Acta Crystallographica Section E
Structure Reports Online
ISSN 1600-5368

2,6-Dimethyl-4*H*-1-benzopyran-4-one

Burcu Arslan,[a]* Canan Kazak[a] and Hakan Göker[b]

[a]Department of Physics, Ondokuz Mayis University, TR-55139 Samsun, Turkey, and [b]Pharmaceutical Chemistry Department, Faculty of Pharmacy, Ankara University, 06100 Tandogan, Ankara, Turkey

Correspondence e-mail: nbarslan@ttnet.net.tr

Key indicators

Single-crystal X-ray study
T = 293 K
Mean σ(C–C) = 0.003 Å
R factor = 0.054
wR factor = 0.184
Data-to-parameter ratio = 12.9

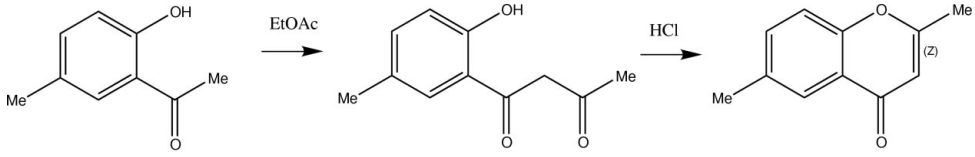
For details of how these key indicators were automatically derived from the article, see http://journals.iucr.org/e.

Received 30 September 2004
Accepted 1 November 2004
Online 6 November 2004

The title compound, $C_{11}H_{10}O_2$, belongs to the class of 4-benzopyrones (also known as chromen-4-ones) with potentially diverse pharmacological activities. It was synthesized by acylation of 2-hydroxy-4-methylacetophenone with ethyl acetate in the presence of sodium hydride and subsequent cyclization by hydrochloric acid. All non-H atoms of the substituted bicyclic molecule are coplanar within 0.03 Å. C—H···O interactions [C···O = 3.272 (5) Å] link neighbouring molecules related by the 2_1 axis.

Comment

4–Benzopyrones (also known as chromen-4-ones or 4*H*-1-benzopyran-4-ones) have attracted considerable attention because of their presence in numerous natural products and synthetic drugs (*e.g.* in amlexanox; Nohara *et al.*, 1985) and their potential pharmacological activities, such as gastroprotective effect (Ares *et al.*, 1996), *in vivo* iron-chelating activity (Ferrali *et al.*, 2001), antioxidizing effect in aldose reductase inhibition (Costantino *et al.*, 1999), acaricidal activity (Gleye *et al.*, 2003), monoamine oxidase inhibition (Sloley *et al.*, 2000), and anti-anaphylactic activity (Nohara *et al.*, 1977). In addition, some benzopyrones, such as 3-cyano-4-benzopyrone, are important intermediates in the synthesis of therapeutically useful anti-allergic and some anti-inflammatory drugs (Nohara *et al.*, 1985; Reddy *et al.*, 2004).



(I) (II) (III)

The title compound, (III), was prepared starting from commercially available (I), according to known reaction sequences, as shown in the scheme. 2-Hydroxy-4-methylacetophenone, (I), on acylation with ethyl acetate in the presence of sodium hydride gave ω-acetyl-2-hydroxy-4-methylacetophenone, (II). This compound was cyclized to (III) with a few drops of HCl in acetic acid.

All non-H atoms of the molecule of the title compound are, in fact, coplanar (Fig. 1); the maximum deviation from the least-squares plane is 0.028 Å for C2.

The C1—H1*C*···O2^{i} interaction [H1*C*···O2^{i} = 2.38 Å, C1···O2^{i} = 3.272 (5) Å and C1—H1*C*···O2^{i} = 154°] links neighbouring molecules related by the 2_1 symmetry operation [symmetry code: (i): $\frac{1}{2}-x$, $y-\frac{1}{2}$, $\frac{1}{2}-z$]. The packing of the title compound is shown in Fig. 2.

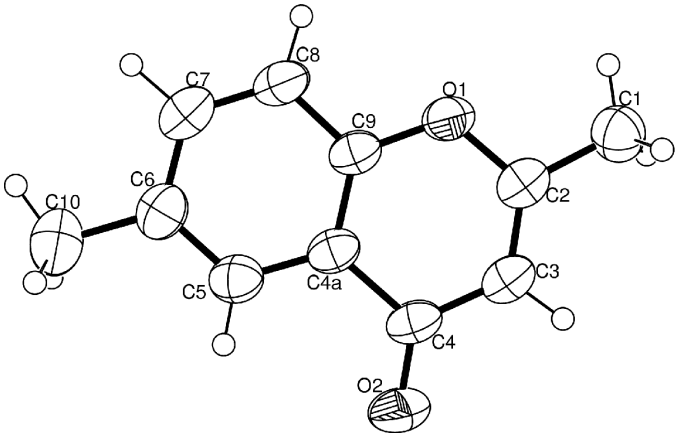


Figure 1
An *ORTEP*-3 (Farrugia, 1997) view of the title compound, with the atom-numbering scheme and 50% probability displacement ellipsoids.

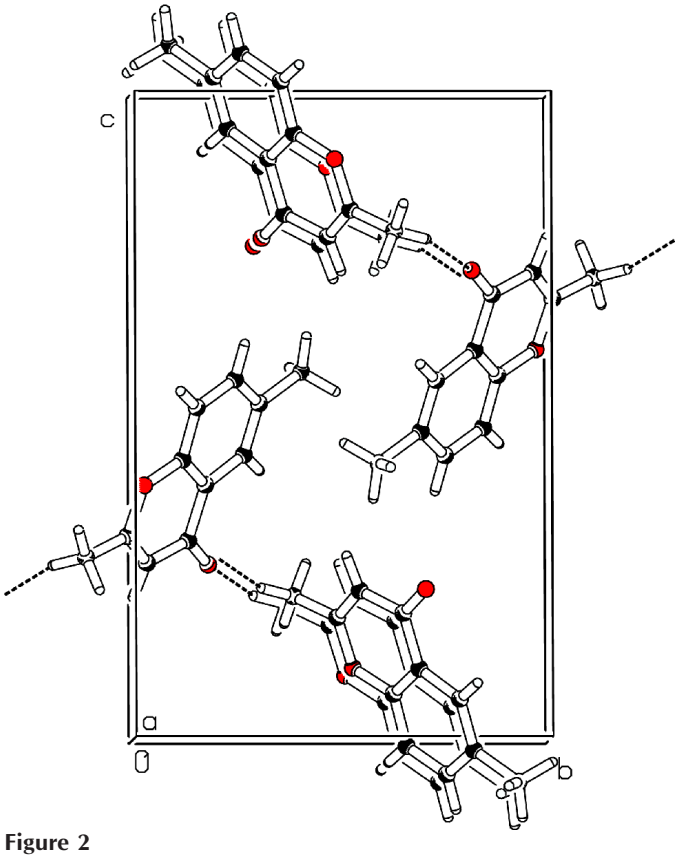


Figure 2
A packing diagram of the title compound, viewed almost along the *a* axis.

Experimental

For the preparation of *ω*-acetyl-2-hydroxy-4-methylacetophenone, (II), (I) (4 g, 26.67 mmol) was added gradually to a mixture of 1.9 g of sodium hydride (dry, 95%) in 22 ml of EtOAc and 20 ml of anhydrous benzene. After the initial vigorous reaction was completed, the mixture was refluxed with stirring for 30 min. Excess solvent was evaporated, water was added, and the yellow sodium salt was converted to the diketone by treatment with acetic acid until the mixture became acidic. Crystallization of the crude product from an EtOAc–*n*-hexane mixture gave pure (II) [yield 3.7 g, 72.3%; m.p. 373 K, 372 K according to Baker (1933)].

For the preparation of 2,6-dimethyl-4*H*-1-benzopyran-4-one, (III), (II) (1.92 g, 10 mmol) was boiled for 2 min with acetic acid (10 ml) and a few drops of concentrated HCl, and poured into water. The solid was crystallized from an EtOAc–*n*-hexane mixture [yield 1.1 g, 63.2%; m.p. 374–376 K, 376 K according to Baker (1933)]. ^{1}H NMR (DMSO-d_6): δ 2.37 (*s*, 3H), 2.4 (*s*, 3H), 6.18 (*s*, 1H), 7.46 (*d*, 1H, J = 8.3 Hz), 7.56 (*dd*, 1H, J = 8.2, 1.3 Hz), 7.78 (*d*, 1H, J = 1.2 Hz), MS *m*/*z* ES(+): 175 (M + H).

Crystal data

$C_{11}H_{10}O_2$	D_x = 1.312 Mg m^{-3}
M_r = 174.19	Mo $K\alpha$ radiation
Monoclinic, $P2_1/n$	Cell parameters from 7949 reflections
a = 5.4595 (5) Å	θ = 2.3–29.4°
b = 10.1947 (14) Å	μ = 0.09 mm^{-1}
c = 15.8862 (15) Å	T = 293 (2) K
β = 93.979 (8)°	Prism, colourless
V = 882.06 (17) Å^3	0.60 × 0.45 × 0.30 mm
Z = 4	

Data collection

Stoe IPDS-2 diffractometer	1740 independent reflections
φ scans	1328 reflections with $I > 2\sigma(I)$
Absorption correction: by integration (*X-RED*32; Stoe & Cie, 2002)	R_{int} = 0.088
	θ_{max} = 26.0°
T_{min} = 0.942, T_{max} = 0.982	$h = -6 \rightarrow 6$
6705 measured reflections	$k = -12 \rightarrow 12$
	$l = -19 \rightarrow 19$

Refinement

Refinement on F^2	$w = 1/[\sigma^2(F_o^2) + (0.1083P)^2 + 0.0774P]$ where $P = (F_o^2 + 2F_c^2)/3$
$R[F^2 > 2\sigma(F^2)]$ = 0.054	
$wR(F^2)$ = 0.184	$(\Delta/\sigma)_{max} < 0.001$
S = 1.11	$\Delta\rho_{max}$ = 0.35 e Å^{-3}
1740 reflections	$\Delta\rho_{min}$ = −0.24 e Å^{-3}
135 parameters	Extinction correction: *SHELXL*97
H atoms treated by a mixture of independent and constrained refinement	Extinction coefficient: 0.093 (16)

The H atoms of methyl groups were refined using a riding model, with fixed C—H distances of 0.96 Å [U_{iso}(H) = 1.5U_{eq}(C_{methyl})]. The non-methyl H atoms were refined isotropically; C—H = 0.92 (3)–1.01 (3) Å.

Data collection: *X-AREA* (Stoe & Cie, 2002); cell refinement: *X-AREA*; data reduction: *X-RED*32 (Stoe & Cie, 2002); program(s) used to solve structure: *SHELXS*97 (Sheldrick, 1997); program(s) used to refine structure: *SHELXL*97 (Sheldrick, 1997); molecular graphics: *ORTEP*-3 (Farrugia, 1997); software used to prepare material for publication: *WinGX* (Farrugia, 1999).

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