SYNTHESIS OF 4-HYDROXY-3-MERCAPTOBENZOIC ACID AND 2,3-DIHYDRO-5,6-TETRAMETHYLENE-1,4-DITHIINE FROM DITHIOLANE DERIVATIVES

Seiichi Takano*, Shinichi Yamada, Keizo Tanigawa,
Susumi Hatakeyama, and Kunio Ogasawara

Pharmaceutical Institute, Tohoku University, Aobayama, Sendai, Japan

Efficient synthesis of 4-hydroxy-3-mercaptobenzoic acid (9) and 2,3-Dihydro-5,6-tetramethylene-1,4-dithiine(16) from dithiolane derivatives was reported.

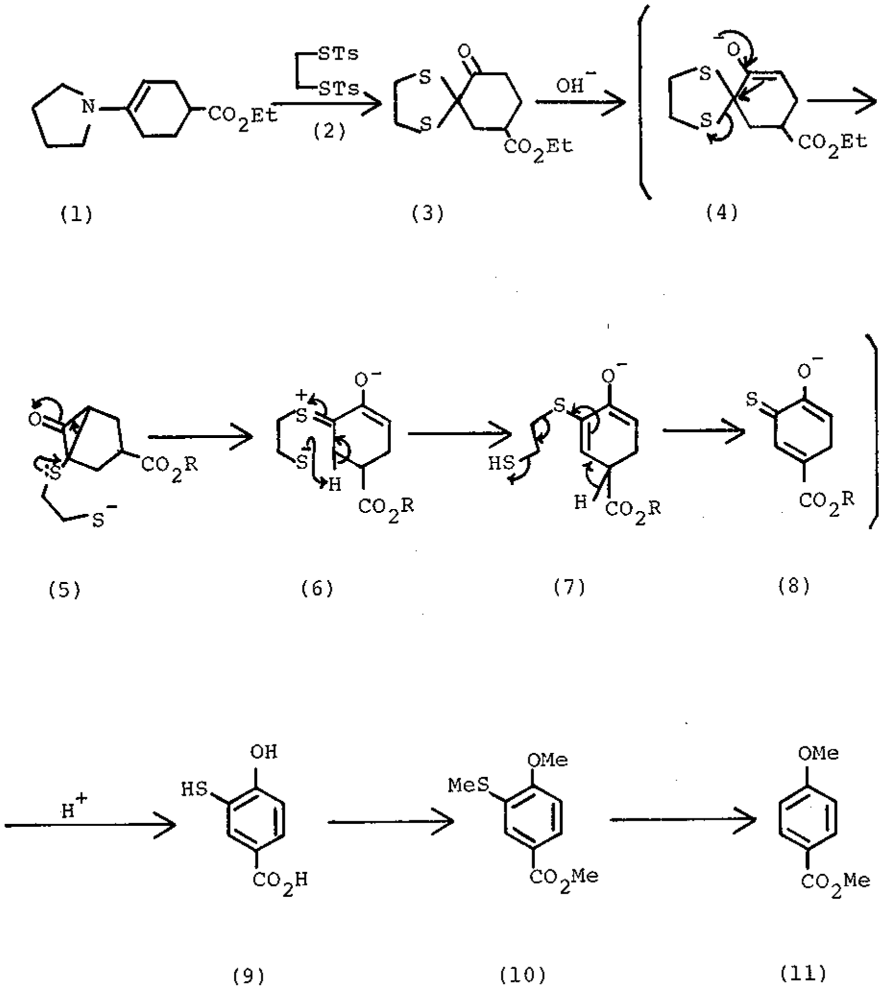
In connection with other projects on the synthesis of sulfur containing compounds, we found new rearrangements performed by dithiolane ring.

Heating 2-ketodithiolane derivative(3), an oil, ir(neat) 1725(ester, C=O), 1720(C=O), 1425, 1380, 1190 cm^{-1}, NMR(CDCl$_3$)(δ) 1.28(3H, t, J=7.0 Hz), 3.30(4H, s) 4.14(2H, q, J=7.0 Hz), Mass(m/e) 260(M$^+$), prepared from the cyclohexanone enamine derivative(1) and ethylenedithiotosylate(2)[1] in excellent yield, with potassium hydroxide in *ter.*Butanol at 60° under nitrogen for 4.75 hr generated the mercapto-phenol(9), a glass, ir(neat) 3500-2500, 1700, 1590 cm^{-1}, NMR(CDCl$_3$)(δ) 6.92(1H, d, J=9 Hz), 7.29(3H, br.s, disapp. with D$_2$O), 7.74(1H, q, J=9 and 1.5 Hz), 8.17(1H, d, J=1.5 Hz), Mass(m/e) 170(M$^+$), in 69.8% yield. The structure confirmation of the product(9) was made by leading to the known compound, methyl *p*-methoxybenzoate(11)[2] *via* a two step reaction(i.e.,(1) methylation with diazomethane to methyl 4-methoxy-3-methythiobenzoate(10), ir(nujol) 1710, 1580, 1180 cm^{-1}, NMR($CDCl_3$)(δ) 2.46(3H, s), 3.86(3H, s), 4.10(3H, s), 6.80 (1H, d, J=11 Hz), 7.79(1H, d, J=2 Hz), 7.81(1H, q, J=11 and 2 Hz), Mass(m/e) 212(M^+), (2) desulfurization with Raney-Ni(W-2) to methyl *p*-methoxybenzoate(11), mp 43°(lit.[2] 44-45°)). The location of the sulfur group in the adjacent position to the oxygen group was deduced by an examination of chemical shifts and coupling patterns of aromatic protons in NMR spectra of both 9 and 11, though we could not decide chemically. The product(9) may be formed through the steps indicated in Chart 1.

On dehydration in the presence of phosphorus pentoxide in boiling benzene, the dithiolane derivative(13), an oil, ir(neat) 3440, 1070 cm^{-1}, NMR($CDCl_3$)(δ) 1.20-2.60(9H, m, disapp. 1H with D_2O), 3.30(4H, s), 3.65(1H, dd, J=8.0 and 4.0 Hz), Mass(m/e) 190 (M^+), prepared quantitatively from the dithiolane(12)[1] by reduction with sodium borohydride, afforded 2,3-dihydro-5,6-tetramethylene-1,4-dithiine(16), bp 83-84°(1.2 mm Hg), ir(neat) 1600 cm^{-1}, NMR($CDCl_3$)(δ) 3.14(4H, s), 2.08(4H, m), 1.65(4H, m), Mass(m/e) 172(m^+), in 96% yield, presumably *via* the steps indicated in Chart 2.

Further studies on the synthetic utility of these reactions are in progress.

Chart 1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STs
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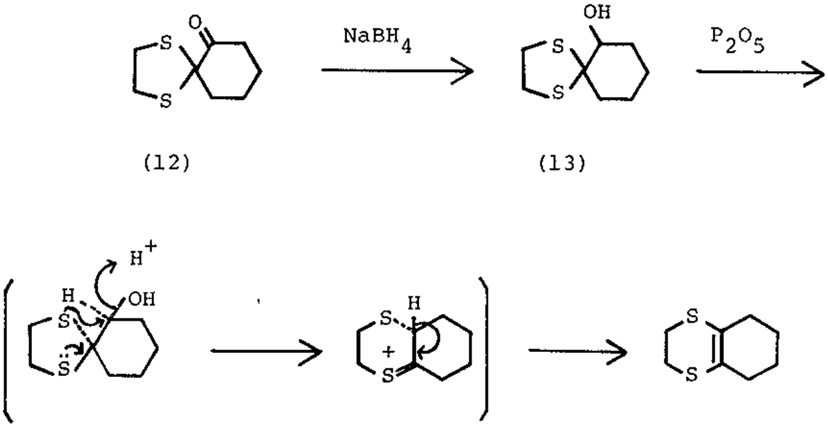
(10)
(11)

Chart 2



(12) (13)

(14) (15) (16)

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Received, 6th February, 1976