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SHORT COMMUNICATIONS

Dedicated to Full Member of the Russian Academy of Sciences B.A. Trofimov on his 70th anniversary

Regio- and Stereoselective Addition of Selenium Dibromide to Divinyl Sulfone

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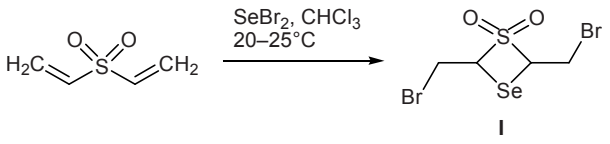
It is known that selenium dibromide in solution exists as an equilibrium mixture of Se_2Br_2 and bromine [1]. We were the first to demonstrate [2, 3] that selenium dibromide may be used for the synthesis of organoselenium compounds. In continuation of our systematic studies on reactions of selenium halides [2–9], the present communication reports on the addition of selenium dibromide to divinyl sulfone. We found that the reaction leads to the formation of a four-membered heterocyclic compound, 2,4-bis(bromomethyl)-1λ⁶,3-thiaselenetane 1,1-dioxide (**I**) with high regio- and stereoselectivity. The yield of compound **I** was quantitative, calculated on the reacted divinyl sulfone (substrate conversion 24%).



I

The reaction was carried out in chloroform at room temperature. The product was a mixture of two diastereoisomers at a ratio 7:1. Considerable prevalence of one stereoisomer implies that the reaction is stereoselective.

The structure of heterocyclic compound **I** was confirmed by the ^1H, ^{13}C, and ^{77}Se NMR and mass spectra. The NMR data, specifically the ^{13}C–^{77}Se and ^1H–^{77}Se coupling constants indicated that the selenium atom is directly attached to CH groups. On the basis of the NMR data we also presumed that the major diastereoisomer has *cis* orientation of the bromomethyl substituents and the minor isomer has *trans* configuration. Compound **I** was synthesized previously by reaction of selenium tetrabromide with divinyl sulfone, but its structure was not proved rigorously; only the IR and ^1H NMR spectra and elemental analysis were given [10]. No data on diastereoisomeric composition of sulfone **I** were reported [10].

Selenium dibromide was generated *in situ* by reaction of selenium with bromine in chloroform.

2,4-Bis(bromomethyl)-1λ⁶,3-thiaselenetane 1,1-dioxide (I). mp 113–114°C. Major diastereoisomer: ^1H NMR spectrum, δ, ppm: 3.72 d.d (2H, CH_2Br, ^2J = 10.8, ^3J = 7.6 Hz), 4.10 d.d (2H, CH_2Br, ^2J = 10.8, ^3J = 8.1 Hz), 5.56 d.d (2H, CH, ^3J = 7.6, 8.1 Hz). ^{13}C NMR spectrum, δ_C, ppm: 27.21 (CH_2Br), 68.41 (CH, $^1J_{Se,C}$ = 51.0 Hz). ^{77}Se NMR spectrum: δ_{Se} 243.9 ppm ($^2J_{Se,H}$ = 9.5 Hz). Mass spectrum, *m*/*z* (I_{rel}, %): 276 $[M - Br]^{+\cdot}$ (14), 133 (5), 106 (100), 80 (13), 57 (8), 48 (12), 28 (16), 27 (50), 18 (19). Minor diastereoisomer: ^1H NMR spectrum, δ, ppm: 3.74 d.d (2H, CH_2Br, ^2J = 11.0, ^3J = 7.7 Hz), 4.14 d.d (2H, CH_2Br, ^2J = 11.0, ^3J = 7.9 Hz), 5.54 d.d (2H, CH, ^3J = 7.7, 7.9 Hz). ^{13}C NMR spectrum, δ_C, ppm: 27.74 (CH_2Br), 69.28 (CH). ^{77}Se NMR spectrum: δ_{Se} 250.5 ppm ($^2J_{Se,H}$ = 10.0 Hz). Mass spectrum, *m*/*z* (I_{rel}, %): 276 $[M - Br]^{+\cdot}$ (17), 106 (100), 80 (16), 57 (13), 48 (12), 28 (54), 27 (55), 18 (95).

The NMR spectra were recorded from a solution in $CDCl_3$ on a Bruker DPX-400 spectrometer at 400.13 (^1H, HMDS), 100.61 (^{13}C, HMDS), and 76.30 MHz (^{77}Se, Me_2Se).

REFERENCES

1. Milne, J., *Polyhedron*, 1985, vol. 4, p. 65.
2. Potapov, V.A., Amosova, S.V., Belozerova, O.V., Albanov, A.I., Yarosh, O.G., and Voronkov, M.G., *Khim. Geterotsikl. Soedin*., 2003, p. 633.
3. Potapov, V.A. and Amosova, S.V., *Russ. J. Org. Chem*., 2003, vol. 39, p. 1373.
4. Amosova, S.V., Potapov, V.A., Belozerova, O.V., Albanov, A.I., Yarosh, O.G., and Voronkov, M.G., *Abstracts of Mark Vol'pin Memorial Int. Symp. "Modern Trends in Organometallic and Catalytic Chemistry,"* Moscow, May 18–23, 2003, p. 86.
5. Potapov, V.A., Amosova, S.V., Belozerova, O.V., Albanov, A.I., Yarosh, O.G., and Voronkov, M.G., *Khim. Geterotsikl. Soedin*., 2003, p. 634.
6. Klyba, L.V., Amosova, S.V., Belozerova, O.V., Potapov, V.A., Zhanchipova, E.R., Yarosh, O.G., and Voronkov, M.G., *Izv. Ross. Akad. Nauk, Ser. Khim*., 2005, p. 639.
7. Amosova, S.V., Makhaeva, N.A., Martynov, A.V., Belozerova, O.A., Penzik, M.V., Albanov, A.I., Yarosh, O.G., and Voronkov, M.G., *Abstracts of Int. Conf. on Organic Chemistry "Organic Chemistry since Butlerov and Beilstein until Present,"* St. Petersburg, June 26–29, 2006, p. 379.
8. Amosova, S.V., Martynov, A.V., Mahaeva, N.A., Belozerova, O.V., Penzik, M.V., Albanov, A.I., Yarosh, O.G., and Voronkov, M.G., *J. Organomet. Chem*., 2007, vol. 692, p. 946.
9. Amosova, S.V., Potapov, V A., Martynov, A.V., Belozerova, O.V., Makhaeva, N.A., Penzik, M.V., Yarosh, O.G., and Voronkov, M.G., *Abstracts of 18th Mendeleev's Congress*, Moscow, September 23–28, 2007, vol. 1, p. 207.
10. Migalina, Yu.V., Lendel, V.G., Koz'min, A.S., and Zefirov, N.S., *Khim. Geterotsikl. Soedin*., 1978, p. 708.