CCLXV.—*Derivatives of* 1-*Benzyltetrahydro*iso*quinoline.*

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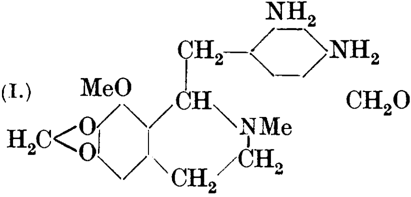
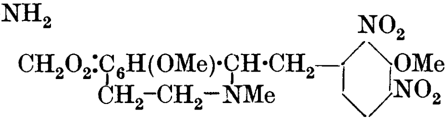
THE experiments here described were made in 1918—1919 and are now placed on record because of the extension contained in the paper which follows. As will readily be appreciated on reference to the latter memoir, it would probably facilitate the synthesis of certain alkaloids of the phenanthrene group if it were possible to prepare monoacyl derivatives of substances of the type of anhydrohydrastinine-2 : 4-diaminotoluene; whichever amino-group proved to be preferentially attacked, advantage could be taken of the process. The substance selected for examination was anhydrocotarnine-2 : 4-diaminotoluene (I), but all efforts to prepare its monoacetyl derivative were fruitless. The condensation of cotarnine and 2 : 4-dinitro-3-methoxytoluene leading to the substance (II) has also been investigated. In this case, the benzene nucleus contains substituents which by suitable modifications might be transformed into those actually occurring in the corresponding sections of the molecules of some natural alkaloids of the phenanthrene group.

(I.)





(II.)

EXPERIMENTAL.

Anhydrocotarnine-2 : 4-*diaminotoluene* (I).—The reduction of anhydrocotarnine-2 : 4-dinitrotoluene (Hope and Robinson, J., 1911, **99**, 2114) is a troublesome operation and the yield is sensitive to variations in the conditions. The chief cause of this is the instability of the dinitro-compound in acid solution.

A mixture of crystallised stannous chloride (5 g.), granulated tin (14 g.), acetic acid (20 c.c.), and concentrated hydrochloric acid (20 c.c.) was cooled in running water and mechanically stirred. Anhydrocotarnine-2 : 4-dinitrotoluene (5 g.) was then introduced in about 4 portions in the course of ½ hour, and stirring continued for an equal period. A solution of potassium hydroxide (50 g.) in water (150 c.c.) was then added, and the precipitate was collected and dissolved as far as possible in boiling benzene. A part of the base separated from the extract on cooling; the remainder was isolated by removal of the solvent and addition of a drop of methyl alcohol to the oily residue in order to induce crystallisation (total yield 3·8 g.). The *diamine* crystallises from methyl alcohol or benzene in colourless prisms, m. p. 119° (Found : C, 67·2; H, 6·6. $C_{19}H_{23}O_3N_3$ requires C, 66·9; H, 6·7%). When a solution in dilute hydrochloric acid is treated with sodium nitrite an orange precipitate is formed, but, nevertheless, the solution contains a tetrazonium salt and this couples with β-naphthol in alkaline solution to give a vivid vermilion azo-compound.

The *diacetyl* derivative is obtained under any conditions which suffice to acetylate the compound at all. Boiling acetic acid, cold acetic anhydride, and acetic anhydride in ethereal solution give the diacetyl derivative with more or less of the unchanged base. The derivative crystallises from alcohol in wedge-shaped needles, m. p. 211° (Found : C, 64·4; H, 6·6. $C_{23}H_{27}O_5N_3$ requires C, 64·8; H, 6·4%).

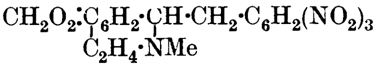
Other acylation processes were investigated, but, although benzoylation and the formation of an oxamic acid gave some promise, no well-defined monoacylation was observed in any case.

2 : 4-*Dinitro*-3-*methoxytoluene* (compare II).—A solution of sodium methoxide (4 g. of sodium) in methyl alcohol (50 c.c.) was gradually added during 5 hours to a suspension and solution of 2 : 3 : 4-trinitrotoluene (see preceding paper) (21 g.) in methyl alcohol (100 c.c.), cooled to − 4° and mechanically stirred. Stirring was continued for 7 hours at the room temperature and the mixture was then just acidified with sulphur dioxide. Most of the methyl alcohol was thereafter removed by distillation, and the residue, mixed with a little water, was heated at 70—80° in order that any unchanged trinitrotoluene might be converted into the soluble sodium dinitrotoluenesulphonate. The solid collected from the cooled mixture crystallised from aqueous alcohol (charcoal) in almost colourless, glistening plates, m. p. 86° (yield 13—16 g.). A methyl-alcoholic solution of potassium hydroxide (10 g.) in place of the sodium methoxide gives almost the same result.

A methyl-alcoholic solution of 2 : 4-dinitro-3-methoxytoluene treated with sodium hydroxide in excess develops an indigo-blue coloration, which is destroyed by water. The blue colour slowly changes to a rich magenta; the substance responsible for this effect is relatively stable to, and soluble in, water.

Anhydrocotarnine-2 : 4-*dinitro*-3-*methoxytoluene* (II).—Although many 2 : 4- and 2 : 6-dinitrotoluene derivatives condense directly with cotarnine in alcoholic solution, 2 : 4-dinitro-3-methoxytoluene gives poor results in this manner and the use of sodium methoxide as a catalyst is desirable. We found conditions which resulted in a 78% yield and the following slight modification of these, giving a 91% yield, is due to Dr. J. Shinoda. Solutions of 2 : 4-dinitro-3-methoxytoluene (5·4 g.) in methyl alcohol (65 c.c.) and of cotarnine (6 g.) in methyl alcohol (20 c.c.) were mixed, sodium methoxide (1 g. of sodium) in methyl alcohol (5 c.c.) was introduced, and the whole kept for 50 hours. The almost pure base separated in bright yellow tablets, m. p. 135—136° (yield 10 g.). After recrystallisation from alcohol and ethyl acetate, the m. p. was 136° (Found : C, 55·4 ; H, 4·6. $C_{20}H_{21}O_8N_3$ requires C, 55·7 ; H, 4·9%). Corresponding with the fact that a catalyst is required for the satisfactory synthesis of this base is its relative stability to acids. The sparingly soluble, crystalline *hydrochloride* is colourless. On boiling with glacial acetic acid the base is slowly decomposed with formation of its generators.

Anhydrohydrastinine-2 : 4 : 6-*trinitrotoluene*.



$$\begin{array}{l} \mathrm{CH_2O_2{:}C_6H_2{\cdot}CH{\cdot}CH_2{\cdot}C_6H_2(NO_2)_3} \\ \qquad\quad \mathrm{C_2H_4{\cdot}NMe} \end{array}$$

—2 : 4 : 6-Trinitrotoluene (0·98 g.) was ground with methyl alcohol (20 c.c.), and hydrastinine (0·77 g.) added. The brilliant orange-yellow prisms which separated were collected, washed with methyl alcohol, and dried (yield 94%). Recrystallisation from ethyl acetate gave a product, m. p. 143° (explosive decomp.) (Found : C, 52·1 ; H, 3·9. $C_{18}H_{16}O_8N_4$ requires C, 51·9 ; H, 3·8%). This substance forms a sparingly soluble *hydrochloride* which is stable in cold dilute solution but is decomposed on boiling. The base is quickly decomposed in a hot acetic acid solution with formation of hydrastininium acetate and trinitrotoluene.

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