

5. Drago, R. S. and Meek, D. W. *J. Phys. Chem.* **65** (1961) 1446.
6. Krishnan, V. and Patel, C. C. *J. Inorg. Nucl. Chem.* **26** (1964) 2201.
7. Krishnan, V. and Patel, C. C. *Indian J. Chem.* **2** (1964) 416.
8. Paetzold, R. and Vordank, P. *Z. anorg. allgem. Chem.* **347** (1966) 294.
9. Horrocks, Jr., W. D. and Cotton, F. A. *Spectrochim Acta.* **17** (1961) 134.
10. Johnson, B. F. G. and Walton, R. A. *Spectrochim Acta.* **22** (1966) 1853.
11. Bird, M. L. and Challenger, F. *J. Chem. Soc.* **1942** 570.
12. Ayrey, G., Barnard, D. and Woodbridge, D. T. *J. Chem. Soc.* **1962** 2089.
13. Welcher, F. J. *The analytical uses of ethylenediaminetetraacetic acid*, Van Nostrand Co. 1958.

Received August 24, 1967.

Organic Selenium Compounds

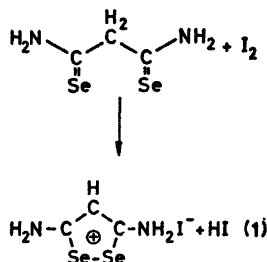
V. Diselenolylium Salts

K. A. JENSEN and ULLA HENRIKSEN
(née Svanholm)

Chemical Laboratory II (General and Organic Chemistry), University of Copenhagen, The H. C. Ørsted Institute, Copenhagen, Denmark

By oxidation of dithiomalonamide, salts of the 3,5-diaminodithiolylium cation or 3,5-diaminodithiolylium ion* have been obtained.^{1,2} When diselenomalonamide be-

* In the literature, the dithiolylium cation is often called the "dithiolium" ion. As was pointed out earlier,¹ this name is misleading because stoichiometrically the dithiolylium cation is a didehydrodithiolium ion. According to the IUPAC rules for organic chemical nomenclature,⁴ cations formed by loss of an electron from an -yl radical may be denoted by the ending -ylium (this ending being considered as an entity and not to imply that the ion is formed by addition of a proton to the radical). Accordingly, the dithiolylium and diselenolylium cations may be called dithiolylium and diselenolylium ions.



came available in this laboratory,³ we tried to prepare the corresponding 3,5-diselenolylium salts, but our first attempts, using hydrogen peroxide as oxidant, were unsuccessful.³ However, when iron(III) chloride or iodine were used as oxidants, 3,5-diaminodiselenolylium chloride or iodide (1) were obtained without difficulty.

The properties of these diselenolylium salts are very similar to those of the corresponding dithiolylium salts and their infrared spectra are very similar. The infrared bands of the chloride (in KBr) were 3400m, 3250s, 3100s, 1630m, 1604s, 1510–1520vs, 1355m, 1272m, 1140w, br, 800m, 785w. As in the case of the dithiolylium salts the iodide showed a shift of some of the bands to lower frequencies (1610m, 1590s, 1330m), probably due to a lattice effect (for discussion of the infrared spectra, see the paper on the dithiolylium salts¹).

Experimental. **3,5-Diaminodiselenolylium chloride.** Diselenomalonamide³ (1.14 g; 5 mmol) was dissolved in ethanol by heating at 40°C. The solution was cooled and filtered from some selenium that had separated, and one equivalent of iron(III) chloride, dissolved in ethanol, was added with stirring. After $\frac{1}{2}$ h, pentane was added, which induced the precipitation of a yellow crystalline solid. Yield 0.90 g (76 %). It was recrystallized from aqueous methanol. On heating it decomposed above 200°C without melting. (Found: C 13.79; H 2.02; N 10.61. Calc. for C₃H₅Se₂Cl: C 13.73; H 1.92; N 10.68).

3,5-Diaminodiselenolylium iodide. An ethanolic solution of diselenomalonamide (0.456 g) was oxidized with one equivalent of iodine (0.508 g) dissolved in ethanol. The solution was stirred for $\frac{1}{2}$ h at room temperature and the resulting salt isolated as above. Yield 0.45 g (68 %) of a yellow crystalline substance, which decomposed on heating above 200°C without melting. It was recryst-

tallized from ethanol with addition of a little dimethylformamide. (Found: C 10.41; H 1.50; N 7.89. Calc. for $C_3H_8Se_2I$: C 10.18; H 1.42; N 7.92).

1. Jensen, K. A., Baccaro, H. R. and Buchardt, O. *Acta Chem. Scand.* **17** (1963) 163.

2. Schmidt, U. *Chem. Ber.* **92** (1959) 1171.

3. Jensen, K. A. and Nielsen, P. H. *Acta Chem. Scand.* **20** (1966) 597.

4. *Nomenclature of Organic Chemistry, Section C, Rule C-83. 1*, Butterworths, London 1965.

Received August 24, 1967.

DEN KGL. VETERINÆR- OG LÆGEBØHJSKOLE
Uorganisk
Kemisk
Laboratorium