolenine (II)—on the methods used for obtaining 2, 3, 3-trimethylindolenine and consisting in the condensation of aniline with methyl α-hydroxy- or methyl α-bromoisopropyl ketone [5] (in the absence of a solvent at 180–190° C).

In view of the instability of free 2-aminothiophene, for condensation with methyl α-hydroxyisopropyl ketone we used the fairly stable double salt of stannic chloride and 2-aminothiophene hydrochloride. Repeated attempts to perform the condensation of these compounds on heating in the absence of solvents proved unsuccessful. We succeeded in obtaining I by carrying out the condensation in absolute ethanol in the presence of anhydrous zinc chloride with heating [6], but only with a yield of 3.6%. Compound I was obtained under the same conditions but with an even lower yield (0.9%) by the condensation of the double salt of stannic chloride and 2-aminothiophene hydrochloride with methyl α-bromoisopropyl ketone (compare [5]).



The isomeric compound II was obtained under similar conditions, as was to be expected (compare [2]), but with a considerably higher yield (21%), by the condensation of the double salt of stannic chloride and 3-aminothiophene hydrochloride with methyl α-bromoisopropyl ketone:



The bases I and II readily form picrates and quaternary salts.

In addition to the trimethyl-substituted thienopyrrolenines I and II, in both cases we obtained from the reaction mixture in low yield (1.0–1.2%) less volatile bases with a different structure, readily forming quaternary salts and a mixture of nonvolatile substances. This shows that the condensation of the aminothiophenes with methyl α-hydroxy- or methyl α-bromoisopropyl ketones apparently takes place by a complex mechanism, which is probably the reason for the low yields of the bases I and II. The structure of the unknown reaction products is being studied.

EXPERIMENTAL

4, 4, 5-Trimethylthieno[2, 3-b]pyrrolenine (I). a) A mixture of 53 g of the double salt of stannic chloride and 2-aminothiophene hydrochloride, 23 g of methyl α-hydroxyisopropyl ketone, and 1500 ml of absolute ethanol was boiled with stirring for 1 hr. Then 20 g of anhydrous zinc chloride was added in small portions and the mixture was boiled for 1 hr and cooled to 40° C, after which another 100 g of anhydrous zinc chloride was added in portions and the mixture boiled for 2 hr. The ethanol was distilled off, and the residue was made alkaline with 10% caustic soda solution and steam-distilled. The distillate was extracted with 1000 ml of ether, and the ethereal extract was dried with potassium carbonate. The ether was driven off, and the residue was distilled in vacuum. Yield 0.6 g (3.6%) of a light yellow oil, bp 107–110° C (9 mm), 113–115° C (10 mm). Found, %: N 8.23, 8.39; C 65.46; 65.31; S 19.29, 19.35; H 6.49, 6.53. Calculated for $C_9H_{11}NS$, %: N 8.47; C 65.41; S 19.40; H 6.70. **Picrate**—light yellow needles with mp 218–220° C (from ethanol). Found, %: N 13.96, 13.99. Calculated for $C_{15}H_{14}O_7N_4S$, %: N 14.20. **Methiodide**—colorless prisms with mp 229–231° C (from ethanol). Found, %: N 4.39, 4.46. Calculated for $C_{10}H_{14}INS$, %: N 4.56. **Ethiodide**—colorless prisms with mp 205–207° C (from ethanol). Found, %: N 4.29, 4.32; S 9.76, 9.81. Calculated for $C_{11}H_{16}INS$, %: N 4.36; S 9.88.

b) A mixture of 159 g of the double salt of stannic chloride and 2-aminothiophene hydrochloride, 75 g of methyl α-bromoisopropyl ketone, and 900 ml of absolute ethanol was boiled for 2 hr and cooled to 20° C, after which 45 g of anhydrous zinc chloride was added in small portions and the mixture boiled again for 2 hr. The substance was isolated as described in (a). The yield of I was 0.45 g (0.9%). The compound obtained and its methiodide were identical with those described in (a).

5, 6, 6-Trimethylthieno[3, 2-b]pyrrolenine (II). A mixture of 21.2 g of the double salt of stannic chloride and 2-aminothiophene hydrochloride, 10 g of methyl α-bromoisopropyl ketone, and 80 ml of absolute ethanol was boiled for 2 hr and cooled to room temperature, after which 3.0 g of anhydrous zinc chloride was added and the mixture boiled again for 2 hr. The ethanol was distilled off, and the residue was made alkaline with 10% caustic soda solution and steam-distilled. The distillate was extracted with 500 ml of ether, the ethereal extract dried with potassium carbonate, the ether driven off, and the residue distilled in vacuum. The yield of II was 1.4 g (21%). Light yellow oil with bp 132–134° C (9 mm). Found, %: N 8.36, 8.42; S 19.29, 19.37. Calculated for $C_9H_{11}NS$, %: N 8.47; S 19.40. **Picrate**—light yellow plates with mp 179–181° C (from ethanol). Found, %: N 13.98, 14.07. Calculated, %: N 14.20. **Methiodide**—colorless needles with mp 181–182° C (from ethanol). Found, %: N 4.49, 4.51. Calculated for $C_{10}H_{14}INS$, %: N 4.56.

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