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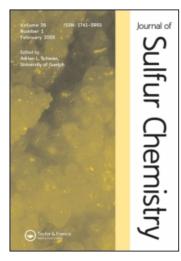
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APPENDIX ADDED IN PROOF

Since the preparation of this review two related reviews have appeared. 1,2

II.

Recently Seitz et al. have developed the rather interesting chemistry of thio analogs of squaric acid and its amides. Thus, the N,N,N',N'-tetrasubstituted enamino thioketones 2 and 3 were prepared by reaction of the squaric acid 1,2-diamides l with P_4S_{10} in 1,2-dimethoxyethane or dichloromethane.^{3,4} 3-(N,N-Dimethylamino)-2-oxo-4-phenyl-1-cyclobutenethione 4 was obtained under analogous conditions.⁵

Boron sulfide and silicon disulfide⁶ have been successfully used for the preparation of N-methylthioacridone and other non-enolizable thioketones from the corresponding ketones.

The cyclopropene derivative 6 has been prepared by successive treatment of the trichloro derivative 5 with (N,N-dimethylamino)-trichlorosilane and hydrogen sulfide in pyridine.⁷

Several recent syntheses of enamino thicketones have been described.⁸⁻¹²

IV and VII.

Also cyclobutenes and cyclopropenes containing an RS—C=C—C=S group are known. Two synthetic approaches to these compounds have been described. The first one is based on the sulfurization of the immonium salts 7^{13} and 9^{14} leading to the β -alkylthiovinylene thioketones δ , 10, and 11, respectively.

$$M_{eS} \longrightarrow \begin{array}{c} \bigoplus_{NMe_{2}}^{\bigoplus} \\ = NMe_{2} \cdot 2 FS0_{3}^{\bigoplus} \\ = SMe \end{array} \longrightarrow \begin{array}{c} M_{eS} \longrightarrow \\ SMe \end{array} \longrightarrow \begin{array}{c} S \\ = S \\ SMe \end{array}$$

7

MeS SMe
$$\cdot I^{\ominus}$$
 MeS SMe $\cdot S^{\ominus}$ MeS SMe $\cdot S^{\ominus}$ MeS $\cdot S^{\ominus}$ MeS $\cdot S^{\ominus}$ \cdot

The second route involves the alkylation of the thiolates 12^7 and 14^5 as well as of 16^{15} with methyl iodide which leads to the formation of the unstable 13 and the relatively stable methylthio derivatives 15 and 17, respectively. Compound 17 is also a rare representative of the β -cyanovinylene thioketones (cf. Section VII.).

 β -Alkylthiovinylene thioketones are structurally similar to the 1,2-dithiol-3-ylidene substituted thioketones 19. These compounds are obtained by reaction of the corresponding 1,2-dithiol-3-thiones 18 with acetylenes. ¹⁶⁻¹⁸ The synthesis of the analogous thioketones 21 is based upon the reaction of the ketones 20 with tetraphosphorus decasulfide. ^{19,20}

V.

Heating of the 2,2,4,4-tetrasubstituted 1,3-cyclobutanediones 22 with tetraphosphorus decasulfide in pyridine leads to a number of β -dithiodiketones $23^{21,22}$ which are unable to enethiolize. The structures of these compounds have been studied by spectroscopic methods²⁴ and by X-ray diffraction.²⁵

VIII.

The compounds 25 can be considered as both functionally substituted enamino thioketone analogs and β -alkoxy- or β -alkylthiovinylene thioketones. They have been prepared, together with other compounds, by treating the malonic acid derivatives 24 with hydrogen sulfide in pyridine.²⁶

$$\begin{bmatrix} Etx - \overset{NH_2}{C} - CH_2 - \overset{NH_2}{C} - XEt \end{bmatrix}^{2\bigoplus} \cdot 2 C1^{\bigoplus} \xrightarrow{H_2S/P_yr} Etx - \overset{S}{C} - CH = \overset{NH_2}{C} - XEt$$
24
$$X = 0, S$$
25

IX.

The ionization constants of a number of heterocyclic enamino thioketones 26 have been determined by potentiometric titration in acetonitrile. The effect of the N-aryl group on the free energy of the deprotonation of these compounds has been quantitatively estimated by means of a correlation analysis.²⁷

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