Structure of Chlormezanone

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The crystal of the title racemic compound, C₁₁H₁₂ClNO₃S, belongs to space group $P\bar{1}$ with cell dimensions of $a = 10.9608(6)$, $b = 11.407(1)$, $c = 11.9286(9)$ Å, $\alpha = 67.202(2)^\circ$, $\beta = 71.850(2)^\circ$, and $\gamma = 65.803(3)^\circ$. The final R value is 0.040. There are two crystallographically independent molecules in the crystal, which adopt significantly different conformations. The thiazinan rings take distorted half-chair conformations.

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Chlormezanone (2-(4-chlorophenyl)-3-methyl-1,3-thiazinan-4-one 1,1-dioxide) has a central sedative and muscle relaxant effect. Until recently, the drug was available for clinical use. Roujeau *et al.*¹ pointed out that the use of chlormezanone is associated with large increases in the risk of the Stevens-Johnson syndrome, or toxic epidermal necrolysis. Therefore, the drug was withdrawn from the market. Chlormezanone has been used as a racemic compound. We undertook an X-ray analysis of the racemate of the title compound in order to disclose its inherent structure so as to understand the structure-toxicity relationships of this drug.

Chlormezanone was purchased from Prestwick Chemical Inc. Single crystals of the molecule were grown from a methanol solution. A colorless prismatic crystal with a size of $0.4 \times 0.4 \times 0.2$ mm was mounted on a glass fiber and used for data collection. The structure was solved by direct methods, and non-H atoms were refined by the full-matrix least-squares method with anisotropic temperature factors. The positions of

all H-atoms were located from difference Fourier maps. The atomic parameters of all H-atoms were refined isotropically. The crystal and experimental data are given in Table 1. The atomic parameters of non-H atoms are given in Table 2.

ORTEP-III⁴ drawings of two crystallographically independent

Table 1 Crystal and experimental data

Formula: C ₁₁ H ₁₂ ClNO ₃ S
Formula weight = 273.73
Crystal system: triclinic
Space group: $P\bar{1}$ $Z = 4$
$a = 10.9608(6)$ Å $\alpha = 67.202(2)^\circ$
$b = 11.407(1)$ Å $\beta = 71.850(2)^\circ$
$c = 11.9286(9)$ Å $\gamma = 65.803(3)^\circ$
$V = 1233.3(2)$ Å ³
$D_x = 1.474$ g/cm ³
No. of observations ($I > 2.00\sigma(I)$) = 3625
$\theta_{\max} = 68.25^\circ$ with Cu K_α
$R(I > 2.00\sigma(I)) = 0.040$
$(\Delta/\sigma)_{\max} = 0.000$
$(\Delta\rho)_{\max} = 0.31$ e Å ⁻³
$(\Delta\rho)_{\min} = -0.29$ e Å ⁻³
Measurement: Rigaku RAXIS-RAPID
Program system: CrystalStructure 3.5.1 ²
Structure determination: SIR92 ³
Refinement: full-matrix

Table 2 Atomic coordinates and equivalent isotropic thermal parameters (B_{eq})

Atom	x	y	z	$B_{eq}(\text{Å}^2)$
Molecule I				
Cl(101)	0.72761(9)	0.21112(7)	0.12365(7)	5.37(2)
S(101)	1.00437(7)	-0.34452(6)	0.57552(6)	3.24(1)
O(101)	1.0622(2)	-0.3892(2)	0.4680(2)	4.09(4)
O(102)	1.0579(2)	-0.2571(2)	0.5906(2)	4.60(5)
O(103)	0.7108(2)	-0.2948(2)	0.9026(2)	4.92(5)
N(101)	0.7519(2)	-0.2372(2)	0.6951(2)	3.47(5)
C(101)	0.8234(3)	-0.2669(3)	0.5776(2)	3.17(6)
C(102)	0.7874(3)	-0.3152(3)	0.8081(3)	3.59(6)
C(103)	0.9247(3)	-0.4216(3)	0.8186(3)	4.12(7)
C(104)	1.0013(3)	-0.4791(3)	0.7106(2)	3.51(6)
C(105)	0.6118(3)	-0.1443(3)	0.6949(3)	4.69(7)
C(106)	0.7993(3)	-0.1444(2)	0.4654(2)	3.19(6)
C(107)	0.7528(3)	-0.1472(3)	0.3715(3)	3.80(7)
C(108)	0.7289(3)	-0.0376(3)	0.2680(3)	4.08(7)
C(109)	0.7530(3)	0.0754(3)	0.2580(3)	3.83(6)
C(110)	0.8012(3)	0.0815(3)	0.3486(3)	4.03(7)
C(111)	0.8242(3)	-0.0296(3)	0.4533(3)	3.78(7)
Molecule II				
Cl(201)	0.8998(1)	-0.22150(8)	1.04194(8)	6.28(2)
S(201)	0.61114(7)	0.46109(6)	0.78058(6)	3.13(1)
O(201)	0.7146(2)	0.4296(2)	0.8477(2)	4.50(5)
O(202)	0.5770(2)	0.5888(2)	0.6875(2)	4.22(5)
O(203)	0.3288(2)	0.3881(2)	0.6600(2)	5.03(6)
N(201)	0.5466(2)	0.3481(2)	0.6566(2)	2.85(5)
C(201)	0.6590(3)	0.3324(2)	0.7080(2)	2.74(5)
C(202)	0.4128(3)	0.3925(2)	0.7041(2)	3.17(6)
C(203)	0.3635(3)	0.4545(3)	0.8078(3)	3.74(6)
C(204)	0.4647(3)	0.4357(3)	0.8821(2)	3.36(6)
C(205)	0.5870(3)	0.2917(3)	0.5543(3)	4.31(7)
C(206)	0.7180(3)	0.1921(2)	0.7919(2)	2.88(5)
C(207)	0.8517(3)	0.1473(3)	0.8070(3)	3.72(6)
C(208)	0.9069(3)	0.0205(3)	0.8841(3)	4.18(7)
C(209)	0.8294(3)	-0.0618(3)	0.9449(3)	4.10(7)
C(210)	0.6973(3)	-0.0206(3)	0.9305(3)	4.43(7)
C(211)	0.6416(3)	0.1069(3)	0.8534(3)	3.73(6)

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$$B_{eq} = 8/3\pi^2(U_{11}(aa^*)^2 + U_{22}(bb^*)^2 + U_{33}(cc^*)^2 + 2U_{12}(aa^*bb^*)\cos \gamma + 2U_{13}(aa^*cc^*)\cos \beta + 2U_{23}(bb^*cc^*)\cos \alpha)$$

Fig. 1 Chemical structure of chlormezanone..

Fig. 2 Molecular structures of the two crystallographically independent molecules of chlormezanone along with the labeling atoms. Thermal ellipsoids of non-H atoms are drawn at the 50% probability level.

molecules along with the labeling atoms are shown in Fig. 2. Selected bond lengths, bond angles and torsion angles are given in Table 3. As shown in Fig. 2, the phenyl group occupies an equatorial position in molecule I, whereas in molecule II it occupies an axial position. Thiazinan rings in both molecules adopt deformed half-chair conformations. S101 and C104 are noticeably deviated from the least-squares plane defined by the other four atoms in the ring. The two atoms are located on opposite sides of the planes. The deviations in molecule I are 0.705(5) and 0.239(6) Å, respectively. The corresponding values in molecule II are 0.755(5) and 0.158(6) Å, respectively. The torsion angles given in Table 3 show that the conformation of the thiazinan ring in molecule II is significantly flatter than that in molecule I. The relative orientations of the thiazinan and phenyl rings in molecules I and II are also significantly different. The C11–C6–C1–N1 torsion angles reflecting the orientations are 56.6(4) and –25.0(4)° in molecules I and II, respectively. The bond lengths and angles in both molecules are within the normal ranges. The N1–C2 and N1–C1 bonds in molecule I are significantly longer than the corresponding ones in molecule II. It is noteworthy that the exocyclic bond angles around the C1 atom are highly asymmetric in molecule I, but the degree of the asymmetry in molecule II is smaller. The present analysis has shown that chlormezanone can adopt two significantly different conformations, which might be

Table 3 Selected bond lengths (Å), bond angles (°) and torsion angles (°)

molecule I		molecule II	
Cl(101)—C(109)	1.744(2)	Cl(201)—C(209)	1.738(2)
S(101)—O(101)	1.429(2)	S(201)—O(201)	1.437(3)
S(101)—O(102)	1.434(3)	S(201)—O(202)	1.433(2)
S(101)—C(101)	1.807(3)	S(201)—C(201)	1.803(3)
S(101)—C(104)	1.745(2)	S(201)—C(204)	1.740(3)
O(103)—C(102)	1.219(3)	O(203)—C(202)	1.220(5)
N(101)—C(101)	1.470(4)	N(201)—C(201)	1.460(4)
N(101)—C(105)	1.465(3)	N(201)—C(205)	1.462(4)
N(101)—C(102)	1.369(3)	N(201)—C(202)	1.351(3)
O(101)—S(101)—O(102)	118.0(1)	O(201)—S(201)—O(202)	118.5(2)
O(101)—S(101)—C(101)	106.7(1)	O(201)—S(201)—C(201)	108.9(1)
O(101)—S(101)—C(104)	111.7(1)	O(201)—S(201)—C(204)	110.5(1)
O(102)—S(101)—C(101)	110.5(1)	O(202)—S(201)—C(201)	107.4(1)
O(102)—S(101)—C(104)	109.5(2)	O(202)—S(201)—C(204)	110.1(1)
C(101)—S(101)—C(104)	98.7(1)	C(201)—S(201)—C(204)	99.6(1)
C(101)—N(101)—C(105)	115.0(2)	C(201)—N(201)—C(205)	114.9(2)
C(101)—N(101)—C(102)	125.1(2)	C(201)—N(201)—C(202)	126.3(2)
C(105)—N(101)—C(102)	116.9(2)	C(205)—N(201)—C(202)	118.2(3)
C(106)—C(101)—S(101)	108.7(2)	C(206)—C(201)—S(201)	112.5(2)
C(106)—C(101)—N(101)	113.5(2)	C(206)—C(201)—N(201)	114.0(3)
S(101)—C(101)—N(101)	110.8(2)	S(201)—C(201)—N(201)	110.5(2)
C(103)—C(102)—O(103)	118.2(2)	C(203)—C(202)—O(203)	118.6(2)
C(103)—C(102)—N(101)	121.2(2)	C(203)—C(202)—N(201)	121.1(3)
O(103)—C(102)—N(101)	120.5(2)	O(203)—C(202)—N(201)	120.2(3)
S(101)—C(104)—C(103)	108.1(2)	S(201)—C(204)—C(203)	108.9(2)
O(101)—S(101)—C(101)—N(101)	170.9(2)	O(201)—S(201)—C(201)—N(201)	170.4(1)
O(101)—S(101)—C(101)—C(106)	–63.8(2)	O(201)—S(201)—C(201)—C(206)	41.7(2)
O(102)—S(101)—C(101)—N(101)	–59.7(2)	O(202)—S(201)—C(201)—N(201)	–60.1(2)
O(102)—S(101)—C(101)—C(106)	65.7(2)	O(202)—S(201)—C(201)—C(206)	171.3(2)
C(104)—S(101)—C(101)—N(101)	55.0(2)	C(204)—S(201)—C(201)—N(201)	54.7(1)
C(104)—S(101)—C(101)—C(106)	–179.6(2)	C(204)—S(201)—C(201)—C(206)	–74.0(2)
O(101)—S(101)—C(104)—C(103)	–174.0(2)	O(201)—S(201)—C(204)—C(203)	–173.6(2)
O(102)—S(101)—C(104)—C(103)	53.5(3)	O(202)—S(201)—C(204)—C(203)	53.5(2)
C(101)—S(101)—C(104)—C(103)	–62.1(3)	C(201)—S(201)—C(204)—C(203)	–59.1(2)
C(105)—N(101)—C(101)—S(101)	165.0(2)	C(205)—N(201)—C(201)—S(201)	155.1(1)
C(105)—N(101)—C(101)—C(106)	42.4(4)	C(205)—N(201)—C(201)—C(206)	–77.1(2)
C(102)—N(101)—C(101)—S(101)	–35.4(4)	C(202)—N(201)—C(201)—S(201)	–34.0(3)
C(102)—N(101)—C(101)—C(106)	–158.0(3)	C(202)—N(201)—C(201)—C(206)	93.8(3)
C(101)—N(101)—C(102)—O(103)	–168.4(3)	C(201)—N(201)—C(202)—O(203)	–172.3(2)
C(101)—N(101)—C(102)—C(103)	15.7(5)	C(201)—N(201)—C(202)—C(203)	10.7(3)
C(105)—N(101)—C(102)—O(103)	–9.1(5)	C(205)—N(201)—C(202)—O(203)	–1.7(3)
C(105)—N(101)—C(102)—C(103)	175.0(3)	C(205)—N(201)—C(202)—C(203)	–178.7(2)
S(101)—C(101)—C(106)—C(107)	110.1(3)	S(201)—C(201)—C(206)—C(207)	–78.6(3)
S(101)—C(101)—C(106)—C(111)	–69.1(3)	S(201)—C(201)—C(206)—C(211)	101.8(3)
N(101)—C(101)—C(106)—C(107)	–126.2(3)	N(201)—C(201)—C(206)—C(207)	154.5(3)
N(101)—C(101)—C(106)—C(111)	54.6(4)	N(201)—C(201)—C(206)—C(211)	–25.0(4)
O(103)—C(102)—C(103)—C(104)	160.6(4)	O(203)—C(202)—C(203)—C(204)	167.4(2)
N(101)—C(102)—C(103)—C(104)	–23.3(5)	N(201)—C(202)—C(203)—C(204)	–15.5(4)
C(102)—C(103)—C(104)—S(101)	50.8(4)	C(202)—C(203)—C(204)—S(201)	44.2(3)

responsible for different biological activities.

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