Acta Crystallographica Section E
Structure Reports Online
ISSN 1600-5368

2-Methyl-6,7-dihydrothiazolo[3,2-*b*][1,2,4]thiadiazine 1,1-dioxide

Michel Evain,[a]* Cyrille Landreau,[b] David Deniaud,[b] Alain Reliquet[b] and Jean Claude Meslin[b]

[a]Institut des Matériaux Jean Rouxel, Laboratoire de Chimie des Solides, 2 rue de la Houssinière, BP 32229, 44322 Nantes CEDEX 3, France, and [b]Laboratoire de Synthèse, Organique UMR CNRS 6513, Faculté des Sciences et des Techniques, 2 rue de la Houssinière, BP 92208, 44322 Nantes CEDEX 3, France

Correspondence e-mail: evain@cnrs-imn.fr

Key indicators

Single-crystal X-ray study
T = 298 K
Mean σ(C–C) = 0.002 Å
R factor = 0.045
wR factor = 0.110
Data-to-parameter ratio = 33.9

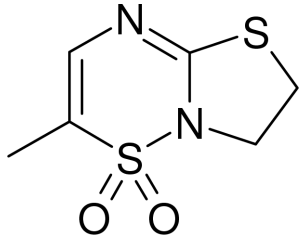
For details of how these key indicators were automatically derived from the article, see http://journals.iucr.org/e.

Received 21 February 2002
Accepted 1 March 2002
Online 8 March 2002

The title compound, $C_6H_8N_2O_2S_2$, represents one of the first examples of a novel sulfonamide family. The molecule, which is roughly planar, is built up from two fused rings, *viz*. the thiadiazine 1,1-dioxide and thiazole rings.

Comment

Heterocyclic sulfonamides are interesting compounds because of their promising chemotherapeutic potential. Among these, 1,2,4-benzothiadiazine 1,1-dioxides are already known to possess diuretic and antihypertensive properties (Edwards & Weston, 1990). The bioisosteric replacement of the benzene ring with a pyridine ring (Neill *et al.*, 1998; de Tullio *et al.*, 1999; Khelili *et al.*, 1999; Pirotte *et al.*, 2000) has led to the discovery of a new class of PCOs (potassium channel openers), namely the pyrido[4,3-*e*]- and [2,3-*e*][1,2,4]thiadiazine-1,1-dioxides. Furthermore, Arranz *et al.* (1998, 1999) have described the synthesis and antiviral activity (HIV-1) of derivatives fused to a thiophene nucleus. These thieno[3,4-*e*][1,2,4]thiadiazines represent a new class of non-nucleoside reverse transcriptase inhibitors (NNRTIs). Ever since, such compounds have also been assessed for their antihypertensive properties as voltage-dependent calcium channel blockers (Arranz *et al.*, 2000). On the other hand, many condensed thiazoles display significant biological activities. As a recent example, several 1-aryl-1*H*,3*H*-thiazolo[4,3-*b*]quinazolines have been found to possess antitumor properties (Grasso *et al.*, 2000). These considerations led us to prepare 6,7-dihydrothiazolo[3,2-*b*][1,2,4]thiadiazine 1,1-dioxides, in which both these heterocycles are combined. A full report of the synthesis, as well as of the physical and analytical data, will be presented separately (Landreau *et al.*, 2002). To our knowledge, the title compound, (I), is one of the first examples in this novel sulfonamide family. The molecule, shown in Fig. 1, is built up from fused thiadiazine 1,1-dioxide and thiazole rings. The fused-ring system is nearly planar, with deviations less than 0.1 Å, except for atom C6, which is 0.363 (3) Å from the plane.



(I)

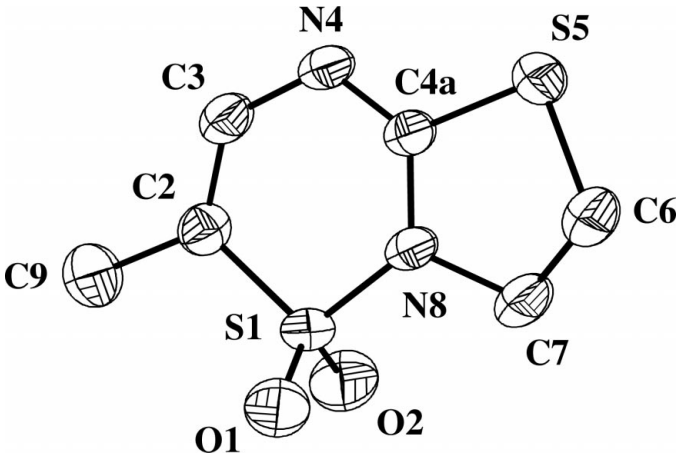


Figure 1
The molecular structure of the title compound, showing 50% probability displacement ellipsoids. H atoms have been omitted for clarity.

Experimental

To a solution of *N*′-(4,5-dihydrothiazol-2-yl)-*N,N*-dimethylformamidine (2 mmol) in dichloromethane (10 ml) was added ethanesulfonyl chloride (2.4 mmol). The reaction mixture was then stirred at room temperature for 4 h. After cooling to 273 K, triethylamine (4.8 mmol) was added and the reaction mixture was further stirred at room temperature for 16 h, then concentrated *in vacuo*. The residue was diluted with dichloromethane and filtered through a short pad of silica gel using, as eluant, CH_2Cl_2/EtOAc (1:1). The mixture was then treated with a solution of iodomethane (2 ml) in tetrahydrofuran (5 ml). After stirring at room temperature for 5 d, the reaction mixture was evaporated to dryness and a solution of triethylamine (1 ml) in dichloromethane (10 ml) was added to this. Stirring was continued at room temperature for 2 d and the solvent was removed. The resulting residue was diluted with dichloromethane and chromatographed (CH_2Cl_2/EtOAc, 9:1). Single crystals suitable for X-ray analysis were obtained by slow evaporation at room temperature from diethyl ether.

Crystal data

$C_6H_8N_2O_2S_2$
M_r = 204.3
Monoclinic, $P2_1/c$
a = 8.3906 (8) Å
b = 8.4339 (8) Å
c = 12.0900 (11) Å
β = 98.036 (12)°
V = 847.15 (14) Å^3
Z = 4
D_x = 1.601 Mg m^{-3}
Mo $K\alpha$ radiation
Cell parameters from 8000 reflections
θ = 12.7–27.8°
μ = 0.59 mm^{-1}
T = 298 K
Block, colourless
0.35 × 0.28 × 0.22 mm

Data collection

Nonius CAD-4 and Stoe IPDS diffractometers
$\theta/2\theta$ and ω scans
Absorption correction: Gaussian (*JANA*2000; Petricek & Dusek, 2000)
T_{min} = 0.885, T_{max} = 0.909
25270 measured reflections
3729 independent reflections
2287 reflections with $I > 2\sigma(I)$
R_{int} = 0.061
θ_{max} = 35.1°
$h = -13 \rightarrow 13$
$k = -13 \rightarrow 13$
$l = -19 \rightarrow 15$
3 standard reflections
frequency: 60 min
intensity decay: 1.0%

Refinement

Refinement on F^2
$R[F^2 > 2\sigma(F^2)]$ = 0.045
$wR(F^2)$ = 0.110
S = 1.42
3729 reflections
110 parameters
H-atom parameters constrained
$w = 1/[\sigma^2(I) + 0.0016I^2]$
$(\Delta/\sigma)_{max}$ = 0.001
$\Delta\rho_{max}$ = 0.71 e Å^{-3}
$\Delta\rho_{min}$ = −0.46 e Å^{-3}
Extinction correction: B–C type 1 Lorentzian isotropic (Becker & Coppens, 1974)
Extinction coefficient: 0.93 (6)

CAD-4 and IPDS data sets (11575 and 13695 reflections, respectively) were scaled on the basis of 5421 common reflections with $I > 10\sigma(I)$ [scale factor: 0.0354 (1)]. The CH_3 group was located in a difference Fourier map. All H atoms were then fixed at calculated positions. Riding isotropic displacement parameters were used for all H atoms.

Data collection: *CAD*-4-*PC Software* (Enraf–Nonius, 1993) and *EXPOSE* (Stoe & Cie, 1997); cell refinement: *CELL* (Stoe & Cie, 1997); data reduction: *JANA*2000 (Petricek & Dusek, 2000); program(s) used to solve structure: *SHELXTL* (Sheldrick, 1995); program(s) used to refine structure: *JANA*2000; molecular graphics: *DIAMOND* (Brandenburg & Berndt, 1999); software used to prepare material for publication: *JANA*2000.

The authors gratefully acknowledge financial support by the French Ministry of Education and CNRS.

References

Arranz, E., Díaz, J. A., Ingate, S. T., Witvrouw, M., Pannecouque, C., Balzarini, J., De Clercq, E. & Vega, S. (1998). *J. Med. Chem.* **41**, 4109–4117.
Arranz, E., Díaz, J. A., Ingate, S. T., Witvrouw, M., Pannecouque, C., Balzarini, J., De Clercq, E. & Vega, S. (1999). *Bioorg. Med. Chem.* **7**, 2811–2822.
Arranz, E., Díaz, J. A., Vega, S., Campos-Toimil, M., Orallo, F., Cardelús, I., Llenas, J. & Fernández, A. G. (2000). *Eur. J. Med. Chem.* **35**, 751–759.
Becker, P. J. & Coppens, P. (1974). *Acta Cryst.* A**30**, 129–153.
Brandenburg, K. & Berndt, M. (1999). *DIAMOND*. Crystal Impact GbR, Bonn, Germany.
Edwards, G. & Weston, A. H. (1990). *Trends Pharmacol. Sci.* **11**, 417–422.
Enraf–Nonius (1993). *CAD*-4-*PC Software*. Enraf–Nonius, Delft, The Netherlands.
Grasso, S., Micale, N., Monforte, A.-M., Monforte, P., Polimeni, S. & Zappalà, M. (2000). *Eur. J. Med. Chem.* **35**, 1115–1119.
Khelili, S., de Tullio, P., Lebrun, P., Fillet, M., Antoine, M.-H., Ouedraogo, R., Dupont, L., Fontaine, J., Felekidis, A., Leclerc, G., Delarge, J. & Pirotte, B. (1999). *Bioorg. Med. Chem.* **7**, 1513–1520.
Landreau, C., Deniaud, D., Reliquet, A. & Meslin, J. C. (2002). *Tetrahedron Lett.* In the press.
Neill, C. G., Preston, P. N. & Wightman, R. H. (1998). *Tetrahedron*, **54**, 13645–13654.
Petricek, V. & Dusek, M. (2000). *JANA*2000. Institute of Physics, Praha, Czech Republic.
Pirotte, B., Ouedraogo, R., de Tullio, P., Khelili, S., Somers, F., Boverie, S., Dupont, L., Fontaine, J., Damas, J. & Lebrun, P. (2000). *J. Med. Chem.* **43**, 1456–1466.
Sheldrick, G. M. (1995). *SHELXTL*. Version 5.0. Analytical X-ray Instruments Inc., Madison, Wisconsin, USA.
Stoe & Cie (1997). *EXPOSE* and *CELL* in Stoe IPDS. Stoe & Cie GmbH, Darmstadt, Germany.
Tullio, P. de, Ouedraogo, R., Dupont, L., Somers, F., Boverie, S., Dogné, J.-M., Delarge, J. & Pirotte, B. (1999). *Tetrahedron*, **55**, 5419–5432.