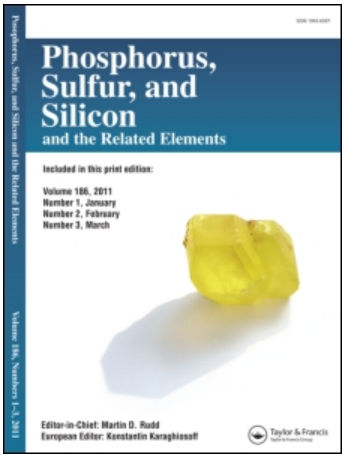

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Tandem Cyclization and Aromatization of Sulfur Bridged Diallenic Systems: Potential Enediyne Models

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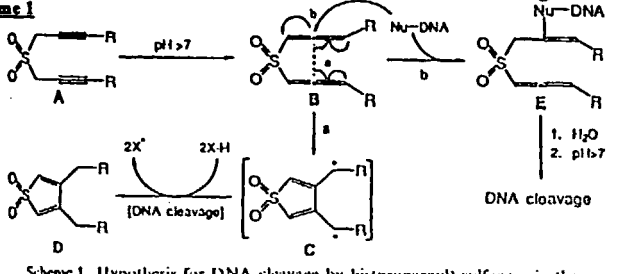
The synthesis and base catalyzed rearrangement of *bis*-γ-phenylpropargyl sulfone, sulfoxide and sulfonium salts are described. In contrast to the first two compounds which undergo a fast acetylene to allene isomerization followed by a tandem cyclization and aromatization *via* a diradical mechanism, the latter compound undergoes a [2,3]-sigmatropic shift via the corresponding ylide intermediate.

The [2,3]-sigmatropic rearrangement of allylic arenesulfinates to allylic aryl sulfones discovered by us over three decades ago, was subsequently used as a model for the analogous rearrangement of allylic sulfenates to sulfoxides, as well as for the related rearrangements of propargylic sulfenates and sulfinates to allenic sulfoxides and sulfones, respectively. Due to their high stereoselectivity and efficiency, these rearrangements have found extensive application in organic synthesis.[1] In one such application, a quarter century ago, a combination of the last two rearrangements was used to prepare *bis*-γ,γ-dimethylallenyl sulfone.[2] Furthermore, this sulfone was found to undergo a facile cyclization *via* a 2,2'- *bis*-allyl diradical intermediate. Some 15 years later, the same reaction was used by K.C. Nicolaou[3] as a model for the design of a new class of DNA-cleaving molecules that could mimic the activity of the naturally occurring enediynes. The mechanistic rationale that led to the design of the first active compounds in this series is presented in Scheme 1, taken from Nicolaou's report.[3]

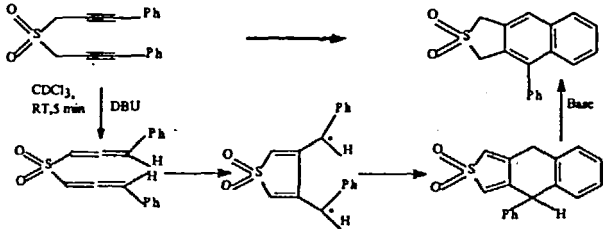
Scheme 1



Scheme 1. Hypothesis for DNA cleavage by bis(propargyl) sulfones via the Garrat–Braverman reaction sequence [4, 5]. For paths a and b, see text.

Prompted by the unusual activity on enediyne analogues[4] and, in view of our previous studies on the cyclization and cycloaromatization of various diallenic systems,[5] we became interested in the cyclization of some novel bridged diallenic systems which would be of synthetic utility, mechanistic interest, and hopefully also of medicinal significance. In view of the demonstrated ability of mono- and diallenic sulfones to bring about DNA cleavage,[3] we became interested in enhancing their activity by the combined effect of cyclization and aromatization. We have thus found that *bis*-γ-phenylpropargyl sulfone undergoes a fast and quantitative cyclization at room

Scheme 2



temperature to the naphthalene derivative shown in Scheme 2, on treatment with base. The suggested reaction mechanism is also presented there. Similarly, *bis*-γ,γ-phenylpropargyl, sulfoxide underwent an analogous base-induced tandem cyclization and aromatization, although at a somewhat slower rate. On the other hand, ethyl *bis*-γ-phenylpropargyl sulfonium tetrafluoroborate under the same conditions, underwent instead a [2,3]-sigmatropic rearrangement. The latter is believed to proceed by a sulfur-ylide intermediate. Further synthetic and mechanistic details will be discussed.

References

[1] Braverman, S. in *Chemistry of Sulfones and Sulfoxides,* Patai, S.; Rappoport, Z.; Stirling, C. J. M. Eds., Wiley, New York, 1988, Chs. 13, 14.
[2] Braverman, S.; Segev, D. *J. Am. Chem. Soc.,* 1974, *96,* 1245.
[3] Nicolaou, K.C.; Skokotas, F.; Maligres, P.; Zuccarello, G.; Schweiger, E.J.; Toshima, K.; Wenderborn, S. *Angew. Chem. Int. Ed Engl.,*1989, *28,* 1272.
[4] For a leading review see: Nicolaou, K.C.; Smith, A.L. in "Modern Acetylene Chemistry", Stang, P.J.; Diedrich, F., Eds., VCH, Weinheim, 1995, Ch. 7.
[5] Braverman, S., *Rearrangements of Allenes* in *Chemistry of Double-Bonded Functional Groups,* Patai, S. Ed., Wiley, 1989, Suppl. A2, pp. 963–1060.