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The Thermal Rearrangement of *N*-Alkyl-*N*-Vinylpropargylamines into 2-Methylpyrroles. A New Synthesis of Annulated[*b*]Pyrroles

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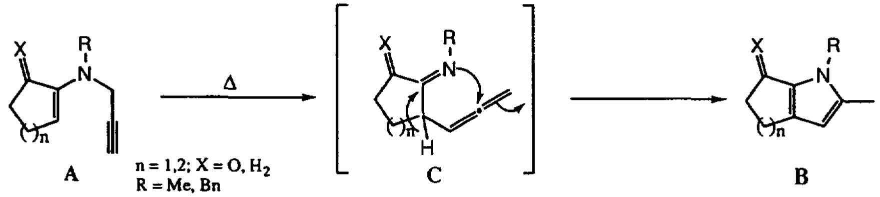
Abstract: The thermolysis of *N*-alkyl-*N*-vinylpropargylamines produced annulated[*b*]pyrroles with moderate to good yields. The formation of these substituted pyrroles probably involves a tandem aza-Claisen rearrangement-cyclization reaction. Copyright © 1996 Published by Elsevier Science Ltd

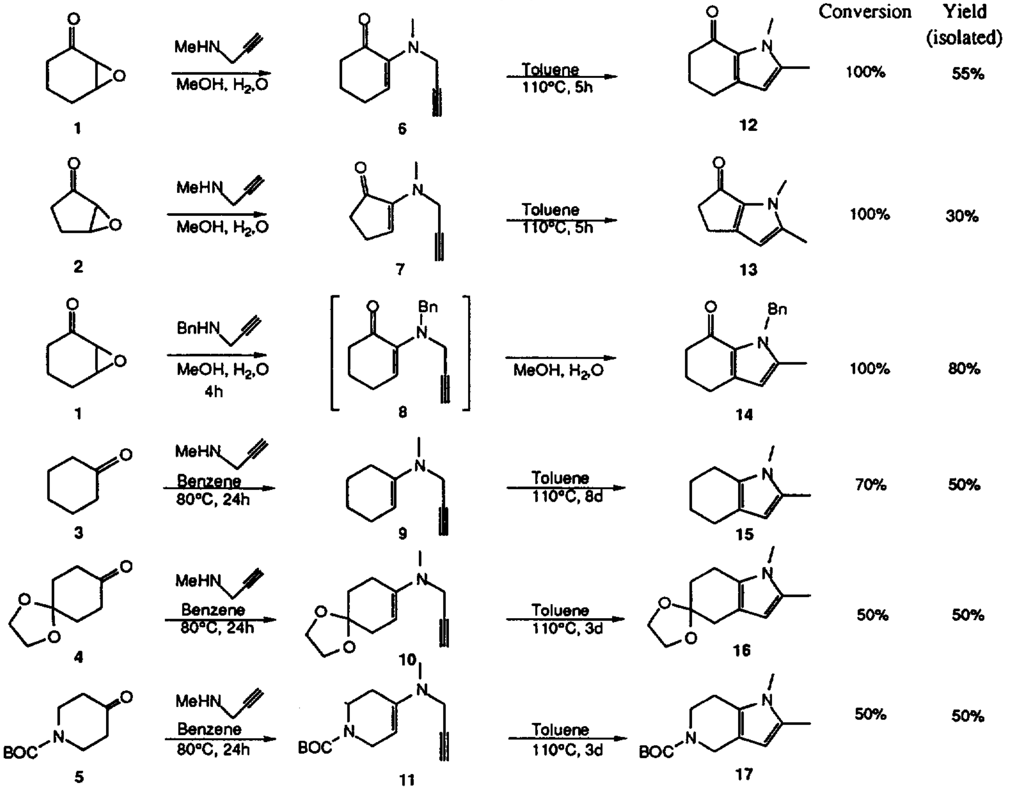
The synthesis of substituted annulated[*b*]pyrroles and particularly oxotetrahydroindoles uses the direct electrophilic substitution of pyrroles [1-2], or the lithiation of pyrroles at C-2 followed by a condensation of a Grignard reagent with 2-pyridylthiol esters [3]. Recently new synthetic methods have been developped for preparing pyrroles through 1,3-dipolar cycloaddition reactions [4]. Pyrroles have also been obtained by reacting nitro-olefins with isonitriles [5], β-acetoxy-nitro compounds with α-isocyano esters [6], azoalkenes with activated carbonyl compounds [7], oximes with alkynes [8], amidoketones with low valent titanium [9] or enaminones with 1,1-bromo-3-phenyl-1-butene under basic conditions [10].

Here, we would like to report that the thermolysis of *N*-alkyl-*N*-vinylpropargylamines of type **A** can produce oxotetrahydroindoles and more generally azabicyclo[n.3.0]alkadienes of type **B**. The formation of the annulated[*b*]pyrroles of type **B** from **A** implies probably a tandem aza-Claisen rearrangement-cyclization reaction via the hypothetical intermediate C.



When enaminoketones **6** and **7** were heated in refluxing toluene (110° C) for 5 h, the corresponding substituted oxotetrahydroindoles **12** and **13** were isolated in 55 % and 30 % yield respectively. Heating epoxyketones **1** and **2** in MeOH under reflux in the presence of *N*-methylpropargylamine, generated the corresponding enaminoketones **6** and **7** respectively. Under these conditions, no trace of **12** and **13** were detected. However, under the same conditions, **1** reacted with *N*-benzylpropargylamine to give the oxotetrahydroindole **14** via the hypothetical enaminoketone **8** intermediate. The formation of tetrahydroindoles from *N*-alkyl-*N*-vinylpropargylamines is general as the thermolysis of *N*-methyl-*N*-vinylpropargylamines **9, 10** and **11**, in toluene during 1 to 8 days, afforded the corresponding tetrahydroindoles **15, 16** and **17** in 50 % yield. These results are reported in the Scheme.

Scheme: Formation of azabicyclo[n.3.0]alkadienes from epoxyketones and ketones.



Mechanistic studies are under investigation and will be reported in due course.

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