mole) of LiAlH₄ and 3 g (0.023 mole) of aluminum chloride in 50 ml of absolute ether. At the end of the addition the mixture was refluxed with stirring for 1 h, after which it was cooled, and 50 ml of ethyl acetate was added to it gradually. The resulting solution was poured into 100 ml of 20% sulfuric acid, and the mixture was filtered. The organic layer was separated, and the aqueous layer was washed twice with 50-ml portions of ether. The combined ether extracts were dried over sodium sulfate, and the solvent was evaporated to give colorless needles of 9H-9-(p-tolyl)-10-telluraanthracene with m.p 163°C (from heptane-benzene) in 75-85% yield. Found: C 62.4; H 4.6%. C₂₀H₁₆Te. Calculated: C 62.6; H 4.4%.

LITERATURE CITED

SYNTHESIS OF COMPOUNDS OF THE BICYCLO[2.2.1]HEPTANE SERIES THAT ARE FUSED WITH AN OXAZECINE RING

N. K. Levchenko, G. M. Segal', and I. V. Torgov

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Derivatives of the bicyclo[2,2,1]heptane series that are condensed with an oxazecine ring were obtained. A number of transformations of the compounds obtained were realized. Data from the IR, NMR, and mass spectra that confirm the structures of the synthesized compounds are presented.

In the course of our research on the preparation of analogs of natural alkaloids we have realized the synthesis of polycyclic nitrogen-containing structures that have the norbornane skeleton. A number of compounds of this type have high spasmolytic [1], antiarrhythmic [2], hypotensive [3], or cardiotonic [4, 5] action. Several highly active natural alkaloids that contain 8-azabicyclo[3.2.1]octane and 9-azabicyclo[4.2.1]nonane systems can be included in this group of compounds [6].

We selected the accessible endo-5-norbornene-2,3-dicarboxylic acid anhydride (I), which is formed by the reaction of cyclopentadiene with maleic anhydride [7], as the starting compound. The corresponding imide (II) is formed smoothly in 65% yield when anhydride I is heated with urea by the method in [8]. The condensation of cyclopentadiene with maleimide also makes it possible to obtain imide II; however, the yield of the adduct decreases in this case.

The reduction of imide II with lithium aluminum hydride leads to norbornene IIIa, condensed with a pyrrolidine ring. Compound IIIa was characterized in the form of the N-acetyl derivative (IIlb) and the benzenesulfonamide (IIlc).
Amine IIIa was then converted to chloroacetamide IIId — the key substance for the construction of an additional oxazecine ring. It has been shown [9-11] that carbocyclic compounds that have closely located hydroxy and chloroacetamido groupings may, upon treatment with sodium hydride, undergo intramolecular cyclization to give an oxazepine or oxazecine ring.

To realize this sort of transformation it was necessary to introduce an OH group with an endo orientation in the 8 or 9 position. The simplest method for this could be the synthesis of the corresponding trans-glycol (IV), which we also obtained by hydroxylation of an unsaturated chloroacetamide (IIId) with performic acid. Another possible synthetic variant could be the construction of an oxazacine ring through the trans-bromohydrin; of the two possible isomers, only that which had an endo-oriented OH group was necessary.

From data on the stereospecificity of the addition of the elements of HOBr to norbornene derivatives [12] and from the result of bromolactonization of 5-norbornenedicarboxylic acids [13] it is known that the Br cation in reactions involving addition to the double bond in such systems usually substitutes the exo position in the final compounds, while the OH group substitutes the endo position. In fact, in our case we obtained the trans-bromohydrin (Va) with the necessary configuration by treatment of amide IIIId with N-bromoacetamide in aqueous perchloric acid. The Va structure follows from the subsequent transformations.

The action of sodium hydride on trans-glycol IV converts it smoothly to the corresponding lactam VIIIa, which we were subsequently able to reduce without isolation to hydroxy amine VIIb, which was characterized in the form of benzoate VIIc and 3,5-dinitrobenzoate VIId.

In the case of bromohydrin VA a similar sequence of transformations also leads to the formation of lactam VIIId and subsequently amine VIIId. However, elimination of the elements of HBr, which leads to the formation of a nortricyclene system, is observed along with cycli-