The Reaction between Bis(2-bromoethyl) selenide and Potassium Selenocyanate

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Aliphatic selenocyanates are most conveniently synthesized by reacting the corresponding alkyl halide with potassium selenocyanate in acetone or ethanol. The reaction between bis(2-bromoethyl) selenide (I) and potassium selenocyanate, however, did not give the expected bis(2-selenocyanatoethyl) selenide (II). The main product consisted of diselenocyanatothene (III). Elemental selenium was also isolated from the reaction mixture.

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bromide in benzene. After termination of the reaction it was possible to isolate yellow crystals of bis (2-bromoethyl) selenide dibromide (IV) from the benzene solution of selenium tetrabromide (Scheme 1).\(^3\)

The stoichiometry of the reaction agreed well with that of Scheme 2. No quantitative estimation of the amount of ethylene evolved has been made.

![Diagram of Scheme 3](image)

Scheme 2.

When repeating the reaction between bis(2-bromoethyl) selenide (I) and potassium selenocyanate using equimolar amounts of the starting materials, it was possible to isolate 1-bromo-2-selenocyanatoethane (V) from the reaction mixture.

With support from the above experiments and from investigations made on mustard gas (bis(2-chloroethyl) sulfide),\(^4\)\(^,\)\(^5\) the following reaction mechanism is proposed (Scheme 3).

The first step in this proposed reaction mechanism consists, quite analogously with the mustard gas case, of an intramolecular attack of the selenium atom on the 2-carbon atom producing a three-membered cyclic selenonium ion. This ion is attacked by a selenocyanate ion giving 1-bromo-2-selenocyanatoethane (V) and ethylene selenide. The intermediate V will undergo further reaction with selenocyanate ion giving diselenocyanatoethane (III). Ethylene selenide being unstable decomposes to give selenium and ethylene.\(^6\)

A more detailed investigation of this reaction is now being made and will be published later.

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