

Phosphorus, Sulfur, and Silicon and the Related Elements

Publication details, including instructions for authors and subscription information:

<http://www.tandfonline.com/loi/gpss20>

The Quest for β -Thiolactam Antibiotics

Ernst Schaumann , Jens Nieschalk , Rainer Isecke , Carsten Spanka , Herbert Mrotzek & Wolf-Rüdiger Förster

^a Institut für Organische Chemie , Leibnizstraße , 6, D-38678 Clausthal-Zellerfeld

^b Institut für Organische Chemie , Leibnizstraße , 6, D-38678 Clausthal-Zellerfeld

^c Institut für Organische Chemie , Leibnizstraße , 6, D-38678 Clausthal-Zellerfeld

^d Institut für Organische Chemie , Leibnizstraße , 6, D-38678 Clausthal-Zellerfeld

^e Institut für Organische Chemie , Leibnizstraße , 6, D-38678 Clausthal-Zellerfeld

^f Institut für Organische Chemie , Leibnizstraße , 6, D-38678 Clausthal-Zellerfeld

Published online: 17 Mar 2008.

To cite this article: Ernst Schaumann , Jens Nieschalk , Rainer Isecke , Carsten Spanka , Herbert Mrotzek & Wolf-Rüdiger Förster (1997) The Quest for β -Thiolactam Antibiotics, Phosphorus, Sulfur, and Silicon and the Related Elements, 120:1, 349-350, DOI: [10.1080/10426509708545543](https://doi.org/10.1080/10426509708545543)

To link to this article: <http://dx.doi.org/10.1080/10426509708545543>

PLEASE SCROLL DOWN FOR ARTICLE

Taylor & Francis makes every effort to ensure the accuracy of all the information (the "Content") contained in the publications on our platform. However, Taylor & Francis, our agents, and our licensors make no representations or warranties whatsoever as to the accuracy, completeness, or suitability for any purpose of the Content. Any opinions and views expressed in this publication are the opinions and views of the authors, and are not the views of or endorsed by Taylor & Francis. The accuracy of the Content should not be relied upon and should be independently verified with primary sources of information. Taylor and

Francis shall not be liable for any losses, actions, claims, proceedings, demands, costs, expenses, damages, and other liabilities whatsoever or howsoever caused arising directly or indirectly in connection with, in relation to or arising out of the use of the Content.

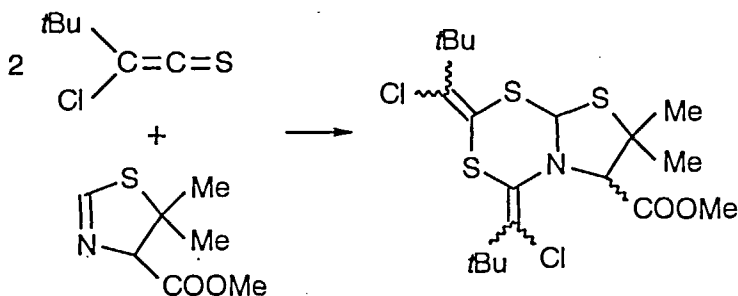
This article may be used for research, teaching, and private study purposes. Any substantial or systematic reproduction, redistribution, reselling, loan, sub-licensing, systematic supply, or distribution in any form to anyone is expressly forbidden. Terms & Conditions of access and use can be found at <http://www.tandfonline.com/page/terms-and-conditions>

The Quest for β -Thiolactam Antibiotics

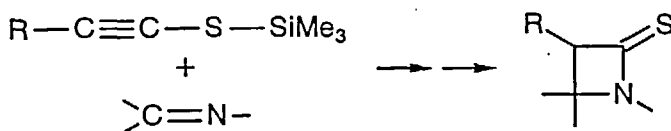
ERNST SCHAUMANN, JENS NIESCHALK, RAINER ISECKE,
 CARSTEN SPANKA, HERBERT MROTZEK,
 WOLF-RÜDIGER FÖRSTER
*Institut für Organische Chemie, Leibnizstraße 6,
 D-38678 Clausthal-Zellerfeld*

Thioketenes or thioketene equivalents give β -thiolactams in the reaction with C=N systems, but problems arise in the synthesis of highly functionalized derivatives. Therefore to obtain the thione analog of a bactam a thionation approach was chosen.

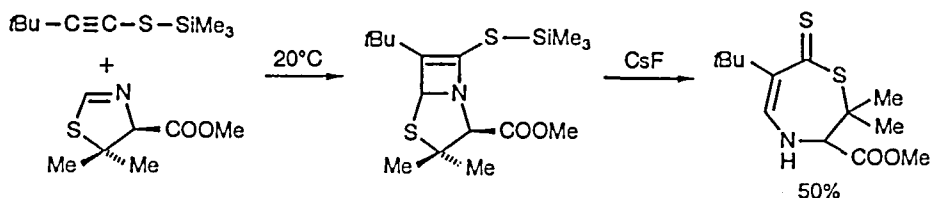
Modifications of natural β -lactams are a promising synthetic target. As to β -thiolactams, the obvious use of thioketenes in a cycloaddition approach with C=N systems is possible, but is limited to sterically hindered thioketenes. More reactive examples, e.g. tert.butyl(chloro)thioketene, tend to give 2:1 cycloadducts with azomethines or thioimides,¹ e.g.:



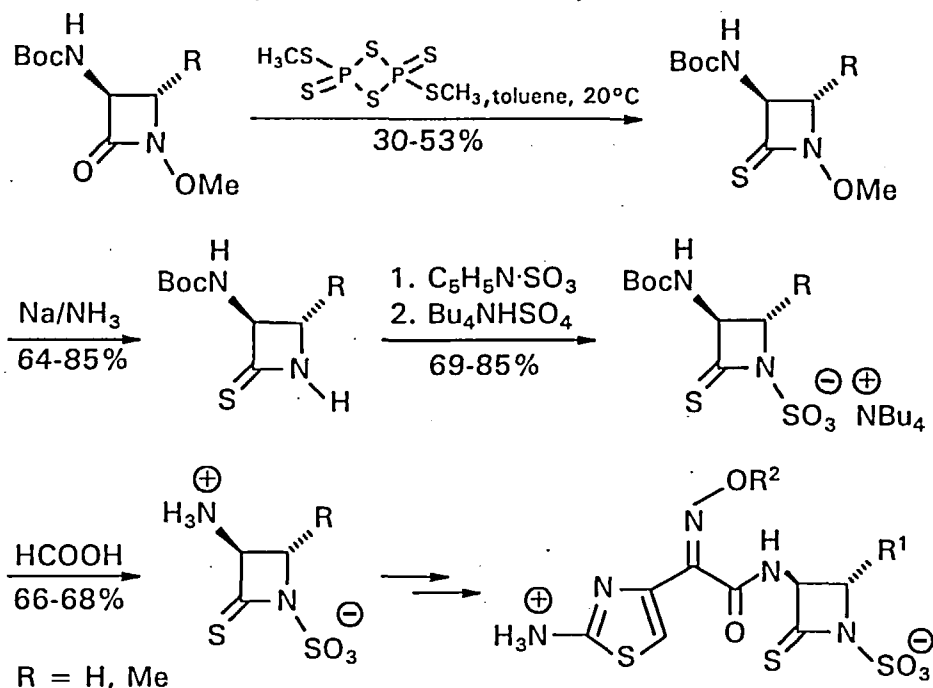
Recently, we found that alkynyl silyl sulfides are a convenient substitute for thioketenes. Interestingly, they give β -thiolactams, in the reaction with C=N systems:



Yields are variable, but can be significantly improved, if Lewis acid catalysis is employed. However, the catalysis fails if thioimides are reaction partners. Here, a competing ring-enlargement in the desilylation step can usually not be suppressed:²



Therefore, to obtain a true thione analogue of a natural β -lactam, we had recourse to a thionation approach.³ As direct thionation of β -lactam antibiotics is known to be problematic,⁴ the thionation was carried out in an early stage of the synthesis. This allowed access to the thione analogues of monobactams including the antibiotic aztreonam ($R = \text{CH}_3$, $R^2 = \text{CMe}_2\text{COOH}$):



REFERENCES

1. E. Schaumann, *Tetrahedron* **44**, 1827 (1988).
2. E. Schaumann, W.-R. Förster und G. Adiwidjaja, *Angew. Chem.* **96**, 429 (1984); *Angew. Chem. Int. Ed. Engl.* **23**, 439 (1994).
3. J. Nieschalk, E. Schaumann, *Liebigs Ann.* **1996**, 141.
4. P.W. Wojtkowski, J.E. Dolfini, O. Kocy, C.M. Cimarusti, *J. Am. Chem. Soc.*, **97** 5628 (1975). - B.P. Murphy, R.F. Pratt, *Biochem. J.* **256**, 669 (1988).