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THE REACTION OF o-QUINONE METHIDES WITH DIMETHYL SULFOXONIUM METHYLIDE.

A SIMPLE SYNTHESIS OF COUMARANS.

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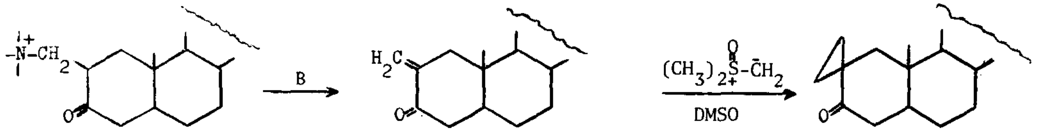
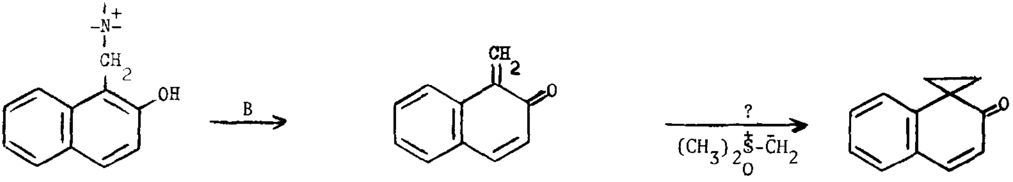
Some recent publications concerning the reactions of ylides [1,2] prompt us to report our observations that methiodides of phenolic Mannich bases can conveniently be converted to the corresponding coumarans, by reacting with dimethyl sulfoxonium methylide in dimethyl sulfoxide (DMSO), in the presence of base (B = Na$^+\bar{C}H_2SOCH_3$).

The utility of Mannich base methiodides in the Corey synthesis of cyclopropyl ketones [3] has been demonstrated by the synthesis of spiranic cyclopropyl ketones in steroids [4] (e.g. equation 1).



(1)

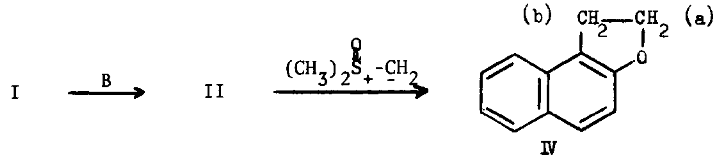
In analogy to this reaction, we attempted the preparation of the unsaturated spiro ketone (III) from the Mannich base methiodide of β-naphtol (I) via the corresponding quinone methide (II) [5] (equation 2). We found however, that this reaction yielded 1,2-dihydronaphto (2,1-b) furan (IV) (50%) (equation 3) b.p. 162° at 14 mm., n_D^{17} 1.6462 [6]. Reported b.p. 154° at 10 mm., n_D^{20} 1.6432 [7] (see Table 1). Similarly, reaction of o-benzoquinone methide (VI), generated *in situ* from



I II III

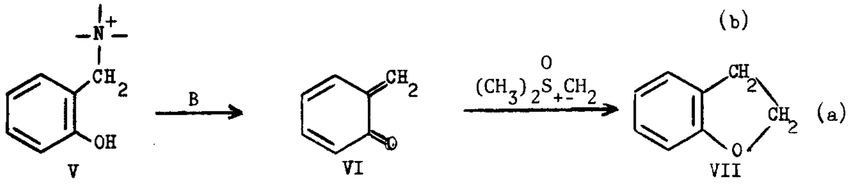
(2)

o-hydroxybenzyltrimethylammonium iodide (V) [8], with dimethyl sulfoxonium methylide gave 2,3-dihydrobenzofuran (VII) (47%) (equation 4), b.p. 73°-75° at 14 mm., n_D^{19} 1.5500 [6] (see



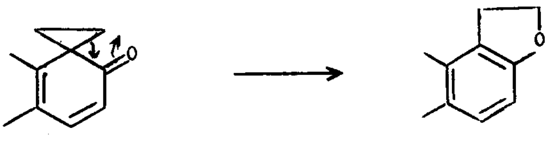
(3)

Table 1). Reported b.p. 84° at 17 mm. [9]. The reactions were carried out by dropwise addition of a suspension of the Mannich base methiodide in DMSO to a solution of two moles of dimethyl sulfoxonium methylide in DMSO [3] containing excess of $\overset{+}{Na}\overset{-}{C}H_2SOCH_3$.



(4)

The formation of dihydrofurans from 9.10-phenanthrenequinone and phosphor ylides was rationalized by Schechter and coworkers [2] in terms of a Michael addition of the ylide to phenanthrenequinone methide. However, since it is known that cyclopropane carboxaldehyde rearranges thermally to dihydrofuran [10], a mechanism involving the initial formation of a spiro ketone and its subsequent isomerization to the dihydrofuran (equation 5) cannot be ruled out. We are currently investigating this mechanistic possibility.



(5)

As Mannich bases can easily be synthesized either by the Mannich reaction of phenols [5,11], or by reductive alkylation of secondary amines by salicyclaldehyde type compounds [8], the reaction described herein represents a convenient synthesis of coumarans.

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TABLE 1

NMR and IR Spectra of Coumarans

	δ, 60 Mc NMR $(CDCl_3)$				IR (neat) cm^{-1*}	
	$H_{aromatic}$	H_a	H_b	$J_{a,b}$	ether bands	
IV	7.77-6.98,m. (6H)	4.72,t. (2H)	3.43,t. (2H)	9.0 cps	1245(s)	1053(m)
VII	7.20-6.55,m. (4H)	4.40,t. (2H)	3.05,t. (2H)	9.0 cps	1233(s),	1019(m)

*Neither compounds showed OH and C=O bands in the IR spectra.

REFERENCES

1. H.G.Lehmann, Tetrahedron Letters, 607 (1968).
2. W.W.Sullivan, D.Ullman and H.Shechter, Tetrahedron Letters, 457 (1969).
3. E.J.Corey and M.Chaykovsky, J.Am.Chem.Soc., 87, 1353 (1965)
4. H.G.Lehmann, H.Muller and R.Wiechert, Chem.Ber., 98, 1470 (1965).
5. P.D.Gardner, H.Sarrafizadeh Rafsanjani and L.Rand, J.Am.Chem.Soc., 81, 3364 (1959).
6. Satisfactory analytical results have been obtained for this compound.
7. C.O.Guss, J.Am.Chem.Soc., 73, 608 (1951).
8. S.B.Cavitt, H.Sarrafizadeh R. and P.D.Gardner, J.Org.Chem., 27, 1211 (1962).
9. G.M.Bennett and M.M.Hafez, J.Chem.Soc., 287 (1941).
10. C.E.Wilson, J.Am.Chem.Soc., 69, 3002 (1947).
11. F.F.Blicke, Org.Reactions, Vol. 1, p.303 (1942).