Novel Conversion of a 3-Oxidopyridinium into a 4-Oxidoisoquinolinium[1]

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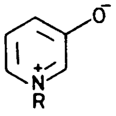
Summary Diels-Alder annelation of a 3-oxidopyridinium dimer followed by oxidation leads in high yield to a mixed 3-oxidopyridinium–4-oxidoisoquinolinium dimer which undergoes reversible dissociation to form a regioisomeric product; the 4-oxidoisoquinolinium is trapped as several adducts with dipolarophiles.

1-(4,6-DIMETHYLPYRIMIDIN-2-YL)-3-OXIDOPYRIDINIUM (**1**) exists as the dimer (**2**).[2] We now find that this dimer (**2**) reacts smoothly with 1-dimethylaminobuta-1,3-diene, the initial Diels-Alder adduct spontaneously losing dimethylamine to yield (**3**)† (>95%), m.p. 225—226 °C. The *exo*-stereostructure of (**3**), and its *exo*-configuration at the site of annelation are demonstrated by the proton–proton coupling constants [indicated in (**3**) in Hz]. Treatment of (**3**) with 1% ethanolic potassium hydroxide leads to internal dehydrogenation–reduction with stereospecific formation of the alcohol (**4**) (95%), m.p. 241—242 °C. The structure of (**4**) was unequivocally established by n.m.r. and mass spectroscopy and by its oxidation by Moffatt's reagent[3] to the ketone (**5**) (55%), m.p. 203—204 °C.



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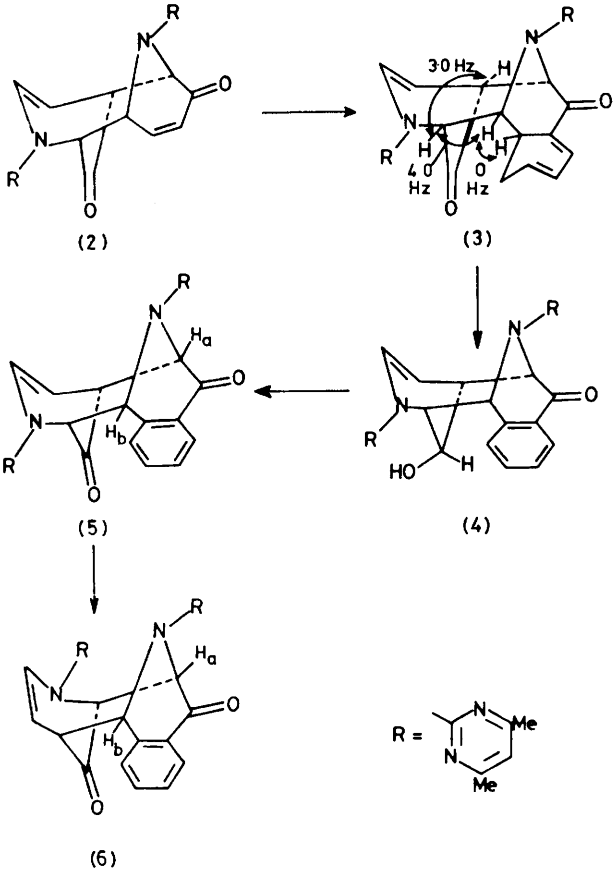
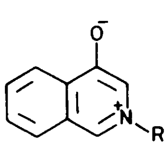


(2) (3) (5) (4) (6)



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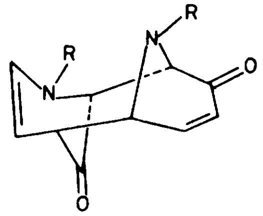

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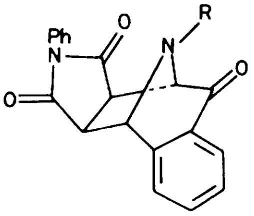

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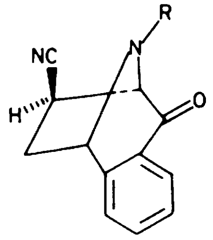

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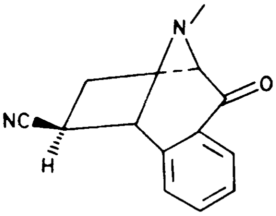

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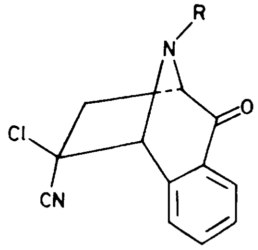

(12)

The ketone (**5**) can be considered as a mixed dimer of the 3-oxidopyridinium (**1**) and the analogous 4-oxidoisoquinolinium (**7**). Dimers formed from two molecules of 3-oxidopyridiniums display reversible dissociation:[2] such a dissociation was demonstrated for mixed dimer (**5**) by its conversion, when heated to reflux for 3 days in 1,2-dichloroethane, into the regio-isomer (**6**) (10%), m.p. 233—234 °C. The structure of (**6**) was demonstrated by the mass spectrum and the n.m.r. spectrum [in particular bridgehead protons H$_a$ and H$_b$ were shifted significantly from their position in the isomer (**5**)]. The conversion (**5**) → (**6**) recalls the conversion of the dimer (**8**) formed from 1-(4,6-dimethylpyrimidin-2-yl)-3-oxidopyridinium under kinetic control into a mixture in which the thermodynamically more stable isomer (**2**) predominates.

2-(4,6-Dimethylpyrimidin-2-yl)-4-oxidoisoquinolinium (**7**) formed by heating (**5**) was successfully trapped by *N*-phenylmaleimide, acrylonitrile, and α-chloroacrylonitrile. These reactions gave, respectively, the adducts (**9**), (**10**) and (**11**), and (**12**) together with the corresponding adducts formed from the 1-(4,6-dimethylpyrimidin-2-yl)-3-oxidopyridinium fragment.

In addition to its theoretical interest, the above transformation possesses considerable synthetic potential: 4-hydroxyisoquinoline[4] is a relatively inaccessible compound and furthermore there are obvious possibilities of regio-

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† All new compounds gave correct elemental analytical results.

specific modification of the initial adduct (**3**) which could lead to isoquinolines substituted specifically in the benzene ring.

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[1] *Cf.* the series '1,3-Dipolar Character of Six-membered Aromatic Rings,' Part XLI, B. El-Osta, A. R. Katritzky, G. Musumarra, and C. Ögretir, to be submitted.

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