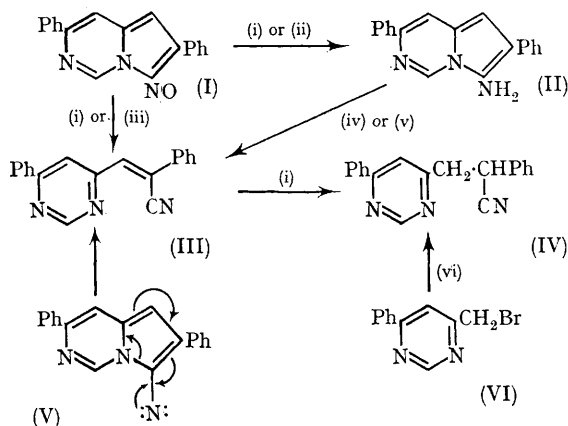


A Novel Ring Cleavage of Pyrrolo[1,2-*c*]pyrimidines and Indolizines

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RING-OPENING REACTIONS of nitrogen bridgehead compounds have been initiated by both nucleophilic¹ and electrophilic² reagents. We now report a novel cleavage of the pyrrole ring in pyrrolo[1,2-*c*]pyrimidines and indolizines under mild, neutral conditions.



Reagents: (i) H_2 , Pd-C; (ii) N_2H_4 , Pd-C; (iii) cyclohexene, Pd-C; (iv) Pd-C; (v) $Pb(OAc)_4$; (vi) $PhCH_2CN$, $NaNH_2$.

We have recently described the synthesis and electrophilic substitution reactions of certain pyrrolo[1,2-*c*]pyrimidines,³ and, in an attempt to obtain the 7-amino-compounds, we have examined the reduction of the corresponding 7-nitroso-derivatives. Catalytic hydrogenation of 7-nitroso-3,6-diphenylpyrrolo[1,2-*c*]pyrimidine (I) gave the expected amine (II), but in poor yield, and two further products were also isolated. These were identified as 1-cyano-1-phenyl-2-(6-phenylpyrimidin-4-yl)ethylene (III) and 1-cyano-1-phenyl-2-(6-phenylpyrimidin-4-yl)ethane (IV).

A rapid hydrogenation of the 7-nitroso-compound (I) with hydrazine hydrate and palladium-charcoal gave solely 7-amino-3,6-diphenylpyrrolo[1,2-*c*]pyrimidine (II) [M (mass spec.), 285; ν_{max} ($CHCl_3$) 3400 and 3325 (NH_2), and 1620 cm^{-1} (NH_2); τ 1.22 d, J 1.3 c./sec. (1-H), 1.93—2.10 m and 2.29—2.60 m (10 phenyl protons), 2.65 d, J 1.3 c./sec. (4-H), 3.48 s (5-H), and 6.58 br s disappearing on deuteration (NH_2)]. The sole product of a transfer hydrogenation of the 7-nitroso-compound (I) with cyclohexene and palladium-charcoal was the cyanoethylene (III) [M (mass spec.), 283; ν_{max} ($CHCl_3$) 2225 ($C\equiv N$), 1610 ($C=C$), and 910 cm^{-1} ($=CH$); τ 0.63 d, J 1.3 c./sec. (2-H), 1.65—1.92 m and 2.22—2.52 m (10 phenyl protons, 4-H and $=CH$)]. Treatment of the amine (II) with either palladium-charcoal in ethanol or with lead tetra-acetate gave the same nitrile (III). The cyanoethane (IV) [M (mass spec), 285; ν_{max} ($CHCl_3$) 2260 cm^{-1} ($C\equiv N$), τ 0.73 d, J 1.3 c./sec. (2-H), 1.87—2.03 m and 2.47—2.63 m (10 phenyl protons and 4-H), 5.43 t, J 7.5 c./sec. ($CH-CH_2$), 6.67 d, J 7.5 c./sec. ($CH-CH_2$)] was prepared by catalytic reduction of the cyanoethylene (III) or by synthesis from 4-bromomethyl-6-phenylpyrimidine (VI) and benzyl cyanide.

The corresponding amines and nitriles have been obtained by similar reactions of 6-methyl-7-nitroso-3-phenylpyrrolo[1,2-*c*]pyrimidine and 3-nitroso-2-phenylindolizine.

We suggest that the reaction probably proceeds *via* the nitrene (V) which undergoes rapid bond isomerisations to yield the unsaturated nitrile. Similar types of cleavage of *o*-phenylenediamines with nickel peroxide⁴ or 2-aminobenzotriazole with lead tetra-acetate⁵ yielded *cis-cis*-muconitrile. The latter reaction has also been explained in terms of a nitrene intermediate.

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