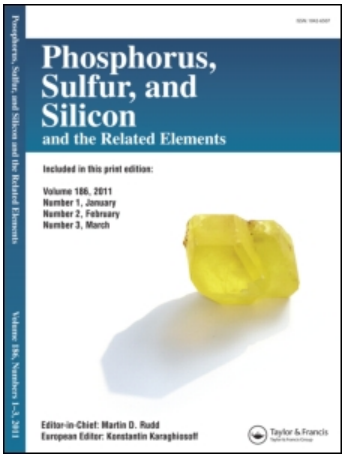

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Developments on the Chemistry of Tellurium and Selenium Azides

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We have been carrying out systematic studies on the preparation and properties of tellurium halide and pseudohalide compounds with a focus on tellurium azides. We were successful in the synthesis of various tellurium azides of both covalent and ionic nature. Several tellurium(IV) azides, tellurium(II) azides, and the first tellurium(VI) azides can be prepared in reasonable amounts. The first structural information of selenium azides is obtained for covalent and ionic derivatives, and spectroscopic data for the existence of selenium(IV) polyazides.

Keywords Binary tellurium azides; pertelluranes; selenenyl/tellurenyl azides; selenonium/telluronium azides

INTRODUCTION

The synthesis of azido-substituted tellurium compounds has been limited to a few examples during the last 30 years with structural characterization of two species, $[Te(N_3)_3]SbF_6$ and $(Ph_2TeN_3)_2O$.[1–6] Information of selenium azides is available only to an *in-situ* generated azidoselenenylation reagent, "$PhSeN_3$".[7–10] Our recent results in chalcogen azide chemistry have led to the preparation of various organotellurium(IV) azides, covalent $R_2Te(N_3)_2$, and $RTe(N_3)_3$, and ionic $[R_3Te]N_3$ (Scheme 1).[11–14] Ionic selenonium azides similarly can be synthesized by reaction of the corresponding iodides with silver azide in aqueous or ethanolic solutions.

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$$[R_3X]I \xrightarrow[-\ AgI]{AgN_3/25\ ^\circ C} [R_3X]N_3$$

X = Se, Te
R = Me, Ph

SCHEME 1

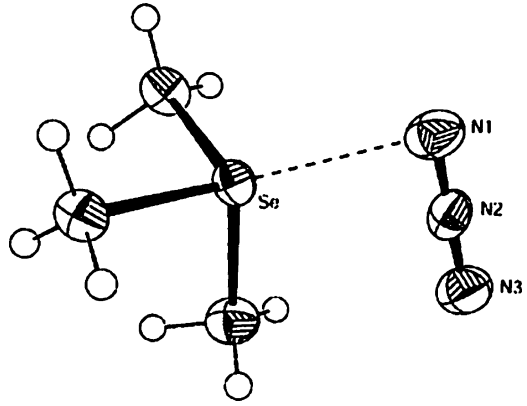


FIGURE 1

$$TeF_4 \xrightarrow[-\ 4\ Me_3SiF]{4\ Me_3SiN_3/0\ ^\circ C} Te(N_3)_4$$

$$Me_4N[TeF_5] \xrightarrow[-\ 5\ Me_3SiF]{5\ Me_3SiN_3/0\ ^\circ C} Me_4N[Te(N_3)_5]$$

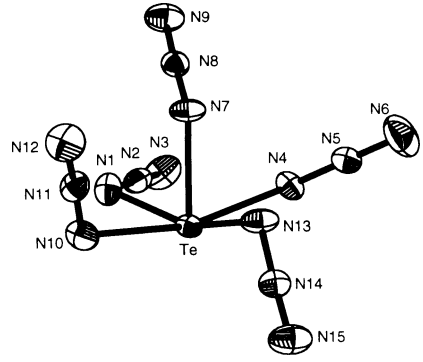


FIGURE 2

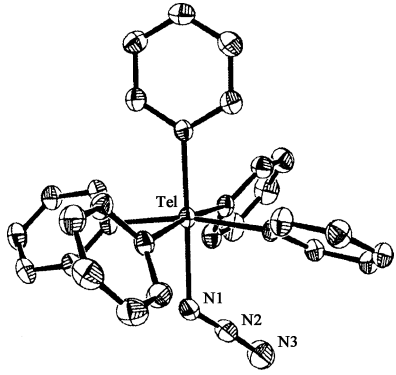
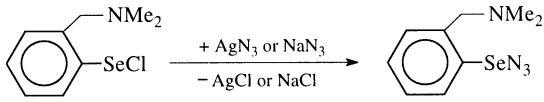


FIGURE 3

The crystal structures of selenonium and telluronium azides consist of distinct Me_3Se or Me_3Te units and linear azide units, which are linked to further cations and anions by Se· · ·N and Te· · ·N interactions (Figure 1).[15]

The highly explosive binary tellurium azides, tellurium(IV) tetraazide, and pentaazidotellurate anion (Figure 2) are synthesized from the corresponding fluorinated derivatives TeF_4 and $Me_4N[TeF_5]$ with Me_3SiN_3 in halocarbon solvents.[16]

The first tellurium(VI) azides or azido pertelluranes, Ph_5TeN_3 (Figure 3) and $biphen_2Te(N_3)_2$, are prepared by treating the corresponding halogenated compounds with silver azide.



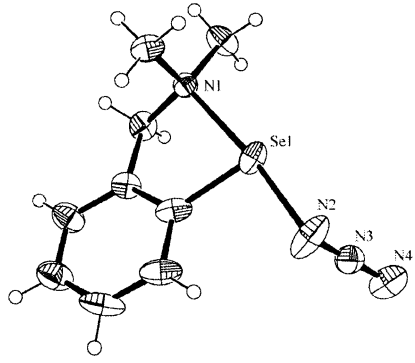


FIGURE 4

Initial studies on the synthesis of covalent selenium azides show that for compounds of the type $RSeN_3$, selenenyl(II) azides, an intramolecular donor stabilization of the selenium atom (Figure 4) is required to obtain moderately stable materials.[17]

Tellurium(II) azides can be stabilized either with bulky substituents or by intramolecular donors, such as the analoguous tellurenyl(II) azide, $2\text{-}Me_2NCH_2C_6H_4TeN_3$, which is prepared in a similar fashion and isotypically crystallizes to the selenenyl azide, as well with strong amino coordination to tellurium.

REFERENCES

[1] N. Wiberg, G. Schwenk, and K. H. Schmid, *Chem. Ber.*, **105,** 1209 (1972).
[2] R. F. Ziolo and K. Pritchett, *J. Organomet. Chem.*, **116,** 211 (1976).
[3] J. P. Johnson, G. K. MacLean, J. Passmore, and P. S. White, *Can. J. Chem.*, **67,** 1687 (1989).
[4] W. Fimml and F. Sladky, *Chem. Ber.*, **124,** 1131 (1991).
[5] I. B. Gorell, C. J. Ludman, and R. S. Matthews, *J. Chem. Soc., Dalton Trans.*, 2899 (1992).
[6] P. Magnus, M. B. Roe, V. Lynch, and C. Hulme, *J. Chem. Soc., Chem. Commun.*, 1609 (1995).
[7] A. Hassner and A. S. Amarasekara, *Tetrahedron Lett.*, **28,** 5185 (1987).
[8] S. Sivasubramanian, S. Aravind, and S. Muthusubramanian, *Indian J. Chem.*, **28B,** 1005 (1989).
[9] J. F. Huot, F. Outurquin, and C. Paulmier, *Chem. Lett.*, 1957 (1991).
[10] M. Tiecco, L. Testaferri, C. Santi, C. Tomassini, F. Marini, L. Bagnoli, and A. Temperini, *Angew. Chem., Int. Ed.*, **42,** 3131 (2003).
[11] T. M. Klapötke, B. Krumm, P. Mayer, and O. P. Ruscitti, *Inorg. Chem.*, **39,** 5426 (2000).
[12] T. M. Klapötke, B. Krumm, P. Mayer, H. Piotrowski, O. P. Ruscitti, and A. Schiller, *Inorg. Chem.*, **41,** 1184 (2002).
[13] T. M. Klapötke, B. Krumm, P. Mayer, H. Piotrowski, I. Schwab, and M. Vogt, *Eur. J. Inorg. Chem.*, 2701 (2002).
[14] T. M. Klapötke, B. Krumm, P. Mayer, D. Naumann, and I. Schwab, *J. Fluorine Chem.*, in press (2004).
[15] T. M. Klapötke, B. Krumm, P. Mayer, H. Piotrowski, K. Polborn, and I. Schwab, *Z. Anorg. Allg. Chem.*, **628,** 1831 (2002).
[16] T. M. Klapötke, B. Krumm, P. Mayer, and I. Schwab, *Angew. Chem. Int. Ed.*, **42,** 5843 (2003).
[17] T. M. Klapötke, B. Krumm, and K. Polborn, *J. Am. Chem. Soc.*, **126,** 710 (2004).