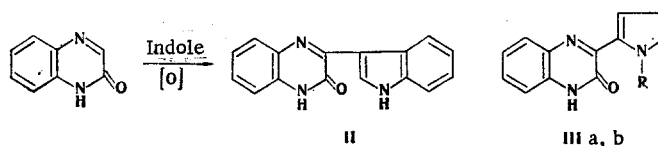


REPLACEMENT OF HYDROGEN IN QUINOXALINES
BY REACTION WITH π -SURPLUS
HETEROAROMATIC SYSTEMS

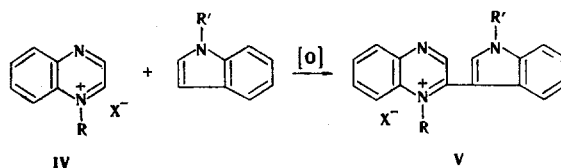
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We have found that 2-quinoxalone (I) undergoes reaction with π -surplus heterocyclic compounds (for example, with indoles and pyrroles) on heating in acetic acid in air to give substitution products (II, IIIa, b). Unsubstituted pyrrole, furan, and thiophene are polymerized under these conditions, and substitution products cannot be isolated.



Quaternary quinoxaline salts (IV) are more reactive with respect to indoles, and the corresponding substitution products (V) can be obtained in good yields even when the components are heated in alcohol with bubbling in of air (Table 1).



EXPERIMENTAL

3-(3-Indolyl)-2-quinoxalone (II). A mixture of 1.5 g (10.2 mmole) of 2-quinoxalone and 1.31 g (11.2 mmole) of indole was heated in 3 ml of acetic acid for 2 h, after which it was diluted with 40 ml of benzene, and the bright-yellow crystalline precipitate was crystallized from xylene-dimethylformamide (DMF). The yield of product with mp > 300° was 1.4 g (52%). UV spectrum in DMF: λ_{\max} (log ϵ) 380 (4.79) and 400 nm (4.73). IR spectrum: 1662 and 3317 cm^{-1} . PMR spectrum, δ : 9.55 (d, 2-H) and 7.4-8.3 (m) ppm.

3-(1-Methyl-2-pyrrolyl)-2-quinoxalone (IIIa). The yield of this compound, with mp 233-234° (from xylene), was 26%.

TABLE 1. 2-(3-Indolyl)-N-alkylquinoxalinium Salts (V)

R	R'	X	mp, °C	Empirical formula	N, %		λ_{\max} , nm (log ϵ), DMF	Yield, %
					found	calc.		
CH ₃	H	TsO	>300	C ₂₄ H ₂₁ N ₃ O ₃ S	9.8	9.7	305(4,42), 460(4,13)	51
CH ₃	CH ₃	TsO	212-214	C ₂₅ H ₂₃ N ₃ O ₃ S	9.1	9.4	310(4,41), 475(4,13)	45
C ₂ H ₅	H	I	262-265	C ₁₈ H ₁₆ N ₃	10.5	10.5	305(4,29), 465(4,13)	73

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3-(1-Phenyl-2-pyrrolyl)-2-quinoxalone (IIb). This compound was obtained in 44% yield and had mp 253-255° (from xylene).

The results of elementary analyses of all of the compounds were in agreement with the calculated values for C, H, and N.