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Research Article

FACILE SYNTHESIS OF α-AROYL KETENE DITHIOACETALS USING SUBSTITUTED ACETOPHENONES

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ABSTRACT

Simple, efficient and facile synthesis of different α- aroyl ketene dithioacetals by using substituted acetophenones.

Keywords: α-aroyl ketene dithioacetals, acetophenone, carbon disulfide, methyl iodide.

INTRODUCTION

Ketene dithioacetals are versatile intermediates in organic synthesis. Large amount of work, since the last decade, has given rise to new view in their chemistry. The theme of this article is having two objectives, first is to highlight the new prospects in the chemistry of useful ketene dithioacetals, and second, to provide an internal link between ketene dithioacetal groups and a variety of other functional groups, which has brought out many new facts that will help in future designs.A ketene is an organic compound of the form $R'R''C=C=O$.The term is also used specifically to mean ethenone, thesimplest ketene, where R' and R'' are hydrogens. The reactions of ketene dithioacetals always governed by alkylthio functionality have been found to be useful. Ketene dithioacetals can be classified on the basis of theirsubstitution patterns at the α-position of the ketene dithioacetal functionality[1-3]. For instance, α-oxo ketene dithioacetals, which bear a carbonyl group at the α-C atom, are versatile intermediates in organic synthesis and their preparation and diverse applications, especially serving as1,3-electrophilic three-carbonsynthones have been reported[4-7]. Based on the structural features, the α-C of ketene dithioacetals is reactive towards electrophiles and this electrophilic susceptibility makes the functionalization of ketene dithioacetals a convenient tool for the construction of diverse ketene dithioacetal scaffolds and other useful building blocks[8-9]. These arylketones are well known for their use as a building block for the synthesis of various pharmaceutical and pharmacologically important compounds[10-11]. They are also in use for dye, fragrance and agrochemical industries[12-13]. α-Amino-arylketone and closely related skeletons are reported as antitubulin agents[14-15] and also exhibit better anti-tumor activity against human cancer cell than colchicine[16-17]. Functionalized α-aminated-diarylketones were used as an intermediate for synthesis of various natural products and biologically useful compound. As these α-aroylketenedithioacetals are useful three carbon synthones extensively employed for the synthesis of a wide variety of heterocyclic compounds and also in several aromatic ring annulation reactions. These are α,β-unsaturated carbonyl compounds with two electron-donating alkylsulafanyl groups on one end and an electron-withdrawing aroyl group at the other end of the double bond, i.e., they are "push-pull" alkenes. Depending on the nucleophile and the reaction conditions either 1,2- or1,4-nucleophilc additions onare possible[18-19]. Since alkylsulfanyl groups are good leavinggroups, subsequent to the attack of a nucleophile, one of the alkylsulfanyl groups of the intermediate leave to regenerate the conjugated system.Being polarized alkenes these also react with bi-functional molecules having nucleophilic and electrophilic centers to furnish cyclic compounds[20-21]. Generally, the reaction centers in α-oxo ketene dithioacetals could be the carbonyl group, the double bond, or sulfur atoms, and deprotonation can occur at several sites, which really depend upon the structure of the α-oxo ketene dithioacetals[22-23]. The presence of two β-alkyl thio substituents in

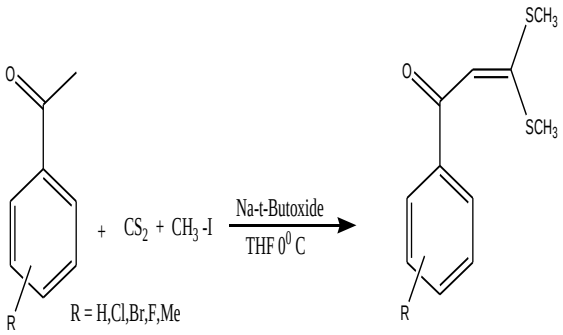
α-oxo ketene dithioacetals affords a higher level of oxidation in manipulation of functional groups and in many cases, generates a product containing an S-functionalized group, which can be further employed in additional synthetic transformations. Numerous one-pot transformations, involving a cascade of 1,2- and 1,4-nucleophilic addition reactions to α-oxo ketone dithioacetals, have been widely employed to synthesize a variety of heterocyclic compounds, suggesting that α-oxo ketene dithioacetal compounds can act as an extremely versatile three-carbon synthon for the manipulation of functional groups and the construction of C–C bonds[24-25].

MATERIAL AND METHODS

IR spectra were recorded on a ShimadzuFTIR using KBr discs. 1H NMR spectra were recorded in DMSO-d6 at 400 MHz using TMS as an internal standard. Mass spectra were recorded on Shimadzu GC-MS using electrospray ionization technique. The elemental analysis was carried out on Flash EA-1112, 50/60 Hz, CHNS analyzer. The progress of the reactions was monitored by TLC.

GENERAL PROCEDURE

In a clean conical flask take substituted acetophenone (10 mmole) then add THF as solvent then sod.tert.butoxide as strong base (2 mole equi.to acetophenone) stirr at 0^0 C.then add CS_2 (10 mmole) at the end add CH_3I (20 mmole) . Stirr this mixture strictly at 0^0 C for 5-8 hours and then workout in ice cold water.

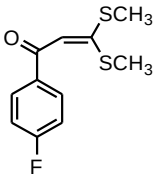
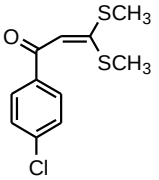
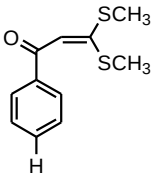
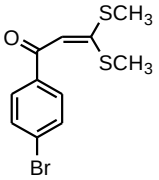
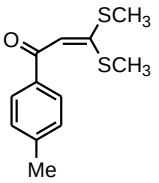


Scheme: Synthesis of α-aroyl ketene dithioacetal

RESULTS AND DISCUSSION

The different and substituted α-aroyl ketene dithioacetals were prepared means simply one pot synthesis by using simple and cheap techniques reprted this synthesis. The all products given in table below synthesized under very low temperature on stirring for about 5-8 hours by using basic conditions due to sodium tertiary butoxide. The base used 2 mole equivalent to the weight of substituted acetophenones.

Table 1

Sr. No.	Product	Reaction Time (hr.)	Melting Point (^{0} C)	Yield (%)
1.		5-6	112	67
2.		6-7	101.4	62
3.		5-6	103.9	71
4.		6-7	87.8	70
5.		4-5	112.5	66

SPECTRAL DATA

1)1-(4-fluorophenyl)-3-3bis(methylthio) prop-2-en-1-one

Orange Solid, IR (KBr): 3058,2920,1620,1239,1157,520 cm^{-1};
^{1}H NMR(DMSO) :7.34(d, 1H), 7.28(d, 1H), 6.85(s, 1H), 2.48(s, 6H) ; ^{13}C NMR (DMSO) :188.2,165.4,132.2,115.4,107.8,18.1;
Mass (m/z): 243.3($m^{+\cdot}$), 146.1; $C_{11}H_{11}FOS_2$ C-54.52, H-4.58, F-7.84,O-6.60, S- 26.46.

2)1-(4-chlorophenyl)-3-3 bis(methylthio)prop-2-en-1-one

Red Solid, IR (KBr): 3047, 2985 ,1616, 1469, 1230, 783, 478, 401 cm^{-1};
^{1}H NMR(DMSO) :7.66(d, 1H), 7.44(d, 1H), 6.56(s, 1H), 2.31(s, 6H) ;^{13}C NMR (DMSO) :186.9,170.4,140.1,108.3,17.1 ;
Mass (m/z): 259.1($m^{+\cdot}$), 260.6(m+2); $C_{11}H_{11}ClOS_2$ C-51.05, H-4.28, Cl-13.70,O-6.18, S- 24.78.

3)3-3 bis(methylthio)-1-phenylprop-2-en-1-one

Brown Solid, IR (KBr): 3012, 2916 ,1696, 1473, 779, 590, 513 cm^{-1};
^{1}H NMR(DMSO) :7.75(d, 1H), 7.31(t, 1H) 7.42(t, 1H), 6.45(s, 1H), 2.18(s, 6H) ;
^{13}C NMR (DMSO) :187.5,171.1,131.8, 122.6,107.4,17.8 ;
Mass (m/z): 223.1($m^{+\cdot}$); $C_{11}H_{12}OS_2$ C-58.89, H-5.39,O-7.13, S- 28.59.

4)1-(4-bromophenyl)-3-3 bis(methylthio)prop-2-en-1-one

Reddish brown Solid, IR (KBr): 3067, 2923, 1677, 1238, 547, 462 cm^{-1};
^{1}H NMR(DMSO):7.59(d, 1H), 7.41(d, 1H), 6.29(s, 1H), 2.33(s, 6H) ;
^{13}C NMR (DMSO) :188.4,172.2,131.7, 127.9,16.9 ;
Mass (m/z):303.3.5($m^{+\cdot}$), 305.2(m+2) ; $C_{11}H_{11}BrOS_2$ C-43.57, H-3.66, Br-26.35,O-5.28, S- 21.15.

5)3-3 bis(methylthio)-1-p-tolylprop-2-en-1-one

Yellow Solid, IR (KBr): 3024, 2912 ,1688, 1238, 775, 585, 474 cm^{-1};
^{1}H NMR(DMSO) :7.54(d, 1H), 7.18(d, 1H), 6.44(s, 1H), 2.32(s, 6H), 2.28(s, 3H) ;
^{13}C NMR (DMSO):188.4, 170.9, 141.2, 128.4, 107.9,17.8 ;
Mass (m/z): 237.8($m^{+\cdot}$); $C_{12}H_{14}OS_2$ C-60.46, H-5.92, O-6.71, S- 26.90.

CONCLUSIONS

In summary, a convenient base mediated simple, non hazardous strategy has been developed by using simple on pot synthesis. Instead of methyl iodide we can use dimethyl sulphate also. To workout above mixture into distilled water is also very easy. In short we have developed easy and cheap method for synthesis of substituted ketene dithioacetals.

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