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10-Alkyl- & 10-Aminoalkyl-2,2′-bis(trifluoromethyl)-7,10′-Biphenothiazines — Revision of Structure of Dimeric Phenothiazines from the Alkylation of 2-Trifluoromethylphenothiazine*

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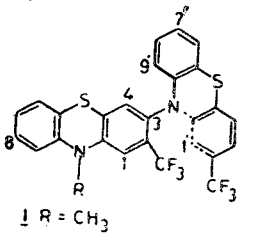
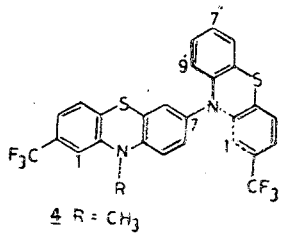
The structures of dimeric products obtained in the alkylation of 2-trifluoromethylphenothiazine are shown to be 10-alkyl(10-aminoalkyl)-2,2′-bis(trifluoromethyl)-7,10′-biphenothiazines (4-6) by X-ray crystallographic studies.

RECENTLY one of us reported the formation of dimeric phenothiazine derivatives during the alkylation of 2-trifluoromethylphenothiazine[1]. The products were assigned structures 1, 2 and 3 tentatively on the basis of their 220 MHz NMR spectra which seemed to favour 3,10′-link of the two phenothiazine units over a 7,10′-link which the alternative structures 4, 5 and 6 possess. Subsequently in an effort to place the structural assignments on a firmer footing, 360 MHz PMR and 100 MHz ^{13}CMR spectra were run but neither displayed sufficient resolution for clinching the issue. Hence an X-ray crystallographic study was undertaken. The dimeric product from the alkylation of 2-trifluoromethylphenothiazine with methyl iodide was found to give crystals suitable for X-ray investigation.



1 R = CH_3
2 R = $CH_2CH_2NMe_2$
3 R = $CH_2CH_2CH_2$-N⟨⟩N-CH_3



4 R = CH_3
5 R = $CH_2CH_2NMe_2$
6 R = $CH_2CH_2CH_2$-N⟨⟩N-CH_3

Crystals of 4 are monoclinic and the crystal data are: $a = 7{\cdot}60$ Å $\pm 0{\cdot}01$, $b = 26{\cdot}76$ Å $\pm 0{\cdot}03$, $c = 13{\cdot}13$ Å $\pm 0{\cdot}02$ and $\beta = 91{\cdot}22°$, space group = $P2_1/c$,

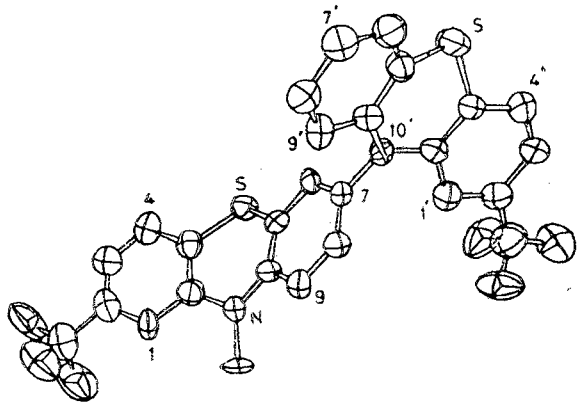


Fig. 1

$D_m = 1{\cdot}46$ g cm^{-3} (by flotation in chloroform and toluene mixture), $D_x = 1{\cdot}48$ g cm^{-3} (including solvent molecule as obtained from structure determination), volume = 2672 Å^3, $Z = 4$. The X-ray diffraction data were collected manually on a General Electric XRD 3 diffractometer to $2\theta = 120°$ using Ni filtered Cu-K_α radiation ($\lambda = 1{\cdot}5418$ Å). The structure was solved by direct methods and refined by using 2926 reflections which had an intensity greater than 2σ out of 4098 reflections measured. At the present stage of refinement the crystallographic R factor for 2926 reflections used in deriving the structure is 14% and the refinement is continuing. In addition to four molecules of biphenothiazines, the unit cell also contains some disordered solvent molecules as indicated from the density measurement.

The molecule is shown in the ORTEP drawing (Fig. 1). The mean planes of the two rings make an angle of 91° with each other. The dihedral angles at S and N for each of the phenothiazines are 149° and 156° respectively, and are within the range reported for the phenothiazines[2,3]. Details of the structure will be published elsewhere.

From Fig. 1 it is seen that the correct structure is 4 and not 1 as indicated earlier[1]. The complex pattern of the aromatic protons in the NMR spectra of 2 and 3 are strongly similar to the one found for 1. On this basis and taking into account their common mode of formation, the structures of 2 and 3 must be revised to 5 and 6 respectively.

References

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