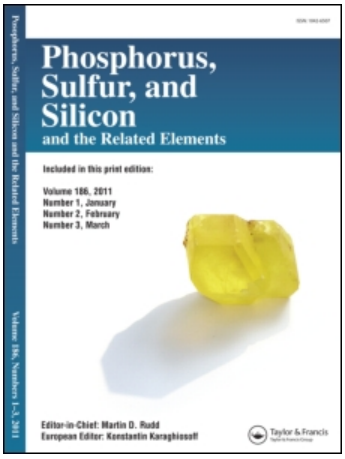


Phosphorus, Sulfur, and Silicon and the Related Elements

Publication details, including instructions for authors and subscription information:
http://www.informaworld.com/smpp/title~content=t713618290

The Preparation of Sulfur-Containing Phosphonoformate Derivatives

Xuewei Liu[a]; Zengmin Li[a]; Charles E. McKenna[a]
[a] Department of Chemistry, University of Southern California, Los Angeles, CA, USA

To cite this Article Liu, Xuewei , Li, Zengmin and McKenna, Charles E.(1999) 'The Preparation of Sulfur-Containing Phosphonoformate Derivatives', Phosphorus, Sulfur, and Silicon and the Related Elements, 147: 1, 213
To link to this Article: DOI: 10.1080/10426509908053587
URL: http://dx.doi.org/10.1080/10426509908053587

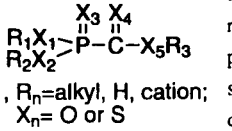
Phosphorus, Sulfur and Silicon, 1999, Vol. 147, pp. 213-213
Reprints available directly from the publisher
Photocopying permitted by license only

The Preparation of Sulfur-Containing Phosphonoformate Derivatives

XUEWEI LIU, ZENGMIN LI and CHARLES E. MCKENNA

Department of Chemistry, University of Southern California, Los Angeles, CA 90089-0744, USA

Thio derivatives of organophosphorus compounds have long been of interest to chemists, not least because these compounds can be useful in agriculture or medicine, as well as in synthesis.[1] The replacement in a phosphate, phosphonate or phosphinate molecule of one or more oxygen atoms by sulfur may lead to significant alteration in biological activity or related properties. One example is thiophosphonoformate (TPFA), a mono-sulfur analogue of the anti-viral agent phosphonoformic acid (PFA).[2] As a class, the sulfur-containing phosphonoformate derivatives **1** have received relatively little attention in the literature, although particular examples (chiefly triesters) have been made and shown to possess a range of useful applications in synthetic chemistry.[3] Simple semi-empirical calculations of ΔH_f for a sampling of **1** (R_n = Me) predict an overall trend of decreasing stability as S replaces O, particularly when $\Sigma S \geq 3$. Thus focused on the less thionated **1** trimethyl esters, we have compared synthesis of three (of four possible) mono-S structural isomers (X_3, X_4 or X_5 = S); three (of seven possible) di-S isomers ($X_{3,4}$, $X_{3,5}$ or $X_{4,5}$ = S); and one (seven possible) tri-S isomer ($X_{3,4,5}$ = S). Also prepared were several mono-S (X_2, X_4 or X_5 = S), di-S ($X_{2,4}$, $X_{2,5}$ or $X_{4,5}$ = S) and tri-S ($X_{2,4,5}$ = S) P,C-dimethyl esters of **1** ($R_{2,3}$ = Me, R_1 = Na). It should be noted that NaI monodealkylation of trimethyl esters of **1** where X_3 = S invariably proceeded with an (RO)P=S —> (RS)P=O rearrangement. All compounds were characterized by NMR (^1H, ^{13}C and ^{31}P) and by HRMS or combustion analysis.



1, R_n=alkyl, H, cation; X_n= O or S

Acknowledgments
We thank BioKeys, Inc. for a grant supporting this research.

References

[1] R.S. Edmundson, in *The Chemistry of Organophosphorus Compounds*, Vol. 4, edited by F.R. Hartley (John Wiley, New York, 1996) Chap. 5, p. 397.
[2] See C.E. McKenna *et al.*, these Proceedings.
[3] (a) D.W. Grisley, *J. Org. Chem.*, **26,** 2544 (1961); (b) S. Masson *et al.*, *J. Org. Chem.*, **57,** 4507 (1992), *Tetrahedron*, **50,** 10277 (1994) and refs. cited therein; (c) L. V. Kovalenko *et al.*, *Russ. J. Gen. Chem.*, **64,** 1456 (1994).