Notes

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Tsutomu Momose and Shujiro Goya : Studies on Tetralin Derivatives. X.*[1] Some Derivatives of 2,3-Dihydroxytetralin.

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In a previous paper[1] of this series, it was shown that 2,3-dihydroxytetralin exhibited the strongest bacteriostatic activity *in vitro* among the tetralin and tetralone derivatives tested. In the present work, some derivatives of 2,3-dihydroxytetralin were prepared to examine their activity and also to study infrared absorption spectra of their aromatic ring, which corresponded to penta-substituted benzene derivatives.

The Reimer-Tiemann reaction of 2-hydroxy-3-methoxytetralin gave its 1-aldehyde derivative in a poor yield. The main product in the reaction was assumed as 2-oxo-3-methoxy-10-dichloromethyl-2,5,6,7,8,10-hexahydronaphthalene. Catalytic hydrogenation of the aldehyde over palladium-carbon gave the anticipated methyl compound and demethylation of the latter gave 1-methyl-2,3-dihydroxytetralin.

The Fries rearrangement had been successfully effected in α- and β-tetralyl acylate,[2] but the same reaction with 2,3-diacetoxytetralin gave 1-acetyl- and 1,4-diacetyl-2,3-dihydroxytetralin only in a poor yield when the reaction was carried out at 150~165° with 2.2~3 moles of aluminum chloride, and no improvement of the yield was found under varied reaction conditions.

The Claisen rearrangement of 3-methoxy-2-tetralyl allyl ether was easily performed under usual conditions. The resulting allyl compound was catalytically reduced over Raney nickel to the propyl compound, which gave 1-propyl-2,3-dihydroxytetralin by demethylation with hydriodic acid.

Finally, 1-bromo-2,3-dimethoxytetralin was obtained by the bromination of 2,3-dimethoxytetralin in carbon tetrachloride. Bacteriostatic activity and infrared spectral study of the above compounds will be published elsewhere.

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Experimental

2-Hydroxy-3-methoxytetralin—To a solution of 5 g. of 2,3-dimethoxytetralin in 15 cc. of dehyd. benzene, 4 g. of anhyd. $AlCl_3$ was added, and boiled for 40 min. The mixture was poured on ice, the separated benzene layer was washed with H_2O, and dried over anhyd. Na_2SO_4. After removal of the solvent, the residue was distilled *in vacuo*, b.$p_{2.5}$ 120~125°. Yield, 4 g. Recrystallization from petr. ether gave needles, m.p. 81~82°. *Anal.* Calcd. for $C_{11}H_{14}O_4$: C, 74.13; H, 7.92. Found : C, 73.51; H, 7.79.

1-Formyl-2-hydroxy-3-methoxytetralin—To a solution of 9 g. of the above compound in 200 cc. of 10% NaOH, 37.5 g. of $CHCl_3$ was added at 70~75° (bath temp.) in 3 hr. and maintained at the same temperature for additional 30 min. The mixture was cooled, washed repeatedly with ether, and acidified with dil. HCl. The separated oily substance was extracted with ether and distilled *in vacuo* after removal of the solvent. About 4.5 g. of the starting material was recovered, and the second fraction, b.p. 150~155°, gave pale yellow needles, m.p. 79°, after recrystallization from MeOH. Yield, 1 g. *Anal.* Calcd. for $C_{12}H_{14}O_3$: C, 69.88; H, 6.84. Found : C, 69.74; H, 6.88.

*1 Part IX : Yakugaku Zasshi, in press.

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1) T. Momose, H. Oya, Y. Ohkura, M. Iwasaki : This Bulletin, **2**, 119(1954).

2) S. I. Sergievskaya, L. M. Morozovskaya : C. A., **40**, 7186(1946); T. Momose, Y. Masuda : Bunseki Kagaku, 8, 153(1959).

2-Oxo-3-methoxy-10-dichloromethyl-2,5,6,7,8,10-hexahydronaphthalene—Obtained from ethereal washings of the above reaction. Recrystallization from EtOH gave needles, m.p. 141~142°. Yield, 2 g. *Anal.* Calcd. for $C_{11}H_{14}O_2Cl_2$: C, 55.18; H, 5.40. Found : C, 55.12; H, 5.63.

1-Methyl-2-hydroxy-3-methoxytetralin—The above compound was catalytically reduced in AcOH over 10% Pd-C. Recrystallization from EtOH gave needles, m.p. 109°. *Anal.* Calcd. for $C_{12}H_{16}O_2$: C, 74.97; H, 8.39. Found : C, 74.74; H, 8.59.

1-Methyl-2,3-dihydroxytetralin—A mixture of 0.8 g. of the above methoxy compound, 0.3 g. of phenol, and 4 g. of 57% HI was refluxed for 30 min. in CO_2 atmosphere. The mixture was diluted with H_2O and extracted with ether. The ether solution was washed successively with $Na_2S_2O_3$ solution and H_2O, dried over anhyd. Na_2SO_4, and evaporated. Addition of petr. ether to the residue gave needles, which were recrystallized from petr. benzine to m.p. 84°. Aqueous $FeCl_3$ gave a green color with the compound. *Anal.* Calcd. for $C_{11}H_{14}O_2$: C, 74.13; H, 7.92. Found : C, 73.86; H, 7.54.

1-Acetyl- and 1,4-Diacetyl-2,3-dihydroxytetralin—A mixture of 3 g. of 2,3-diacetoxytetralin[3] and 5 g. of anhyd. $AlCl_3$ was heated at 120° for 30 min. After additional heating at 160~165° for 3 hr., the mixture was decomposed with a mixture of ice and dil. HCl, and extracted with ether. The ether solution was extracted with 5% NaOH, the alkaline solution was acidified with dil. HCl, and the separated oily substance was again extracted with ether. After evaporation of the solvent, the residue was recrystallized from EtOH to pale yellow plates, m.p. 133~134°. Yield, 0.2 g. *Anal.* Calcd. for $C_{12}H_{14}O_3$: C, 69.88; H, 6.84. Found : C, 69.92; H, 6.88.

From the mother liquor a small amount of pale yellow needles of m.p. 261° appeared. *Anal.* Calcd. for $C_{14}H_{16}O_4$: C, 68.01; H, 6.07. Found : C, 68.41; H, 6.21.

1-Allyl-2-hydroxy-3-methoxytetralin—To a solution of 0.45 g. of metallic Na in 20 cc. of MeOH, 3 g. of 2-hydroxy-3-methoxytetralin and 2 g. of allyl bromide were successively added and the mixture was refluxed for 10 hr. on a water bath. After evaporation of the solvent the residue was extracted with ether and distilled *in vacuo*, $b.p_2$ 133~135°. This crude ether was heated at 230° for 2 hr. in CO_2 atmosphere and resulting crystalline material was recrystallized from EtOH to needles, m.p. 75~76°. Yield, 1.8 g. *Anal.* Calcd. for $C_{14}H_{18}O_2$: C, 77.03; H, 8.31. Found : C, 76.58; H, 7.96.

1-Propyl-2-hydroxy-3-methoxytetralin—The above compound was catalytically reduced in EtOH over Raney Ni. Recrystallization from EtOH gave needles, m.p. 86°. *Anal.* Calcd. for $C_{14}H_{20}O_2$: C, 76.32; H, 9.15. Found : C, 75.32; H, 8.79.

3,5-Dinitrobenzoate : Prepared by the usual method and recrystallized from benzene to yellow needles, m.p. 216°. *Anal.* Calcd. for $C_{21}H_{22}O_9N_2$: C, 60.86; H, 5.23. Found : C, 60.82; H, 5.23.

1-Propyl-2,3-dihydroxytetralin—Prepared by demethylation of the above methyl ether in the same way as mentioned before. Recrystallization from petr. benzine gave prisms, m.p. 87°. This compound gave a green color with $FeCl_3$ solution. *Anal.* Calcd. for $C_{13}H_{18}O_2$: C, 75.69; H, 8.80. Found : C, 75.41; H, 8.98.

1-Bromo-2,3-dimethoxytetralin—To a solution of 5 g. of 2,3-dimethoxytetralin in 10 cc. of CCl_4, 4.5 g. of Br_2 was gradually added under cooling in an ice bath. After the reaction ceased the solution was successively washed with H_2O and Na_2CO_3 solution, and dried over $CaCl_2$. After removal of the solvent, the residue was distilled *in vacuo*, $b.p_2$ 127~130°. Yield, 6 g. Recrystallization from petr. ether gave needles, m.p. 64°. *Anal.* Calcd. for $C_{12}H_{15}O_2Br$: C, 53.14; H, 5.52. Found : C, 52.84; H, 5.67.

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3) T. Momose, Y. Ohkura, S. Goya : This Bulletin, **3**, 405(1955).