

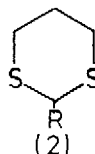
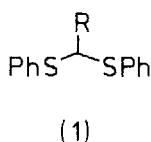
ALKYLATIONS OF BIS(PHENYLTHIO)ACETALS¹

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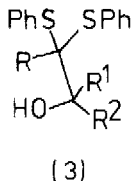
Summary: Bis(phenylthio)acetals can be lithiated with *n*-butyllithium-N,N,N',N'-tetramethylethylenediamine complex in hexane and consequently alkylated.

Bis(phenylthio)acetals (1), unlike dithians (2)^{2,3} have not found widespread use because of the difficulty of alkylating the lithium derivative^{4,5}.



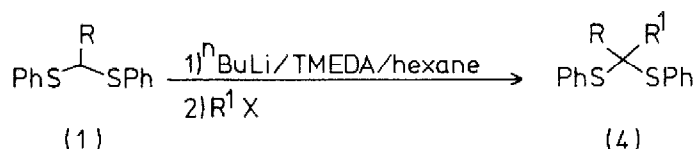
The bis(phenylthio)acetals (1) will form the lithium derivative with *n*-butyllithium in tetrahydrofuran (THF) and these have undergone conjugate additions to α,β -unsaturated ketones after formation of the cuprate⁶.

Blatcher and Warren⁷ have found that the bithioacetals (1) will react with aldehydes and ketones when the anion is formed using *n*-butyllithium in THF in the presence of N,N,N',N'-tetramethylethylenediamine (TMEDA) to give the adducts (3) in good yields.



The problem, therefore, seems not to lie in anion formation but in the alkylation step.

We have found that (1; R=Ph or alkyl) can be alkylated with alkyl iodides by treating (1) with n-butyllithium - TMEDA in hexane at 0°C followed by the alkyl halide.

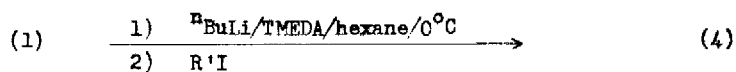


The results are given in the table⁸.

Bis(phenylthio)phenylmethane (1; R=Ph) could be alkylated with little loss in yield using n-butyllithium-TMEDA in THF, at 0°C while using the same conditions with (1; R=alkyl) gave only small amounts of alkylated product.

The best results were obtained with primary alkyl iodides.

In a typical experiment TMEDA (1.1mmol) was added to an efficiently⁹ stirred solution of n-butyllithium (1.05mmol) of a 1.4M solution in hexane) under nitrogen at 0°C. After 0.25h., the bis(phenylthio)acetal (1)¹⁰ (1.0mmol) was added and after stirring at 0°C for 1h., the alkyl iodide (1.0mmol) was added. The reaction was quenched with saturated aqueous ammonium chloride and extracted with ether to give, after chromatography, the product (4).

TableYields of (4) (%)^{a, b}

R'I	R=			
	Me	Et	ⁿ C ₅ H ₁₁	Ph ^c
MeI	97	93	96	95
EtBr	85	82	79	80
EtI	92	89	91	87
ⁿ PrI	90	86	89	91
ⁿ BuBr	78	74	77	64
ⁿ BuI	88	84	87	86
ⁿ C ₁₂ H ₂₅ Br	61	65	72	69
Allyl-Br	91	84	85	82
PhCH ₂ Br	63	58	56	44

a. isolated yields

b. new compounds have been characterised

c. these reactions were carried out using THF as solvent.

Yields were slightly lower if no solvent was used.

References and Notes.

1. Part of this work was carried out at the Department of Chemistry, The University, Southampton SO9 5NH. An S.R.C. Postdoctoral Fellowship for this is gratefully acknowledged.
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3. B.-T. Grobel and D. Seebach, Synthesis, 1977, 357
4. The sodium derivative of (1; R=Me) has been alkylated in liquid ammonia. A. Groling and J.F. Arens, Recueil Trav.Chim., 1962, 81, 1009, and G. Schill and C. Merkel, Synthesis, 1975, 387
5. See ref. 2 and E.J. Corey and D. Seebach, J.Org.Chem., 1966,31,4097
6. T. Mukaiyama, K. Narasaka and M. Furusato, J.Amer.Chem.Soc., 1972, 94, 8641
7. P. Blatcher and S. Warren, J.Chem.Soc.Perkin 1, 1979, 1074
P. Blatcher, J.I. Grayson and S. Warren, Chem.Comm., 1976, 547
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8. Very little C-S bond cleavage occurs under the reaction conditions employed. See W.E. Truce and F. E. Roberts, J.Org.Chem., 1963, 28, 96 and refs. cited therein.
9. Efficient stirring is necessary as the reactions are exothermic.
10. The bis(phenylthio)acetals (1) were prepared by alkylation of bis(phenylthio)methane or by treating the appropriate aldehyde with thiophenol in the presence of an acid catalyst. See ref 5 and refs. cited therein.

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