

The extent of use of this reaction is illustrated by the preparation of derivatives in which the substituents R<sup>1</sup> and R<sup>2</sup> are hydrogen, methyl, phenyl and ethoxycarbonyl group. The methyl and the phenyl groups can be introduced starting from any of the parent compounds I or II. For monosubstituted derivatives (IV, R<sup>2</sup> = H) formylhydrazine (II, R<sup>2</sup> = H) serves as starting compound; as for the derivatives of 1,2,4-triazole-3-carboxylic acid their preparation from the esters of thioxamic acid (I, R<sup>1</sup> = COOR) is more convenient because the hydrazide of methoxamic acid (II, R<sup>2</sup> = COOC<sub>2</sub>H<sub>5</sub>) gives low yields.

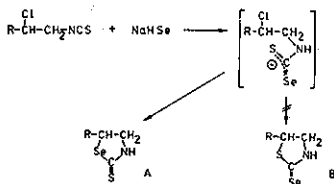
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SYNTHESIS OF 1,3-SELENAZOLIDINE-2-THIONES AND 1,3,5-OXADIAZINE-4-THIONES FROM ISOTHIOCYANATES

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By using the reaction of 2-halogen-ethyl isothiocyanates with ethanolic solution of NaHSe, a simple universal method was elaborated for the preparation of 1,3-selenazolidine-2-thiones. The intermediary selenothiocarbamate is able to undergo intramolecular substitution to give either selenazolidine-2-thione A or thiazolidine-2-selenone B.

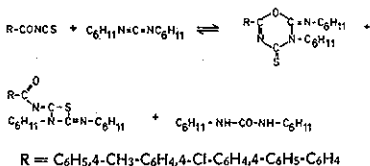


R = H, CH<sub>3</sub>, C<sub>6</sub>H<sub>5</sub>, 4-CH<sub>3</sub>-C<sub>6</sub>H<sub>4</sub>, 4-Cl-C<sub>6</sub>H<sub>4</sub>

Scheme 1

The structure of the products obtained was proved on the basis of the Roman, IR and mass spectra of selenazolidine-2-thiones and their sulphur analogs, i. e. thiazolidine-2-thiones. These compound were prepared in an analogous way by using the reaction of 2-halogen-ethyl isothiocyanates with NaHS.

The 4-substituted benzoyl isothiocyanates react with dicyclohexylcarbodiimide in [4+2] cycloaddition to yield 1,3,5-oxadiazine-4-thiones. In case of benzoyl isothiocyanate also the [2+2] cycloadduct, i. e. 2-benzoylimino-3-cyclohexyl-4-cyclohexylimino-1,3-thiazetidine, is to be isolated from the reaction mixture after a shorter reaction time.



R = C<sub>6</sub>H<sub>5</sub>, 4-CH<sub>3</sub>-C<sub>6</sub>H<sub>4</sub>, 4-Cl-C<sub>6</sub>H<sub>4</sub>, 4-C<sub>6</sub>H<sub>5</sub>-C<sub>6</sub>H<sub>4</sub>

Scheme 2

The structure of both cycloadducts was proved by IR and mass spectra.

However, benzoyl isothiocyanates react with diphenylcarbodiimide to give the corresponding substituted benzoylanilides.

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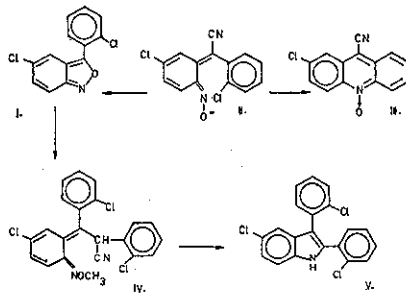
PRODUCT OF A REACTION OF 4-CHLORONITROBENZENE WITH 2-CHLOROPHENYLACETONITRILE IN METHANOLIC SOLUTIONS OF ALKALI HYDROXIDES

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Whereas the reaction of 4-chloronitrobenzene with phenylacetone in a methanolic solution of NaOH (or KOH) at 20–30 °C and in the presence of a small amount of water affords almost exclusively 5-chloro-2,1-benzisoxazole and thus opens a preparatively advantageous approach to 2-amino-5-chlorobenzophenone and the psychotropic 5-phenyl-7-chloro-1,3-dihydro-1,4-benzodiazepin-2-ones, a similar reaction of 4-chloronitrobenzene with 2-chlorophenylacetone nitrile has not yet been described. It has been established now that this reaction leads to a mixture of products from which five crystalline compounds were isolated. Their empirical formulae were determined by analyses and mass spectra and the products were further characterized by the <sup>1</sup>H-NMR, UV and IR spectra, as well as by some chemical reactions.

The desired 2,1-benzisoxazole I (C<sub>13</sub>H<sub>7</sub>Cl<sub>2</sub>NO) was obtained in a yield of only 12%. It is apparently formed by cyclization of the non-isolated alkaline salt of the oxime II, representing a type postulated in analogous reactions as the primary product. Reduction of compound I with iron and acetic acid yielded 2-amino-5,2'-dichlorobenzophenone.

A yellow substance C<sub>14</sub>H<sub>7</sub>Cl<sub>2</sub>N<sub>2</sub>O was isolated in a yield of 20%. According to the spectra, it is a condensed aromatic compound containing the N-oxide and nitrile groups. Structure III was assigned which is compatible with the hypothesis that this compound is also formed by cyclization of the intermediate II. Its reduction with LiAlH<sub>4</sub> resulted in a mixture of 2-chloro-9-(aminomethyl)acridin and 2-chloroacridin. The alkaline hydrolysis of compound III gave also two products identified as 2-chloroacridine-9-carboximide (containing the corresponding N-oxide) and 2-chloro-10-hydroxyacridanone.



A further isolated compound (15%) corresponds to C<sub>22</sub>H<sub>15</sub>Cl<sub>3</sub>N<sub>2</sub>O. The spectra indicate the presence of OCH<sub>3</sub>, C = N – O (oxime) and CN groups. As the most probable, the structure IV is considered and it is assumed that the compound is formed from I by the action of methoxide anion and a further molecule of 2-chlorophenylacetone nitrile.

The main product (25%) is a compound C<sub>20</sub>H<sub>12</sub>Cl<sub>3</sub>N for which the structure of the indole derivative V was suggested on the basis of spectral evidence and confirmed by synthesis: it was obtained by Fischer reaction from 4-chlorophenylhydrazine of 2,2'-dichloro-deoxybenzoin. In our reaction, it could be formed via compound IV.

A minor product (5%) C<sub>13</sub>H<sub>5</sub>Cl<sub>2</sub>NO<sub>2</sub> was identified by spectra to be 2-chloro-4'-nitrobenzophenone.