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LETTERS

Acid-catalysed Rearrangement of the *N*-Quinazolinonyl- and *N*-Phthalimido-aziridines Derived from 3-Phenylcyclohex-2-enol

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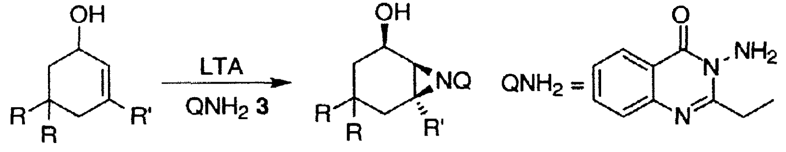
Abstract: Acid-catalysed rearrangement of the direct aziridination products of 3-phenylcyclohex-2-enol affords unusual diazadioxabicyclo[2. 2. 2] octanes. © 1998 Elsevier Science Ltd. All rights reserved.

The direct aziridination of 3-phenylcyclohex-2-enol **1** and isophorol **2** with lead(IV) acetate (LTA) and the quinazolinone **3** in DCM is reported[1, 2] to proceed unexceptionally to afford the aziridines **4** and **5** respectively. The reaction conditions employed for preparation of **4** (74%) involved addition of the alkene **1** (3 equivalents) to the pre-formed 3-acetoxyamino-2-ethylquinazolin-4(3*H*)-one at -20°C, whereas those reported for **5** (23%) involved addition of LTA to an equimolar mixture of **2** and **3** at room temperature.



1 R=H, R'=Ph
2 R= R'=Me

4 R=H, R'=Ph
5 R= R'=Me; **6** R=H, R'=Me

3

As part of a study of the use of aziridines in free radical mediated synthesis, we required **4** and related aziridines and have to report that a frequent and significant by-product of the aziridination is the unusual diazadioxabicyclooctane **7**, the structure of which was established by X-ray crystallography.

It became apparent that **7** is formed by an acetic acid-catalysed rearrangement[3] of the aziridine **4** which could be inhibited by addition of suitable and sufficiently soluble bases to the aziridination mixtures (Table). It is noteworthy that sodium bicarbonate was more effective in the presence of 15-crown-5[4] and triethylamine[5] was found to be very effective.

A probable mechanism is outlined in Scheme 1 and it is apparent that the benzylically stabilised carbocation is involved since the C-N bond must cleave prior to the attachment of the carbonyl oxygen owing to the *syn*-relationship between the aziridine ring and the hydroxy group in **4**.[1, 6]

Support for this and the importance of the phenyl substituent is provided by our observation that the 3-methyl analogue **6**[1] shows no sign of rearrangement with acetic acid. Furthermore, the phthalimidoaziridine **8**, prepared as similar compounds,[7] rearranges to the analogous diazadioxabicyclooctane **9** and a co-product **10**, which arises from the interception of the intermediate benzylic cation by acetate ion (Scheme 2).

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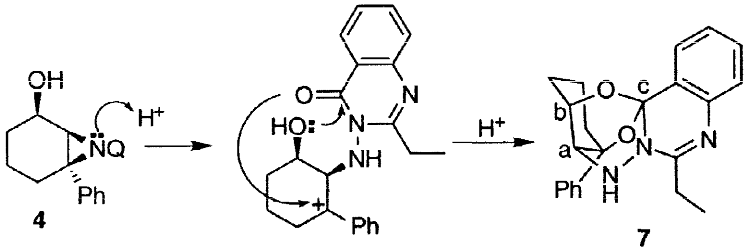
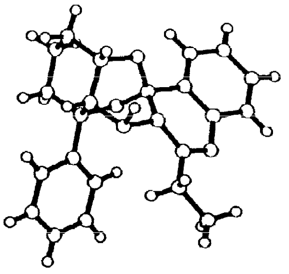
Table: Effect of Reaction Conditions on the Ratio[8] of **4**:**7**

Co-reactant	- [a]	- [b]	$NaHCO_3$[b]	$NaHCO_3$/15-C-5[b]	Na_2CO_3[b]	Et_3N[b]
Ratio **4**:**7**[c]	66:34	88:12	89:11 (13 eq)	96:4 (13 eq/1.4 eq)	100:0 (13 eq)	100:0 (4 eq)
Ratio **4**:**7**[d]	-	36:64	23:77 (13 eq)	83:17 (13 eq/1.2 eq)	100:0 (13 eq)	100:0 (4 eq)

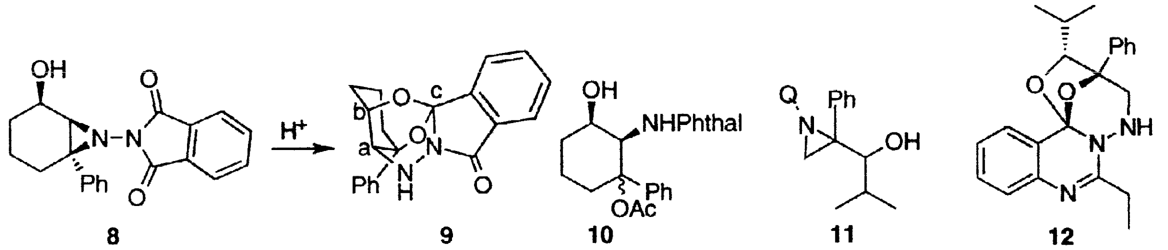
a, based on reference 1; b, based on reference 2; c, 0.5 hr reaction time; d, ca. 1.5 hr reaction time.



Scheme 1



X-Ray Structure of 7



Scheme 2

The assignment of the structure of **9** is supported by comparison the the key spectroscopic data for **7** (**7**: δ_H 3.36 (1 H, d, J = 2 Hz, a-CH), 4.74 (1 H, m, b-CH); δ_C 97.3 (c-C); **9** δ_H 3.42 (1 H, d, J = 1.7 Hz, a-CH), 4.83 (1 H, m, b-CH); δ_C 101.0 (c-C)). Key data in support of **10** are: δ_H 1.93 (3 H, s, Me) δ_C 22.0 (Me), 168.3 (C=O).

The diazadioxabicyclo[3. 2. 1] octane **12** was reported to be isolated from a related acid-catalysed rearrangement of the aziridino-alcohol **11**.[9] However, the initial aza-Payne rearrangement is prohibited in substrates **4** and **8** due to the *syn*-stereochemisty of the aziridine and alcohol groups.[1, 6]

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References

1. Atkinson, R. S.; Kelly, B. J. *J. Chem. Soc., Perkin Trans. 1*, **1989**, 1515-1519.
2. Dickinson, J. M.; Murphy, J. A. *Tetrahedron*, **1992**, 48, 1317-1326.
3. Confirmed by treatment of **4** with acetic acid in $CDCl_3$.
4. Ganboa, I.; Palomo C. *Synthesis*, **1986**, 52-54.
5. Triethylamine at -30°C directs aziridination through a triethylammonium imide:- Atkinson, R.S.; Barker, E. *J. Chem. Soc., Chem. Commun.*, **1995**, 819-820.
6. Also established by X-ray crystallography-unpublished results.
7. Chilmonczyk Z.; Egli M.; Behringer C.; Dreiding A. *Helv. Chim. Acta*, **1989**, 72, 1095-1106.
8. Determined by ^{1}H-nmr analysis of the reaction mixtures.
9. Atkinson, R. S.; Fawcett, J.; Russell, D. R.; Williams, P. J. *Tetrahedron Lett.*, **1995**, 18, 3241-3244.