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CYCLOADDITION OF ARYNES WITH OXAZOLES[1]: A CONVENIENT SYNTHESIS OF VARIOUSLY SUBSTITUTED POLYCYCLIC HYDROCARBONS

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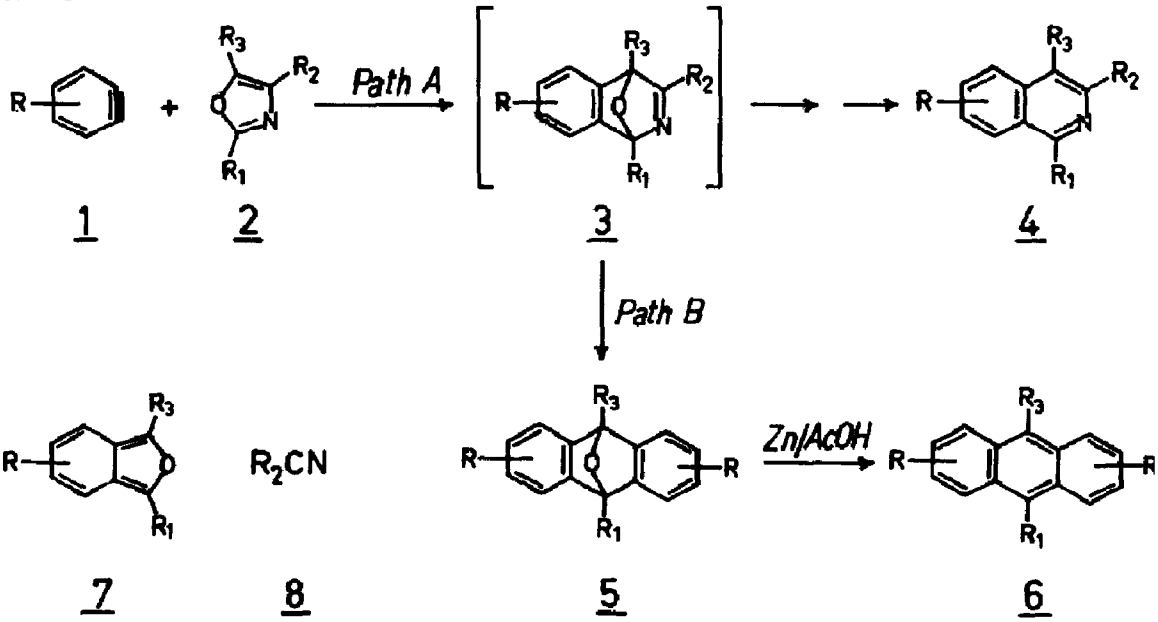
Abstract: Substituted polycyclic ethers and hydrocarbons are synthesised by the cycloaddition reaction of arynes with oxazoles.

Oxazoles have been extensively used as azadienes in cycloaddition reactions, particularly for the synthesis of pyridine derivatives[2]. Recently we have developed a new reaction for the facile conversion of ketoximes to a variety of variously substituted oxazoles[3]. In this connection we have examined the possibility of utilizing the oxazoles for the synthesis of isoquinoline derivatives by the cycloaddition reaction with arynes (Path A).

While experiments are in progress towards this objective, we wish to report that ethers are formed with great facility by the condensation of two molecules of aryne with insertion of two carbons of the oxazole molecule (Path B). The ethers thus formed are easily convertable to hydrocarbons leading to a facile synthesis of substituted hydrocarbons.



1 2 3 4

7 8 5 6

R = H	R_1	R_2	R_3		R_1	R_2	R_3		R_1	R_2	R_3
a)	Ph	Me	Ph	c)	Et	Me	Ph	2e)	Ph	$-(CH_2)_4-$	
b)	Ph	Me	Me	d)	Ph	Me	i-Pro	5e,6e)	Ph	-	$-(CH_2)_4CN$

The initial adduct 3 formed from 1 and 2, presumably is cleaved to give a nitrile 8, and a benzofuran derivative 7, which further reacts with an aryne t give the ether 5. Zinc and acetic acid treatment of the ether 5 furnishes the hydrocarbon 6.

Table

Oxazole	Ether*	m.p† °C	Hydrocarbon*	Yield‡ %	m.p. °C	Lit. m.p °C
2 a	5 a	185	6 a	73	245	245-7[4]
2 b	5 b	Gum	6 b	70	112-13	113[5]
2 c	5 c	90-1	6 c	68	109-10	110[6]
2 d	5 d	155	6 d	67	116	115-1
2 e	5 e	Gum	6 e	65	131-2†	–

* Compounds 5a, 6a were isolated by crystallization from ethanol. Rest of the were isolated by preparative TLC (silica gel, benzene:hexane 1:2; and benzen for 5e, 6e). All compounds were identified by UV, IR, NMR and M.P. data.

† All compounds gave satisfactory elemental analysis.

‡Yield of hydrocarbon 6 is based on oxazole 2.

Procedure: Oxazole 2 (10 mmol) was dissolved in 1,4-dioxane (10 ml) and anthr acid (30 mmol) and isoamyl nitrite (32 mmol) each in 1,4-dioxane (10 ml) were added simultaneously at the refluxing temperature over a period of 30-45 minut Then the mixture was refluxed for 0.5 hr and cooled. The cooled solution was diluted with ether (60 ml) and stirred with 3N KOH. The phases were separated and the aqueous phase was extracted with ether. The combined ether extracts w washed with water, brine, dried (Na_2SO_4) and evaporated to get the ether 5 as gummy material which was purified either by crystallization or TLC or chromato-graphy.

The ether 5 (5 mmol) was dissolved in glacial acetic acid (20 ml), Zi dust (2g) was added and refluxed for 8-10hr. The reaction mixture was cooled poured in water. After the standard work up procedure the pure hydrocarbon 6 obtained either by crystallization or TLC.

References:

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