A Novel Route to 1,2-Benzothiazin-4-ones involving S-Dealkylation of an Arylalkyl Sulphide

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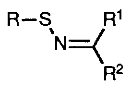
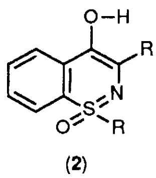
A novel preparation of the sulphenylimine, 1,2-benzothiazine-4-one involving sequential nucleophilic displacement of a toluene-*p*-sulphonate group from an oxime tosylate and dealkylation of an arylalkyl sulphide is reported; a possible mechanism is presented.

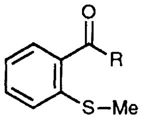
Sulphenylimines (**1**) are a little-studied class of sulphur–nitrogen compounds. Recently,[1] their synthesis and chemical properties have been reviewed as part of a wider discussion of related structures. The usual route of synthesis of these compounds involves reaction of an imine with a disulphide or sulphenyl chloride (Scheme 1, X = Cl, SR). This report prompts us to describe here an unusual synthesis of a cyclic sulphenylimine, a 1,2-benzothiazin-4-one. This unprecendented synthesis appears to involve a sequential nucleophilic thioether displacement of a toluene-*p*-sulphonate group from an oxime tosylate followed by dealkylation of the resultant sulphonium salt.



(**1**)

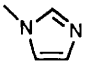


(**2**)



(**3**) R = OH

(**4**) R =



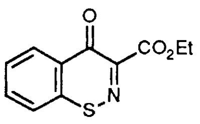
(**5**) R = CH(COMe)CO$_2$Et

(**6**) R = CH$_2$CO$_2$Et

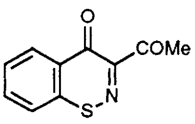
(**7**) R = C(NOH)CO$_2$Et

(**8**) R = C(NOTs)CO$_2$Et

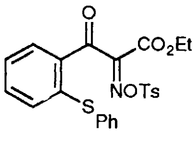
(**12**) R = C(NOH)COMe



(**9**)



(**13**)



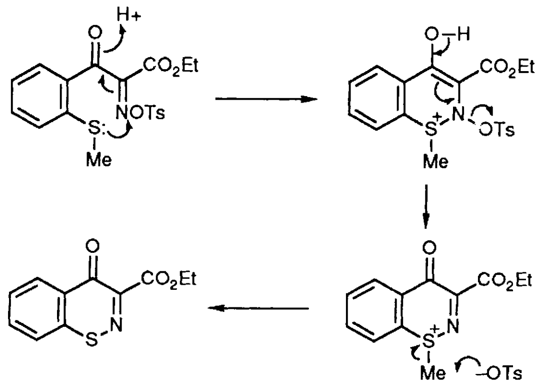
(**10**)

Ts = SO$_3$C$_6$H$_4$Me-*p*

As part of our continuing studies on the chemistry of sulphoximines,[2–4] we have been examining routes to the 1,2-benzothiazine-4-one-1-oxide system (**2**). Thus, 2-methylthiobenzoic acid (**3**) was converted to its imidazolide (**4**)† and condensed with the thallium salt of ethyl acetoacetate[5] to give ethyl acetyl(2-methylthiobenzoyl) acetate (**5**), base hydrolysis of which gave ethyl (2-methylthiobenzoyl) acetate (**6**). Nitrosation of (**6**) (NaNO$_2$–HAc) (Ac = acetyl) gave the oxime (**7**), tosylation of which gave ethyl 2-(2-methylthiobenzoyl)-2-(*O*-toluene-*p*-sulphonyloximino)acetate (**8**).

Thermolysis of (**8**) in toluene at 80 °C in the presence of a catalytic amount of toluene-*p*-sulphonic acid gave, in 72% yield, a new compound identified by NMR spectroscopy and mass spectrometry as ethyl 1,2-benzothiazine-4-one-3-carboxylate (**9**) {$\nu_{C=O}$ 1737, $\nu_{C=N}$ 1632; NMR δ 7.4—8.7 (4H, m,

Scheme 1



Scheme 2

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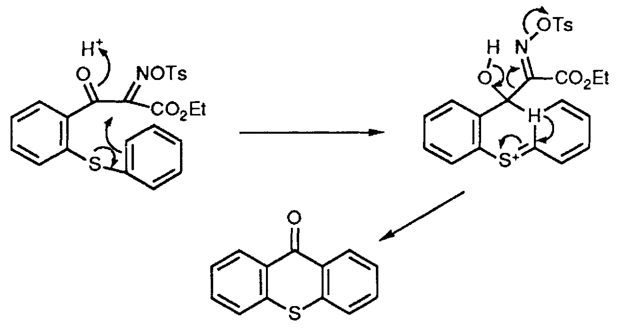
† All new compounds gave satisfactory elemental analyses.



(**11**)

Scheme 3

arylH), 4.45 (2H, q, OEt), 1.4 (3H, t, OEt)}. Clues to the possible mechanism of this reaction are provided by the fact that the thermolysis of (**8**) in the absence of acid gave no decomposition at all; that methyl toluene-*p*-sulphonate could be detected in the reaction medium; that heating the oxime (**7**) in acidic ethanol gave, by a different reaction, ethyl 2-thiomethylbenzoate but that treatment of (**7**) with trifluoroacetic anhydride readily produced (**9**) and that reaction of the *S*-phenyl analogue (**10**) gave, in poor yield, thioxanthone (**11**) as the only identifiable product.

These findings establish the need for a good leaving group on the oxime nitrogen atom, and a nucleophilic sulphur atom. A possible mechanism accounting for these facts is shown in Scheme 2 whilst Scheme 3 illustrates the formation of thioxanthone. The latter product presumably arises because of the reduced nucleophilicity of the sulphur atom in diaryl sulphides but increased reactivity of *S*-aryl rings with electrophilic centres.

It might be expected that the reaction would be general for any system containing a good electron withdrawing group in the 3-position of the final 1,2-benzothiazine-4-one. Indeed, it was found that the oxime of the acetyl analogue (**12**) reacted with toluene-*p*-sulphonyl chloride to give (**13**) directly in 52% yield. Attempts to isolate the presumed intermediate tosyloxime were unsuccessful.

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References

1 L. Craine and M. Raban, *Chem. Rev.*, 1989, **89**, 689.

2 P. D. Kennewell and J. B. Taylor, *Chem. Soc. Rev.*, 1975, **4**, 189; 1980, **9**, 477.

3 A. C. Barnes, P. D. Kennewell, and J. B. Taylor, *J. Chem. Soc., Chem. Commun.*, 1973, 776.

4 S. Jones, P. D. Kennewell, W. R. Tully, R. Westwood, and P. G. Sammes, *J. Chem. Soc., Perkin Trans. 1*, 1990, 447.

5 E. C. Taylor, G. H. Hawkes, and A. McKillop, *J. Am. Chem. Soc.*, 1968, **90**, 2421.