



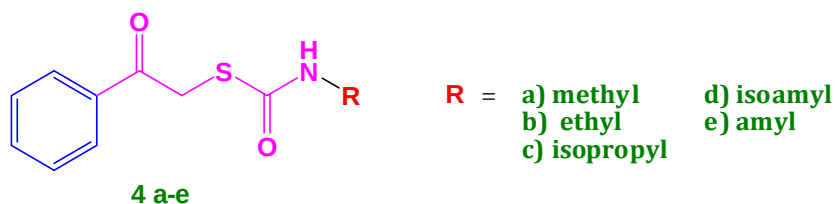
Synthesis of S-2-Oxo-2-Phenylethyl Alkylcarbamothioates

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GRAPHICAL ABSTRACT

Synthesis of S-2-oxo-2-phenylethyl alkylthiocarbamates **4 a-e**.



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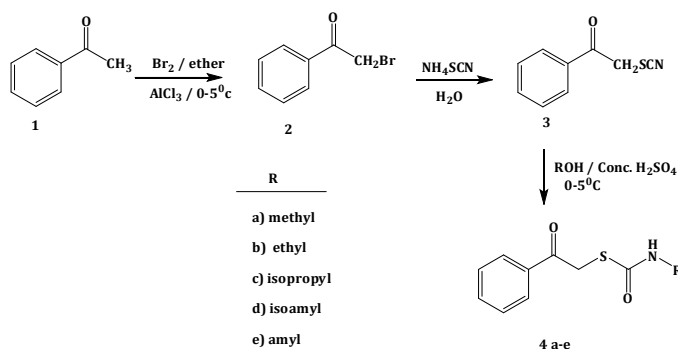
ABSTRACT

The current study reports the synthesis of S-2-oxo-2-phenylethyl alkylthiocarbamates **4 a-e**. Bromination of acetophenone **1** with bromine in the presence of aluminium chloride gave phenacylbromide **2**, which on further reaction with ammonium thiocyanate afforded the 1-phenyl-2-thiocyanatoethanone **3**; treatment of **3** with appropriate alcohols in the presence sulphuric acid yielded the corresponding thiocarbamates **4 a-e**. All the synthesized compounds were characterized by IR and NMR spectroscopic data.

1. Introduction

Thiocarbamates are important class of compounds that have numerous biological effects ranging from pesticidal, fungicidal, bactericidal, anesthetic and antiviral activity; but the most noted applications of these compounds are their use as commercial pesticides and particularly as herbicides. Some are used for vector control in public health [1-5]. Recent studies reported that some of the thiocarbamates are possessed antitrypanosomal activity [6], hepatocyte growth factor receptor binder [7], and also used as a catalysts in bromoaminocyclization [8], asymmetric synthesis [9] and peptide ligation reactions [10] etc.

This observation prompted us to undertake the synthesis of S-2-oxo-2-phenylethyl alkylthiocarbamates **4 a-e**. Bromination of acetophenone **1** with bromine in the presence of aluminium chloride gave phenacylbromide **2**, which on further reaction with ammonium thiocyanate afforded the 1-phenyl-2-thiocyanatoethanone **3**; treatment of **3** with appropriate alcohols in the presence sulphuric acid yielded the corresponding thiocarbamates **4 a-e** (Scheme 1).



Scheme 1 Synthesis of compounds **4 a-e**

2. Synthesis

2.1 Synthesis of phenacyl bromide, **2**

To a solution of acetophenone (0.10 mol), bromine (0.10 mol) and a pinch of aluminium chloride were stirred with diethyl ether (25 mL) for about 30 min. The contents were poured into ice cold water and separated with diethyl ether (3 x 25 mL), remove the solvent *in vacuo* afforded the compound **2**. Yield: 90 %; m.p.: 49-50 °C. Lit. 48-50 °C [11]. ¹H NMR (CDCl₃, 400 MHz) δ 4.44 (s, 2H, -CH₂), 7.48 – 7.99 (m, 5H, Ar-H). ¹³C NMR (CDCl₃, 100 MHz) δ 31.01, 128.88, 128.95, 133.91, 133.99, 192.01.

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2.2 Synthesis of 1-phenyl-2-thiocyanatoethanone, 3

To a solution of phenacylbromide 2 (0.10 mol), ammonium thiocyanate (0.11 mol) in water (2 mL) was added and the mixture stirred for 30 min. The contents were poured into cold water and the separated solid was filtered, washed with water, dried and crystallized from aqueous ethanol. Yield: 94 %; m.p.: 67 °C. Lit. 67–69 °C [12].

2.3 General procedure for the synthesis of thiocarbamates, 4 a-e

To a suspension of 3 (0.10 mol), appropriate alcohols (0.10 mol), conc. H_2SO_4 (5.0 mL) was added while shaking and cooling. The reaction mixture is allowed to stand at 0–5 °C for 6 hours and poured into ice water. The separated solid was filtered, washed with water, dried and crystallised.

2.3.1. S-2-oxo-2-phenylethyl methylcarbamothioate, 4a:

Yield: 72 %. IR (KBr): 3309, 3139 (NH str.), 1650 (CO str.), 603, 765 cm^{-1} . (–OCN str.), 1116 cm^{-1} . ^1H NMR (CDCl_3 , 400 MHz) δ 2.89 (s, 3H, –CH₃), 4.71 (s, 2H, –SCH₂), 5.01 (s, 1H, NH), 7.55 – 7.98 (m, 5H, Ar-H).

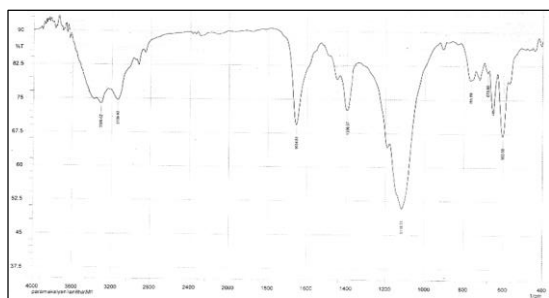


Fig.1 FT-IR spectra of S-2-oxo-2-phenylethyl methylcarbamothioate, 4a

2.3.2. S-2-oxo-2-phenylethyl ethylcarbamothioate, 4b:

Yield: 77 %. IR (KBr): 3313, 3137 (N-H str.), 1649 (CO str.), 1114, 756, 651, 603 cm^{-1} . ^1H NMR (CDCl_3 , 400 MHz) δ 1.09 (s, 3H, –CH₃), 3.09 (s, 2H, –CH₂), 4.79 (s, 2H, –SCH₂), 5.08 (s, 1H, NH), 7.50 – 7.99 (m, 5H, Ar-H).

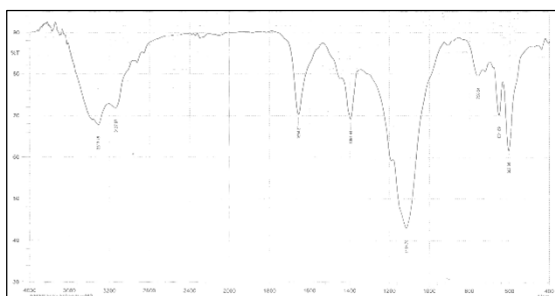


Fig.2 FT-IR spectra of S-2-oxo-2-phenylethyl ethylcarbamothioate, 4b

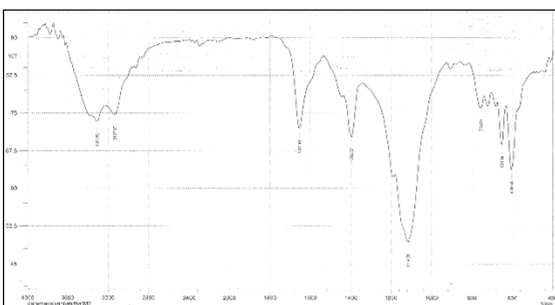


Fig.3 FT-IR spectra of S-2-oxo-2-phenylethyl methylcarbamothioate, 4c

2.3.3. S-2-oxo-2-phenylethyl isopropylcarbamothioate, 4c:

Yield: 73 %. IR (KBr): 3303, 3138 (NH str.), 1647 (CO str.), 1396, 1114, 756, 651, 603 cm^{-1} . ^1H NMR (CDCl_3 , 400 MHz) δ 1.31 (m, 6H, 2 CH₃), 4.11 (m, 2H, –CH), 4.72 (s, 2H, –SCH₂), 5.07 (s, 1H, NH), 7.51 – 7.95 (m, 5H, Ar-H).

2.3.4. S-2-oxo-2-phenylethyl isopentylcarbamothioate, 4d:

Yield: 65 %. IR (KBr): 3305, 3135 (NH str.), 1650 (CO str.), 1387, 1110, 755, 649 cm^{-1} . ^1H NMR (CDCl_3 , 400 MHz) δ 1.03–3.68 (m, 11H, 2 CH₃, 2 CH₂, CH), 4.19 (s, 2H, –SCH₂), 5.07 (s, 1H, NH), 7.49 – 7.93 (m, 5H, Ar-H).

2.3.5. S-2-oxo-2-phenylethyl pentylcarbamothioate, 4e:

Yield: 62 %. IR (KBr): 3381 (NH str.), 2956, 2856, 1647 (CO str.), 1621, 767 cm^{-1} . ^1H NMR (CDCl_3 , 400 MHz) δ 1.01–3.72 (m, 11H, CH₃, 4 CH₂), 4.21 (s, 2H, –SCH₂), 5.11 (s, 1H, NH), 7.32 – 7.87 (m, 5H, Ar-H).

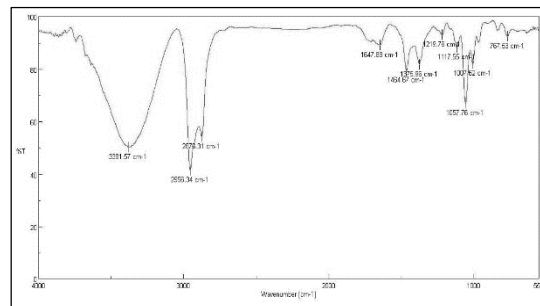


Fig.4 FT-IR spectra of S-2-oxo-2-phenylethyl methylcarbamothioate, 4e

3. Conclusion

In view of the importance of thiocarbamates, it has been planned to prepare S-2-oxo-2-phenylethylalkylthiocarbamates 4 a-e from different alcohols. All the compounds (3 and 4 a-e) were answered positive sulphur and nitrogen test. All the compounds were characterized by IR and NMR spectroscopic data. The presence of carbonyl groups (thiocarbamate C=O) in 4 a-e was established by IR bands in the region 1650–1700 cm^{-1} . The method proposed in this investigation has facile manner of preparation and isolation of product.

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