

Table 1. Fractional atomic coordinates and equivalent isotropic displacement parameters (\AA^2)
$$U_{\text{eq}} = (1/3)\sum_i \sum_j U_{ij} a_i^* a_j^* \mathbf{a}_i \cdot \mathbf{a}_j$$

	x	y	z	U_{eq}
S1	0.1099 (1)	0.5438 (1)	0.1841 (1)	0.0414 (4)
C2	-0.0817 (6)	0.6095 (2)	0.2912 (3)	0.0396 (7)
C3	-0.0583 (7)	0.7063 (2)	0.2655 (3)	0.0486 (8)
C4	0.1130 (6)	0.7254 (2)	0.1588 (4)	0.0491 (8)
C5	0.2200 (6)	0.6456 (2)	0.1042 (3)	0.0415 (7)
C6	0.4109 (8)	0.6393 (3)	-0.0101 (4)	0.0530 (9)
C7	-0.2523 (6)	0.5617 (2)	0.3866 (3)	0.0394 (7)
O8	-0.2671 (4)	0.47208 (13)	0.3891 (2)	0.0476 (6)
O9	-0.3845 (5)	0.61708 (15)	0.4653 (2)	0.0538 (7)

Table 2. Selected geometric parameters (\AA , $^\circ$)

S1—C2	1.710 (3)	C4—C5	1.353 (4)
S1—C5	1.715 (3)	C5—C6	1.494 (4)
C2—C3	1.376 (4)	C7—O8	1.251 (3)
C2—C7	1.448 (4)	C7—O9	1.287 (3)
C3—C4	1.394 (4)		
C2—S1—C5	91.7 (1)	C4—C5—C6	128.0 (3)
C3—C2—C7	128.4 (3)	C4—C5—S1	111.3 (2)
C3—C2—S1	111.2 (2)	C6—C5—S1	120.8 (2)
C7—C2—S1	120.3 (2)	O8—C7—O9	123.6 (3)
C2—C3—C4	112.3 (3)	O8—C7—C2	120.6 (3)
C5—C4—C3	113.6 (3)	O9—C7—C2	115.8 (3)

Table 3. Hydrogen-bonding geometry (\AA , $^\circ$) and intermolecular interactions

D—H...A	D—H	H...A	D...A	D—H...A
O9—H9...O8 ⁱ	0.90 (5)	1.72 (5)	2.617 (3)	177 (5)
C4—H4...O8 ⁱⁱ	0.93 (4)	2.65 (4)	3.558 (4)	164 (3)
C6—H63...O9 ⁱⁱⁱ	0.86 (5)	2.73 (6)	3.559 (4)	161 (5)

Symmetry codes: (i) $-1 - x, 1 - y, 1 - z$; (ii) $-x, \frac{1}{2} + y, \frac{1}{2} - z$; (iii) $1 + x, \frac{3}{2} - y, z - \frac{1}{2}$.

Cell refinement: XSCANS (Siemens, 1992). Data reduction: XSCANS. Program(s) used to solve structure: SHELXS86 (Sheldrick, 1990a). Program(s) used to refine structure: SHELXL93 (Sheldrick, 1993). Molecular graphics: SHELXTL-Plus (Sheldrick, 1990b). Software used to prepare material for publication: SHELXL93.

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Lists of structure factors, anisotropic displacement parameters, H-atom coordinates and complete geometry have been deposited with the IUCr (Reference: KA1147). Copies may be obtained through The Managing Editor, International Union of Crystallography, 5 Abbey Square, Chester CH1 2HU, England.

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A de novo Designed Possible 5-Lipoxygenase Inhibitor: α -Acetoxy-N-[1-(1-tricyclo[3.3.1.1^{3,7}]dec-1-yl)ethyl]benzeneacetamide

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Abstract

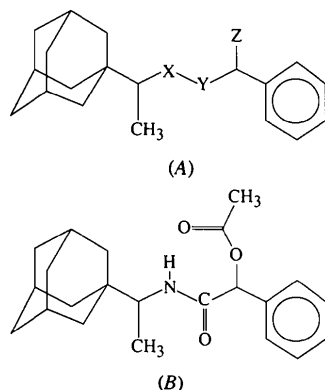
The structure of the title compound {alternative IUPAC name: α -[1-(tricyclo[3.3.1.1^{3,7}]dec-1-yl)ethylamino-carbonyl]benzyl acetate}, $\text{C}_{22}\text{H}_{29}\text{NO}_3$, a *de novo* designed non-acidic anti-inflammatory agent, has been determined. Data collection was performed utilizing methods common in macromolecular crystallography (rotation method and an imaging plate area detector) and provided data of good quality.

Comment

Leukotrienes are products of arachidonic acid metabolism and are frequently mediators of inflammation. They are derived from arachidonic acid through the action of the enzyme 5-lipoxygenase (5-LO). Pharmacological intervention in the conversion of arachidonic acid to leukotrienes by the development of 5-LO inhibitors seems to be a promising clinical approach (Gasland & Salmon, 1991; Musser & Kreff, 1992). In an attempt to produce possible 5-LO inhibitors, we are involved in a study of the design and synthesis of compounds of the general type (A). Linkage of the highly hydrophobic adamantane ring or the 1-adamantylethyl group to a phenyl ring through different bridges produces molecules with anti-inflammatory activity. The title compound, (B), a member of the series (A) compounds,

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having an α -acetoxyacetamino bridge, proved to be a potent non-acidic anti-inflammatory agent. We present here its crystal and molecular structure (Fig. 1).



The conformation of the molecule is described by the torsion angles given in Table 2. The crystal is stabilized via a rather simple hydrogen-bonding network involving the N3 and O1 atoms of adjacent unit cells. This is the only kind of intermolecular hydrogen bond found and results in the formation of long chains of molecules

which run along the *b* axis of the cell. The crystal packing is dominated by van der Waals interactions between adamantyl groups of symmetry-related molecules (Fig. 2).

Experimental

The title compound was synthesized by the reaction of α -acetoxyphenylacetic acid chloride with 1-(1-adamantyl)ethylamine. The required acid chloride was prepared according to known literature methods and 1-(1-adamantyl)ethylamine was obtained from the catalytic induction of the corresponding oxime. Crystals were obtained by evaporation of a methanol solution.

Crystal data

C₂₂H₂₉NO₃

M_r = 355.46

Monoclinic

*C*2/*c*

a = 38.40 (5) Å

b = 11.00 (5) Å

c = 9.60 (5) Å

β = 97.00 (10)°

V = 4025 (28) Å³

Z = 8

D_x = 1.173 Mg m⁻³

D_m not measured

Monochromatic radiation

λ = 0.92000 Å

Cell parameters from all

reflections

θ = 1.38–24.56°

μ = 0.077 mm⁻¹

T = 293 (2) K

Long thin needle

2.00 × 0.05 × 0.05 mm

Transparent

Data collection

MAR image-plate area-detector

1286 observed reflections

[*I* > 2σ(*I*)]

Rotation scans

R_{int} = 0.053

Absorption correction:

θ_{\max} = 24.56°

none

h = 0 → 34

4307 measured reflections

k = 0 → 9

1427 independent reflections

l = -7 → 7

Refinement

Refinement on *F*²

(Δ/σ)_{max} < 0.001

R(*F*) = 0.0442

$\Delta\rho_{\max}$ = 0.155 e Å⁻³

wR(*F*²) = 0.2770

$\Delta\rho_{\min}$ = -0.189 e Å⁻³

S = 0.938

Extinction correction: none

1418 reflections

Atomic scattering factors

236 parameters

from *International Tables*

H-atom parameters not

for *Crystallography* (1992,

refined

Vol. C, Tables 4.2.6.8 and

w = 1/[σ²(*F_o*²) + (0.0358*P*)²

6.1.1.4)

+ 6.2140*P*]

where *P* = (*F_o*² + 2*F_c*²)/3

Table 1. Fractional atomic coordinates and equivalent isotropic displacement parameters (Å²)

$$U_{eq} = (1/3)\sum_i\sum_j U_{ij}a_i^*a_j^*a_i \cdot a_j$$

	<i>x</i>	<i>y</i>	<i>z</i>	<i>U_{eq}</i>
O1	0.35962 (5)	0.9898 (2)	0.2126 (3)	0.0506 (7)
O2	0.29393 (5)	1.0143 (3)	0.0791 (2)	0.0605 (8)
O3	0.30391 (7)	0.8249 (3)	0.0173 (3)	0.0878 (10)
C1	0.32250 (7)	1.0527 (3)	0.0082 (3)	0.0432 (9)
C8	0.32286 (7)	1.1876 (3)	0.0086 (4)	0.0491 (10)
C20	0.33692 (11)	1.3715 (5)	-0.0986 (6)	0.0901 (13)
C7	0.25855 (10)	0.8658 (4)	0.1579 (5)	0.103 (2)

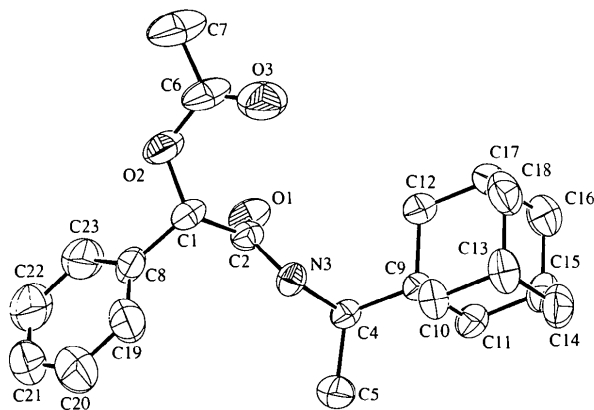


Fig. 1. The structure of the title compound showing 50% probability displacement ellipsoids. H atoms are excluded and all atoms are labelled.

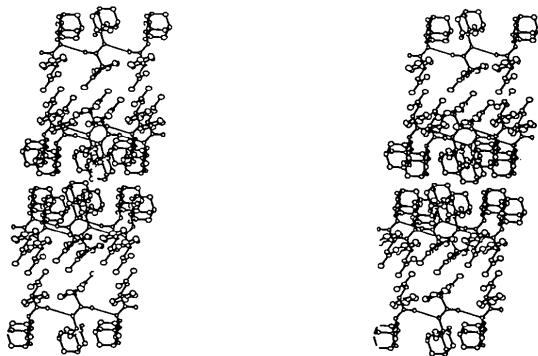


Fig. 2. The crystal packing and hydrogen-bond network.

C19	0.33498 (9)	1.2482 (4)	-0.0988 (4)	0.0693 (11)
C21	0.32667 (12)	1.4357 (4)	0.0085 (8)	0.0960 (15)
C23	0.31329 (9)	1.2533 (5)	0.1187 (5)	0.0820 (13)
C22	0.31507 (11)	1.3767 (6)	0.1172 (7)	0.105 (2)
C6	0.28749 (9)	0.8963 (6)	0.0775 (4)	0.0689 (12)
N3	0.38187 (6)	0.9913 (2)	0.0066 (2)	0.0374 (8)
C4	0.41785 (7)	0.9636 (3)	0.0618 (3)	0.0373 (9)
C5	0.44116 (8)	1.0624 (3)	0.0154 (3)	0.0574 (10)
C11	0.46488 (7)	0.8062 (3)	0.0913 (3)	0.0461 (9)
C18	0.41083 (9)	0.5995 (3)	-0.1039 (4)	0.0668 (11)
C9	0.42779 (6)	0.8343 (2)	0.0246 (3)	0.0328 (9)
C10	0.42589 (8)	0.8141 (3)	-0.1324 (3)	0.0476 (10)
C14	0.47280 (8)	0.6598 (3)	-0.0965 (4)	0.0636 (11)
C17	0.41327 (8)	0.6159 (3)	0.0530 (4)	0.0564 (10)
C12	0.40327 (7)	0.7450 (3)	0.0842 (3)	0.0470 (9)
C15	0.47474 (8)	0.6773 (3)	0.0599 (4)	0.0565 (10)
C13	0.43588 (9)	0.6850 (3)	-0.1634 (4)	0.0566 (10)
C16	0.45016 (8)	0.5909 (3)	0.1188 (4)	0.0632 (11)
C2	0.35655 (7)	1.0057 (2)	0.0863 (5)	0.0366 (9)

Table 2. Selected geometric parameters (\AA , $^\circ$)

O1—C2	1.216 (7)	C11—C9	1.520 (4)
O2—C6	1.321 (8)	C18—C13	1.506 (6)
O2—C1	1.424 (4)	C18—C17	1.508 (9)
O3—C6	1.199 (5)	C9—C10	1.517 (9)
C1—C8	1.484 (8)	C9—C12	1.519 (5)
C1—C2	1.517 (5)	C10—C13	1.510 (7)
C7—C6	1.467 (6)	C14—C15	1.507 (9)
N3—C2	1.318 (5)	C14—C13	1.509 (5)
N3—C4	1.451 (4)	C17—C16	1.505 (5)
C4—C5	1.509 (5)	C17—C12	1.511 (7)
C4—C9	1.526 (7)	C15—C16	1.498 (6)
C11—C15	1.507 (7)		
C6—O2—C1	116.1 (3)	C12—C9—C4	109.3 (3)
O2—C1—C8	107.7 (3)	C11—C9—C4	109.8 (2)
O2—C1—C2	109.3 (3)	C13—C10—C9	110.5 (2)
C8—C1—C2	109.4 (2)	C15—C14—C13	109.3 (3)
C19—C8—C1	119.6 (4)	C16—C17—C18	109.8 (3)
C23—C8—C1	121.8 (4)	C16—C17—C12	109.7 (3)
O3—C6—O2	122.7 (4)	C18—C17—C12	108.9 (3)
O3—C6—C7	125.5 (5)	C17—C12—C9	110.4 (3)
O2—C6—C7	111.8 (5)	C16—C15—C11	109.7 (4)
C2—N3—C4	123.4 (4)	C16—C15—C14	109.7 (3)
N3—C4—C5	108.3 (3)	C11—C15—C14	109.6 (3)
N3—C4—C9	111.4 (2)	C18—C13—C14	109.5 (3)
C5—C4—C9	115.4 (3)	C18—C13—C10	108.8 (4)
C15—C11—C9	110.6 (3)	C14—C13—C10	109.7 (3)
C13—C18—C17	109.8 (3)	C15—C16—C17	109.3 (3)
C10—C9—C12	108.8 (3)	O1—C2—N3	125.0 (3)
C10—C9—C11	108.5 (3)	O1—C2—C1	121.0 (3)
C12—C9—C11	107.6 (3)	N3—C2—C1	114.0 (4)
C10—C9—C4	112.7 (2)		
C6—O2—C1—C8	173.9 (3)	C15—C11—C9—C12	59.2 (4)
C6—O2—C1—C2	-67.3 (4)	C15—C11—C9—C4	178.0 (2)
O2—C1—C8—C19	-149.6 (3)	N3—C4—C9—C10	62.2 (3)
C2—C1—C8—C19	91.7 (4)	N3—C4—C9—C12	-58.9 (4)
C1—O2—C6—O3	-1.9 (5)	N3—C4—C9—C11	-176.7 (2)
C2—N3—C4—C5	-121.8 (3)	C4—N3—C2—C1	171.2 (2)
C2—N3—C4—C9	110.3 (3)	O2—C1—C2—N3	153.7 (3)
C15—C11—C9—C10	-58.4 (3)	C8—C1—C2—N3	-88.6 (3)

Data collection was performed on synchrotron beamline X31 at EMBL – Hamburg, HASYLAB, DESY. The crystals did not diffract in a standard sealed-tube generator, but diffracted reasonably well in the synchrotron beam. The rotation method, standard for macromolecular crystallography, was employed since it provides accurate data in a fraction of the time necessary for conventional diffractometry (Grochowski, Serda, Wilson & Dauter, 1994). Data were collected with an image plate area detector, with 5° rotation per image and a total of 120° , which was enough to give 92% complete data. Space-group determination, intensity integration for diffraction spots from the images and reduction of data to the asymmetric unit

were carried out using *DENZO* software (Otwinowski, 1993), widely used in macromolecular crystallography. The data quality was high as judged by R_{merge} [$R_{\text{merge}} = \sum(|I - \langle I \rangle|) / \sum I$], which showed that the internal agreement for all symmetry-related and multiply recorded reflections was 5.3%. The total amount of time used was a slot of 2 h of machine-studies beam time.

Cell refinement: *DENZO SCALEPACK* (Otwinowski, 1993). Program(s) used to solve structure: *SHELXS86* (Sheldrick, 1985). Program(s) used to refine structure: *SHELXL93* (Sheldrick, 1993). Molecular graphics: *ORTEPII* (Johnson, 1976).

Zbigniew Dauter is thanked for help in the data collection and indexing of the rotation images.

Lists of structure factors, anisotropic displacement parameters, H-atom coordinates and complete geometry have been deposited with the IUCr (Reference: AS1211). Copies may be obtained through The Managing Editor, International Union of Crystallography, 5 Abbey Square, Chester CH1 2HU, England.

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Coumarin 343, C₁₆H₁₅NO₄

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Abstract

In the title compound, 2,3,6,7-tetrahydro-11-oxo-1*H*,5*H*,11*H*-[1]benzopyrano[6,7,8-*ij*]quinolizine-10-carboxylic acid, the coumarin moiety is planar. The two piperidine rings take flattened sofa conformations. There