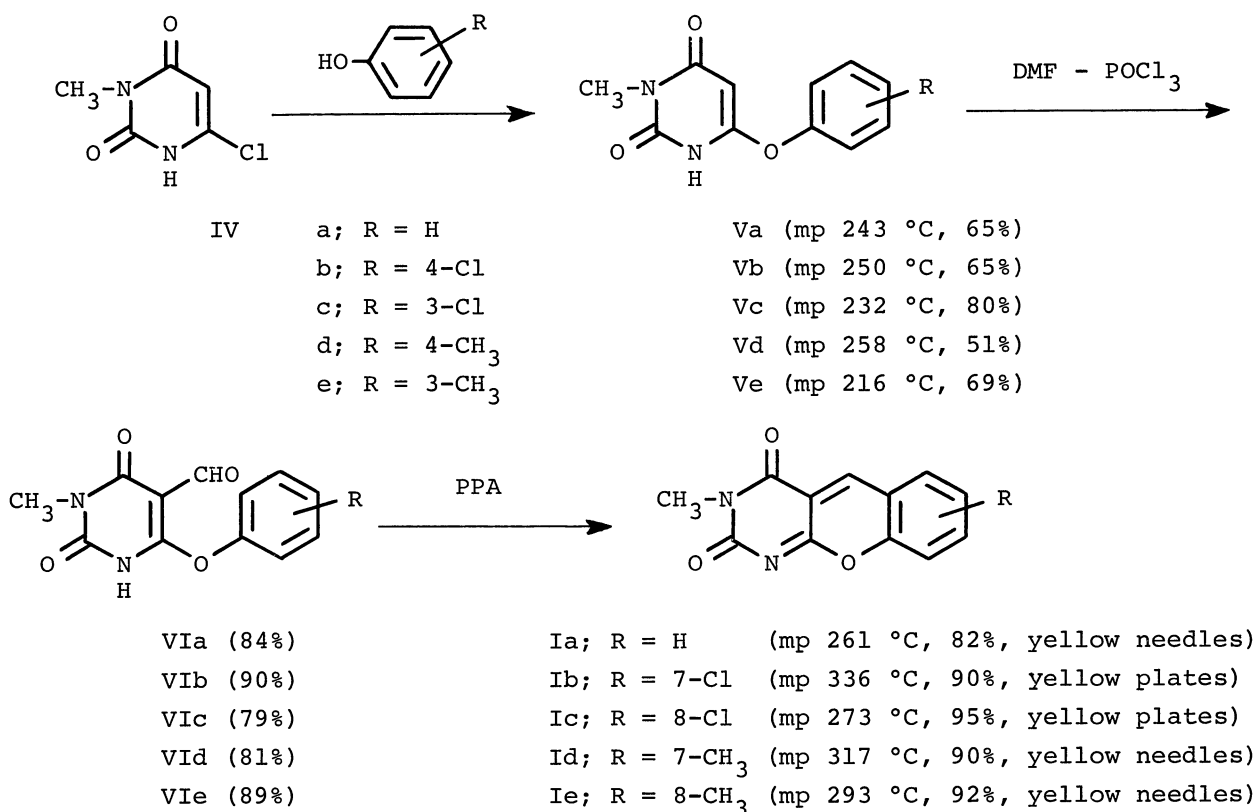


This paper describes a synthesis of 5-deaza-10-oxaflavin derivatives and a preliminary attempt to oxidize benzyl alcohol with them.

Heating of 6-chloro-3-methyluracil (IV)³ (10 mmol) with appropriate phenols (50 mmol) in dimethylformamide (20 ml) in the presence of potassium carbonate (50 mmol) for 10 hr under reflux gave 3-methyl-6-phenoxyuracils (Va-e), which were recrystallized from ethanol. The compounds V (5 mmol) were treated with a mixture of dimethylformamide (5 ml) and phosphorus oxychloride (1 ml) (the Vilsmeier reagent) at 90 °C for 2 hr and then the reaction mixtures were poured into ice water (100 ml) to separate the corresponding 5-formyl-3-methyl-6-phenoxyuracils (VIa-e). The 5-formyluracils (VI) thus obtained were unstable on recrystallization from solvents and were used for further step without purification.

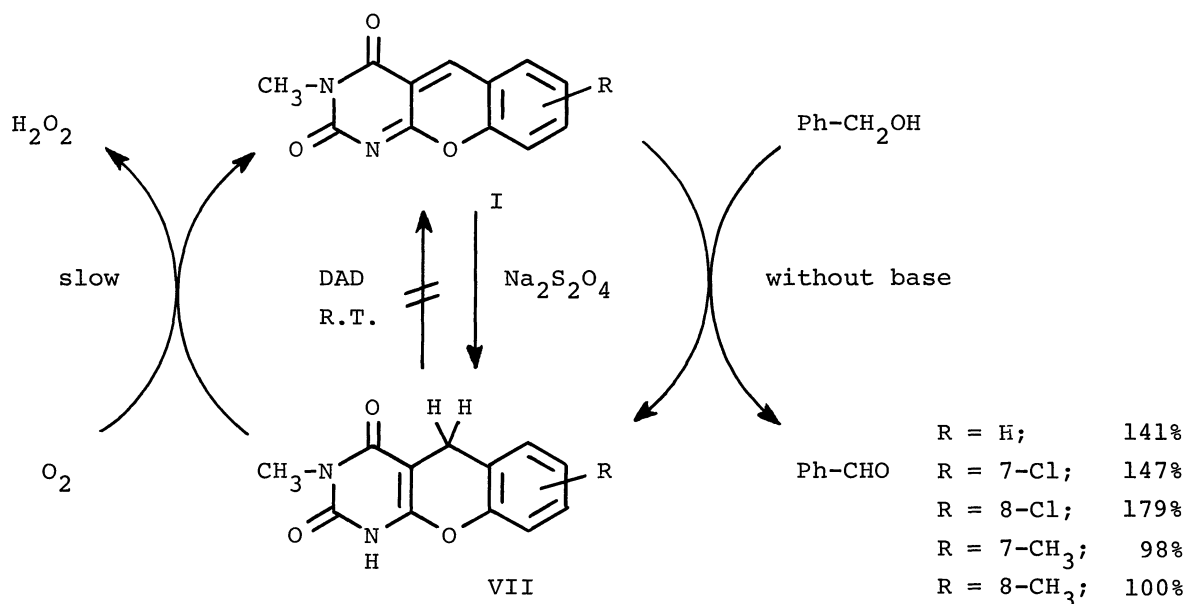


Scheme 2

Heating of 5-formyluracils (VI) (5 mmol) in polyphosphoric acid (7 ml) at 120 °C for 2 hr, followed by dilution with ice water (100 ml), afforded 3-methyl-2H-chromeno[2,3-d]pyrimidine-2,4(3H)-diones (3-methyl-5-deaza-10-oxaflavins) (Ia-e), which were recrystallized from a mixture of acetic acid and acetic anhydride (10:1). The

structures of Ia-e were assigned by elemental analyses and satisfactory spectral data, especially by the presence of the characteristic C-5 proton signal at 9.9 region in the NMR (CF_3COOH).

We have found that the compounds I have remarkable oxidizing ability in oxidizing benzyl alcohol under neutral conditions (in the absence of base)⁴ to give benzaldehyde, while the compounds I themselves are reduced to 1,5-dihydro-5-deaza-10-oxaflavins (VII). In some cases, a recycling of the oxidation was observed and more than 100% yield of benzaldehyde (based on the 5-deaza-10-oxaflavin) was obtained.



Scheme 3

For example, a mixture of 3-methyl-5-deaza-10-oxaflavin (Ia) (0.5 mmol) and benzyl alcohol (10 mmol) was stirred at 90 °C for 10 hr under aerobic conditions and the reaction mixture was diluted with ether. The 1,5-dihydro-3-methyl-5-deaza-10-oxaflavin (VIIa) thus separated (R = H, mp 258 °C, ca 50%) was filtered off and the filtrate was treated with a saturated solution of 2,4-dinitrophenylhydrazine in 2N hydrochloric acid to cause the separation of benzaldehyde 2,4-dinitrophenylhydrazone, mp 237 °C, in 141% yield based on Ia. Other 5-deaza-10-oxaflavins (Ib-e) also oxidized benzyl alcohol to give benzaldehyde under neutral conditions in the yields indicated in Scheme 3. In this series, the presence of the 8-chloro substituent enhanced the oxidizing power. Although the compounds I showed remarkable oxidizing power even in the absence of base, recycling of the reaction was not so excellent as

was expected. This may be attributable to considerable stability of the compounds VII initially formed in aerobic media and their slow reoxidation to the original 5-deaza-10-oxaflavins (I) by air. In fact, the compound VIIa (R = H) alternatively synthesized by the sodium dithionite reduction of Ia was very stable and even diethyl azodicarboxylate (DAD)⁵ did not reoxidize it to the original Ia under usual conditions.⁶

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