

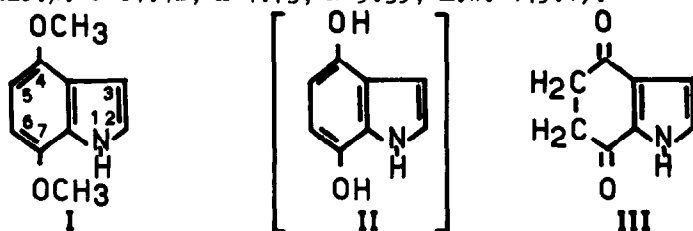
DEMETHYLATION OF 4,7-DIMETHOXYINDOLE

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In a previous paper⁽¹⁾ we tried to obtain 4,7-dihydroxyindole by demethylation of 4,7-dimethoxyindole (I). However, by heating I with aqueous hydroiodic or hydrochloric acid we obtained a demethylated product as a black compound of polymeric nature, the structure of which is still under study⁽²⁾. Also other 4,7-dimethoxyindole derivatives showed an analogous behaviour^(1,3).

On the contrary, a yellow crystalline substance was obtained, in which -OCH₃ groups were absent, by heating 4,7-dimethoxyindole in benzene solution with anhydrous aluminium trichloride. The molecular weight of this compound corresponded to a monomeric dihydroxyindole; after sublimation under high vacuum and crystallization from toluene it had m.p. 185° (found : C 64.33; H 4.65; N 9.33; m.w. 148. For C₈H₇O₂N calc. %: C 64.42; H 4.73; N 9.39; m.w. 149.1).



Some properties of the obtained substance, however, were not in agreement with the expected structure of 4,7-dihydroxyindole (II): a) it was insoluble in aqueous 5% sodium hydroxide solution; b) it was not oxidized by potassium dichromate in 10% sulfuric acid; c) the I.R. spectrum (solid, KBr) showed a strong absorption band at 1655 cm⁻¹, indicating the presence of carbonyl groups.

As, on the other hand, the substance did not show a quinonic behaviour toward an aqueous solution of diphenylbenzidine in the presence of sulfuric acid, we postulated that the compound had the carbonyl structure III, instead of the hydroxylic one II.

N.M.R. spectrum of the substance, obtained with a Varian A 56/60 spectrometer using a saturated solution in CDCl₃, showed absorptions at δ = 2.97 p.p.m. (4 H),

$\delta = 6.71$ p.p.m. (1 H) and $\delta = 7.14$ p.p.m. (1 H) (TMS as internal reference). The first peak is a singlet and corresponds to the four protons in the 5 and 6 positions; they are markedly deshielded by the carbonyl groups and the chemical shifts are identical, owing to the internal molecular motions and also to the equivalence of the anisotropic effects of the C₂-C₃ double bond and of the nitrogen atom. The two other bands gave rise to an AB system with $J = 2.9$ cps after addition of D₂O to the solution. Therefore they can be assigned to the protons in 2 and 3 positions, considering also the analogous absorption pattern obtained with 4,7-dimethoxyindole ($\delta = 6.62$ and 7.02 p.p.m., $J \approx 3.0$ cps). It was impossible to observe any absorption of the aminic proton, which in similar cases appears as a broad band, because the compound was scarcely soluble.

Therefore we concluded that the demethylated compound obtained from 4,7-dimethoxyindole has really the carbonyl structure III, namely 4,7-dioxo-5,6-dihydroindole. This carbonyl structure was further confirmed by the mono-semicarbazone obtained by heating the substance in aqueous-alcoholic solution with semicarbazide hydrochloride and sodium acetate (m.p. 223°; found : C 53.02; H 4.80; N 27.30; for C₉H₁₀O₂N₄ calc. %: C 52.42; H 4.89; N 27.17) and by mono-p-nitrophenylhydrazone (m.p. 212°; found : N 19.95; for C₁₄H₁₂O₃N₄ calc. %: N 19.71).

Moreover, as the substance was recovered unchanged after heating for 5 hours with acetic anhydride in the presence of pyridine, it appears that the carbonyl form III, at least in these experimental conditions, is really the stable form and that the enolic form II is practically absent.

A behaviour analogous to that of 4,7-dimethoxyindole seems to be presented also by other 4,7-dimethoxyindole derivatives; now we are trying to ascertain this fact.

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