Synthesis of dithiolene compounds from xanthydrole

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Abstract. In this search may hatarocyclic compounds contain sulfur atoms e been prepared by reacting the di thiocarbamate derivatives with alfa –haloketones the compounds identified by melting point, FTIR, HNMR and C13 NMR.

Keywords. 5-FU and its derivatives; geometrical properties; QSAR; DFT; activity of new drug.

1. Introduction

1.1. Dithiolane
Dethiolan is a heterogeneous organic cyclic compound saturated with chemical formula C₃H₆S₂. The composite consists of a pentagon ring containing two sulfur peaks, allowing for different versions of the compound, namely 2,1-diethylane, and 3,1-diethiolan compound derivatives are called Dithiolans [1]. This is derived from the cyclopentane by the substitution of two bridges methylene -(CH2- units) with groups of vehicles. Thioether mother is 1.2dithiolane and 1.3 dithiolane) [2]. 1,2_Detyolanis), (such as lipoic acid, is cyclic disulfides) [3]. 1,3_Dithiolanes; important as groups protecting carbonyl compounds), (because it is inert to a wide range of conditions). Reply; carbonyl reaction, a group with-1,-2-ethanedithiol turning it into a 1,3-dithiolane) [4]. As 1,2-dithiol, this compound is used widely in organic chemistry because it reacts with aldehydes and ketones to give 1,3-dithiolan which are intermediates useful [5]. Lipoic acid has a strong link with some metals such as gold molybdenum and tungsten. There is material in the 1,2-dithiolanesjother important nanomaterials such as nanoparticles or gold TMDs (MoS2 and WS2) [6].

These are used in the resent invention and have been tested and found effective against a number of common insects, including M. domestic-us., P. amerr'cana; O. fasciatus, T. confusum and A. Iabae. Further, the compounds of the present invention possess acaricidal fungicidal and nematocidal activity. The compounds may also be used as ore flotation agents, lubricating oil additives and in the compounding of rubber [7]. The chemistry of molecules containing sulfur attracts continuous attention as a consequence of the potential biological activity of this class of compounds [8]. For example, tiapamil is an anti-anginal agent used in the treatment of angina pectoris [9]. The protection of carbonyl functionalitias a dithioacetel or a thioketal is an important tool in the multistep total synthesis of complex natural and non-natural products and has attracted special attention in recent years [10]. Syntheticorganic chemists have found 1,3-dithianes to be versatile systems of great applicability, natural products being the main targets in organic synthesis [11, 12]. In addition, these compounds are also...
utilized as masked acyl anions [13] or masked methylene functional groups in carbon–carbon. Dithiolane preparation uses Molybdenum Trioxide has recently found use as a catalyst support for oxidative waste water treatment [14]. Dithiolane was prepared by K. V. Lipina,*, O. V. Ershova, M. Yu. Belikova, and S. V. Fedosseva and it includes the reaction of carbon disulfide with methylene-active compounds in the presence of sodium ethylate followed by adding 1,2-dichloroalkanes to the reaction mixture [15].

1.2. (Oxazole)

Oxazole is the main compound for a wide class of aromatic organic compounds heterogeneous. This is azoles with oxygen, nitrogen, carbon, and separated by one carbon [16]. Oxazole is aromatic compounds but less than thiazole. Oxazole is a weak base with a conjugate acid which has a pKa of 0.8 compared to 7 imidazole. There are many applications of Oxazole compounds among these applications, using the discovery of novel drugs [17, 18, 19], agrochemicals [20, 21] and as potential antibacterial, antifungal, Anti-cancer and antioxidant agents monoamine oxidase inhibitors etc. Indolyl-oxazole [22, 23, 24]. It has been proven that the biological and pharmaceutical activities and show wide. 2,5-Disubstituted.oxazole alkaloids1 [25, 26]. It is another kind of natural product oxazole.

Oxazole and its derivatives are brought in several known ways, including the synthesis of Robinson-Gabriel synthesis and the synthesis of Fischer oxazole synthesis, as well as Van Leusen reaction.

In one study [27], Oxazoles were prepared in a single-potency technique by a condensate reaction between propargill and benzoyl chloride, followed by the Sonogashira coupling reaction of the peripheral alkine, and then treated with a para-toluene acid compound Slavonic (TsOH) [28, 29].

2. Experimental part

2.1. Synthesis of ethyl 2-(9H-xanthen-9-yloxy) acetate (A)

A mixture of (0.86mol, 1.00g) of compound (Xanthydrol) and (0.86mol, 1.2) of (ethylchloroacetate) was dissolved in ethanol (25ml) and stirred with a few drops of tri-ethylamine. Strongly in a water bath at 67 °C for (7-8) hors. (The progress of the reaction was followed by TLC. (At room, temperature ethanol was evaporated). The compound was, then, purified by recrystallization. Then, yellow crystals were obtained, this is shown in Equation (1).

\[
\text{Equation 1. Synthesis of A}
\]

| (Comp) | M-F | M-Wt | colour | M-P$_{\text{oC}}$ | yield | $R_f$ | Solvent |
|--------|-----|------|--------|-----------------|-------|------|---------|
| A      | C$_{17}$H$_{16}$O$_4$ | 284,31 | yellow | 137-139 | 85 % | 0.57 | MtOH : EtOH 2:6 |

2.2. Synthesis of 2-(9H-xanthen-9-yloxy)acetohydrazide (A1)

A mixture of (0.78mol, 1.00g) of compound (A) and (0.11mol, 0.1127g) of (solution hydrazine) was dissolved in ethanol (25ml) and stirred. Strongly in a water bath at 67 °C for (9-10) hors. (The progress of the reaction was followed by TLC. (At room, temperature ethanol was evaporated). The compound was, then, purified by recrystallization. The powder was dark brown, this is shown in Equation (2).
2.3. Synthesis of potassium 2-(2-(9H-xanthen-9-yloxy) acetyl) hydrazinecarbodithioate (A2)

A mixture of (0.5mol, 1.00g) of compound (A1) and (0.22mol, 0.281g) of (carbon disulfide) was dissolved in ethanol (25ml) and stirred. Then added drops of alcohol KOH slowly. Strongly in a water bath at 67 °C for (5-6) hors. The progress of the reaction was followed by TLC. (At room temperature ethanol was evaporated. The compound was then purified by recrystallization. Then, nutty crystals were obtained. This is shown in Equation (3).

\[
\text{2-(9H-xanthen-9-yloxy)acetohydrazide + KOH + CS}_2 \rightarrow \text{2-(9H-xanthen-9-yloxy)acetohydrazide}
\]

\[
\text{Equation 3. Synthesis of (A2)}
\]

| (Comp) | M-F     | M-Wt   | colour | M-P, °C | yield | R_f   | Solvent       |
|--------|---------|--------|--------|---------|-------|-------|---------------|
| A2     | C_{16}H_{13}KN_{2}S_{2}O_{3} | 400.51 | nutty  | 143-145 | 80 %  | 0.8   | MtOH : EtOH 2:6 |

2.4. Synthesis of 2-(9H-xanthen-9-yloxy)-N’-(4-oxo-1,3 dithiolan-2-yl) acetohydrazide (A3)

A mixture of (0.88mol, 1.00g) of compound (A2) and (0.23mol, 0.305g) of (ethylchloroacetate) was dissolved in ethanol (30ml) and stirred. Strongly in a water bath at 67 °C for (9-10) hors. The progress of the reaction was followed by TLC. (At room temperature ethanol was evaporated. The compound was then, purified by recrystallization. We obtain the yellowish red crystals of. This is shown in Equation (4).
2.5. Synthesis of potassium O-9H-xanthen-9-ylcarbonodioate (A4)
A mixture of (0.86mol, 1.00g) of compound (Xanthylrol) and (0.304mol, 0.384g) of (carbon disulfide) was dissolved in ethanol (30ml) and stirred. Then added drops of alcohol KOH slowly. Strongly in a water bath at 67 °C for (13-14) hrs. The progress of the reaction was followed by TLC. At room temperature ethanol was evaporated. The compound was then, purified by recrystallization. The brown crystals were obtained. This is shown in equation (5).

Equation 5. Synthesis of (A4)

Table 5. Physical properties of comp.(A4)

| (Comp) | M-F     | M-Wt     | colour       | M-P_ °C | yield | Rf_ | Solvent  |
|--------|---------|----------|--------------|---------|-------|-----|----------|
| A4     | C_{14}H_{9}KS_{2}O_{2} | 312,42   | brown        | 105-107 | 75 %  | 0.57 | Ben : EtOH 4:6 |

2.6. Synthesis of 2-(9H-xanthen-9-ylxyloxy)-1,3-dithiolan-4-one (A5)
A mixture of (0.70mol, 1.00g) of compound (A7) and (0.342mol, 0.392g) of (ethyl acetate chloro) was dissolved in ethanol (25ml) and stirred. (Strongly in a water bath at 67 °C for (9-10) hrs. (The progress of the reaction was followed by TLC. (At room, temperature ethanol was evaporated. The compound was, then, purified by recrystallization. The White crystals were obtained .This is shown in Equation (6).

Equation 6. Synthesis of (A5)

Table 4. Physical properties of comp. (A3)

| (Comp) | M-F     | M-Wt     | colour       | M-P_ °C | yield | Rf_ | Solvent  |
|--------|---------|----------|--------------|---------|-------|-----|----------|
| A3     | C_{18}H_{15}S_{2}N_{2}O_{4} | 404,46   | yellowish red | 154-156 | 79 %  | 0.77 | MtOH : EtOH 2:6 |

Equation 4. Synthesis of (A3)
(A5)

\[
K_{2}S_{2}O_{3} + \text{ethyl 2-chloroacetate} \xrightarrow{\text{refluxe}} 2-(9H-xanthen-9-yloxy)-1,3-dithiolan-4-one
\]

Equation 6. Synthesis of (A5)

**Table 6. Physical properties of comp. (A5)**

| Comp  | M.F   | M.Wt  | colour | M-P. °C  | (yield) | R.f | Solvent   |
|-------|-------|-------|--------|----------|---------|-----|-----------|
| A5    | C_{16}H_{12}S_{2}O_{3} | 316.39 | White  | 133-135  | 75 %    | 0.52 | Ben : EtOH 2:6 |

2.7. Synthesis of 9-(4-(4-bromophenyl)-1,3-dithiol-yloxy)-9H-xanthene (B1)

A mixture of (0.70 mol, 1.00g) of compound (A7) and (0.546 mol, 0.889g) of (2-bromo-1-(4-bromophenyl)ethanone) was dissolved in ethanol (25ml) and stirred strongly in a water bath at 67 °C for (8-9) hors. The progress of the reaction was followed by TLC. (At room temperature ethanol was evaporated). The compound was, then, purified by recrystallization. The powder was obtained black color. This is shown in Equation (7).

\[
\text{potassium O-9H-xanthen-9-yl carbodithioate} + \text{2-bromo-1-(4-bromophenyl)ethanone} \xrightarrow{\text{refluxe}} 9-(4-(4-bromophenyl)-1,3-dithiol-2-yloxy)-9H-xanthene
\]

Equation 7. Synthesis of (B1)

**Table 7. Physical properties of comp. (B1)**

| Comp  | M.F   | M.Wt  | color | m.p °C  | yield | R.f | solvent   |
|-------|-------|-------|-------|---------|-------|-----|-----------|
| B1    | C_{2}H_{3}BrSO_{2} | 437.35 | black | 222-224 | 80 %  | 0.56 | Ben : EtOH 2:6 |

2.8. Synthesis of (9H-xanthen-yl)hydrazine (B2)

A mixture of (0.86mol, 1.00g) of compound (Xanthydrol) and (0.244mol, 0.252g) of (Hydrazine hydrate) was dissolved in ethanol (25ml) and stirred with a few drops of acid. Strongly in a water bath at 67 °C for (8-7) hors. The progress of the reaction was followed by TLC. (At room, temperature ethanol was evaporated). The compound was, then, purified by recrystallization. The powder was obtained white. This is shown in Equation (8).
2.9. *Synthesis of Potassium 2-(*9H*-xanthen-yl) hydrazinecarbodithioate (B3)*

A mixture of (0.95 mol, 1.00 g) of compound (B2) and (0.284 mol, 0.358 g) of (CS$_2$) was dissolved in ethanol (25 ml) and stirred strongly in a water bath at 67 °C for (9-10) hrs. (Then we added drops of alcohol KOH slowly. The progress of the reaction was followed by TLC. (At room temperature ethanol was evaporated). The compound was then purified by recrystallization). The powder was obtained yellow. This is shown in Equation (9).

\[
\text{Equation 9. Synthesis of (B3)}
\]

| Comp   | M.F          | M.Wt | colour  | m.p °C | yield | R.f. | solvent     |
|--------|--------------|------|---------|--------|-------|------|-------------|
| B3     | C$_{14}$H$_{11}$K$_2$S$_2$N$_2$O | 326,47 | Yellow | 111-113 | 79%   | 0.58 | MeOH: EtOH 2:6 |

2.10. *Synthesis of 2-(2-(*9H*-xanthen-9-yl)hydrazinyl)-1,3- dithiolan-4-one (B4)*

A mixture of (0.45 mol, 1.00 g) of compound (B3) and (0.284 mol, 0.375 g) of (ethyl 2-chloroacetate) was dissolved in ethanol (25 ml) and stirred strongly in a water bath at 67 °C for (4-5) hrs. The progress of the reaction was followed by TLC. (At room temperature ethanol was evaporated)). The compound was, then, purified by recrystallization). The powder was obtained nutty. This is shown in Equation (10).

\[
\text{Equation 10. Synthesis of (B4)}
\]
3. Result and Discussion

3.1. Characterization of ethyl 2-(9H-xanthen-9-yloxy) acetate (A)

This compound (A) was synthesized by reacting of Xanthydrol with ethylchloroacetate, the compound was identified by using FTIR spectroscopy by appearing the (C=O) band at 1753 cm⁻¹ and disappearing of (O-H) at 3346 cm⁻¹ of starting material.

**Table 10. Physical properties of comp. (B4)**

| Comp | M-F | M-Wt  | colour | M-p °C | yield | Rf  | solvent      |
|------|-----|-------|--------|--------|-------|-----|--------------|
| B4   | C₁₀H₁₄S₂N₂O₂ | 330.42 | nutty  | 131-133 | 75%   | 0.72 | MtOH: EtOH 2:6|

**Figure 1.** FT-IR Spectrum of Compound (Xanthydrol)

**Figure 2.** FT-IR Spectrum of Compound (A)
3.2. Characterization of 2-(9H-xanthen-9-yloxy)acetohydrazide (A1)
The compounds (A1) was synthesized by the reaction of (A) with hydrazine hydrate (99%); this compound was identified by FTIR spectroscopy by appearing of (N-H, N-H$_2$) stretching vibration at 3221,3334 cm$^{-1}$ respectively and disappearing OH at 3400 cm$^{-1}$ for starting material.

![FT-IR Spectrum of Compound (A2)](image)

**Figure 3.** FT-IR Spectrum of Compound (A2)

3.3. Characterization of potassium 2-(2-(9H-xanthen-9-yloxy)acetyl)hydrazinecarbodithioate (A2)
Compound (A2) was synthesized by reacting Carbon disulfide with compound (A1) the compound was identified by using FTIR spectroscopy by disappearing of (NH) symmetric and asymmetric stretching vibration at 3334 cm$^{-1}$ compound (A1), and also the appearing of the (-C=S) bond at 1211 cm$^{-1}$ in compound (A2).

![Chemical Structure of A3](image)

**Equation 11.** Synthesis of A3

$$
2-(9H\text{-xanthen-9-yloxy})\text{ace}tohydrazide + \text{CS}_2 \xrightarrow{\text{KOH refluxed}} \text{potassium 2-(2-(9H-xanthen-9-yloxy)acetyl)hydrazinecarbodithioate}
$$
3.4. Characterization of 2-(9H-xanthen-9-yloxy)-N’-(4-oxo-1,3-dithiolan-2-yl)acetohydrazide (A3)

Compound (A3) was synthesized by reacting (A2) with compound ethylchloroacetate, the compound was identified by using FTIR spectroscopy by appearing the band of (N-H) stretching vibration at 3375 cm\(^{-1}\) compound and appearing the band of (O=C) at 1730 cm\(^{-1}\) (A3) and also the disappearing of the (C=S) bond at 1211 cm\(^{-1}\).

\[
\text{Equation 12. Synthesis of A3}
\]

Figure 4. FT-IR Spectrum of Compound (A3)

Figure 5. FT-IR Spectrum of Compound (A3)
3.5. Characterization of potassium O-9H-xanthen-9-yl carbonodioate (A4)
The compound (A7) was synthesized by the reaction of Xanthrol with carbon disulfide; this compound was identified by FTIR spectroscopy by the disappearing of the (O-H) bond at 3200-3400 cm\(^{-1}\) in compound and appearing of (C=S) stretching vibration at 1209 cm\(^{-1}\) for compound (A7).

\[
\text{Equation 13. Synthesis of A4}
\]

Figure 6. FT-IR Spectrum of Compound (A4)

3.6. Characterization of 2-(9H-xanthen-9-yl-oxy)-1,3-dithiolan-4-one (A5)
The compound (A8) was synthesized by the reaction of (A7) with ethyl 2-chloroacetate; this compound was identified by FTIR spectroscopy by appearing of (C=O) stretching vibration at 1738 cm\(^{-1}\) compound (A8) and also the disappearing of the (C=S).

\[
\text{Equation 14. Synthesis of A8}
\]
3.7. Characterization of 9-(4-(4-bromophenyl)-1,3-dithiole-2-yl)-9H-xanthene (B1)

The compound (B1) was synthesized by the reaction of (A7) with 2-bromo-1-(4-bromophenyl)ethanone; this compound was identified by FTIR spectroscopy by appearing of (C=C) stretching vibration at 1688 cm\(^{-1}\) compound (B1) disappearing of the (C=S) vibration for compounds (A7); respectively (B1) was also identified by using 1H-NMR appearing of (4.8) for (1H) (S-CH-O)1,3-dithiole (5.4) for (1H) (O-CH-C)xanthene (5.6) for (1H) (S-CH=C)1,3-dithiole (7-8) for H Aromatic 13C-NMR appearing of (62.5) for (O-C)xanthene (77) for (S-C-O)1,3-dithiole (120-135) for Aromatic (155) for (C=C)xanthene.

![Equation 15. Synthesis of B1](image)

**Figure 7.** FT-IR Spectrum of Compound (A5)

**Figure 8.** FT-IR Spectrum of Compound (B1)
3.8. Characterization of (9H-xanthen-yl)hydrazine (B2)

The compound (B2) was synthesized by the reaction of Xanthydrol with Hydrazine hydrate; this compounds was identified by FTIR spectroscopy by appearing of (N-H,N-H) stretching vibration at 3200,3500 cm⁻¹ compound (B2) and also the disappearing of the (O-H) bond at 3345 cm⁻¹ in compound (Xanthydrol).
3.9. Synthesis of Potassium 2-(9H-xanthen-yl) hydrazinecarbodithoate (B3)

The compound (B3) was synthesized by the reaction of (B2) with carbon disulfide; (this compound was identified by FTIR spectroscopy by the disappearing of the (N-H$_2$) bond at 3200-3400 cm$^{-1}$ in compound and appearing of (C=S) stretching vibration at 1207 cm$^{-1}$ for compounds (B3).
3.10. Characterization of 2-(2-(9H-xanthen-9-yl)hydrazinyl)-1,3-dithiolan-4-one (B4)

The compound (B4) was synthesized by the reaction of (B3) with ethyl 2-chloroacetate; this compound was identified by FTIR spectroscopy by appearing of (C=O) stretching vibration at 1738 cm\(^{-1}\) in compounds (B4) and also the disappearing of the (C=S) bond at 1207 cm\(^{-1}\) in compound (B3).

**Equation 18. Synthesis of B4**

\[
\text{potassium 2-(9H-xanthen-9-yl)hydrazinecarbodithioate} + \text{ethyl 2-chloroacetate} \xrightarrow{\text{reflux}} \text{2-(2-(9H-xanthen-9-yl)hydrazinyl)-1,3-dithiolan-4-one}
\]
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