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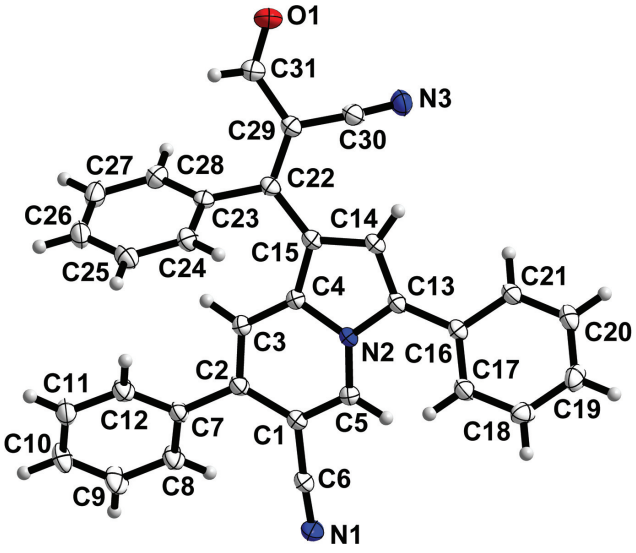
Crystal structure of (*E*)-1-(2-cyano-3-oxo-1-phenylprop-1-en-1-yl)-3,7-diphenylindolizine-6-carbonitrile, $C_{31}H_{19}N_3O$



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Abstract

$C_{31}H_{19}N_3O$, triclinic, $P\bar{1}$ (no. 2), $a = 8.672(5)$ Å, $b = 10.725(6)$ Å, $c = 13.886(8)$ Å, $\alpha = 97.550(9)°$, $\beta = 101.415(9)°$, $\gamma = 109.603(9)°$, $V = 1164.9(12)$ Å^3, $Z = 2$, $R_{gt}(F) = 0.0439$, $wR_{ref}(F^2) = 0.1288$, $T = 296$ K.

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The molecular structure is shown in the figure. Table 1 contains crystallographic data and Table 2 contains the list of the atoms including atomic coordinates and displacement parameters.

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Table 1: Data collection and handling.

Crystal:	Colourless block
Size:	0.25 × 0.23 × 0.20 mm
Wavelength:	Mo $K\alpha$ radiation (0.71073 Å)
μ:	0.08 mm^{-1}
Diffractometer, scan mode:	Bruker APEX-II, φ and ω
θ_{max}, completeness:	25.0°, 99%
$N(hkl)_{measured}$, $N(hkl)_{unique}$, R_{int}:	5907, 4060, 0.017
Criterion for I_{obs}, $N(hkl)_{gt}$:	$I_{obs} > 2\ \sigma(I_{obs})$, 3168
$N(param)_{refined}$:	316
Programs:	Bruker [1], SHELX [2, 3]

Table 2: Fractional atomic coordinates and isotropic or equivalent isotropic displacement parameters (Å^2).

Atom	x	y	z	U_{iso}*/U_{eq}
C1	0.3097(2)	0.40101(16)	0.56440(12)	0.0357(4)
C2	0.3088(2)	0.52698(17)	0.53712(12)	0.0348(4)
C3	0.4106(2)	0.64391(17)	0.60777(12)	0.0357(4)
H3	0.420844	0.726881	0.590869	0.043*
C4	0.5000(2)	0.64362(16)	0.70451(12)	0.0343(4)
C5	0.3957(2)	0.39959(17)	0.65828(12)	0.0360(4)
H5	0.395031	0.317674	0.673737	0.043*
C6	0.2217(2)	0.26982(19)	0.49658(13)	0.0443(5)
C7	0.2037(2)	0.53535(17)	0.44035(12)	0.0351(4)
C8	0.1603(2)	0.44195(19)	0.34975(13)	0.0454(5)
H8	0.197771	0.370190	0.347888	0.054*
C9	0.0619(3)	0.4549(2)	0.26253(14)	0.0565(6)
H9	0.032152	0.390412	0.203474	0.068*
C10	0.0075(3)	0.5620(2)	0.26212(15)	0.0562(5)
H10	−0.056885	0.570624	0.203148	0.067*
C11	0.0506(3)	0.6568(2)	0.35125(15)	0.0507(5)
H11	0.015991	0.730115	0.351717	0.061*
C12	0.1448(2)	0.64261(19)	0.43951(14)	0.0445(5)
H12	0.169470	0.705002	0.499004	0.053*
C13	0.5818(2)	0.53816(17)	0.82828(12)	0.0360(4)
C14	0.6653(2)	0.67569(17)	0.86180(12)	0.0372(4)
H14	0.742133	0.717667	0.924186	0.045*
C15	0.6174(2)	0.74494(17)	0.78735(12)	0.0358(4)
C16	0.5843(2)	0.42703(17)	0.88014(12)	0.0359(4)
C17	0.4378(2)	0.31372(18)	0.87128(13)	0.0432(4)
H17	0.334273	0.307513	0.831908	0.052*
C18	0.4458(3)	0.21090(19)	0.92069(14)	0.0473(5)
H18	0.348225	0.135559	0.913292	0.057*
C19	0.5980(3)	0.2198(2)	0.98081(14)	0.0508(5)

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Table 2 (continued)

Atom	x	y	z	U_{iso}*/U_{eq}
H19	0.603370	0.150096	1.013108	0.061*
C20	0.7427(3)	0.3330(2)	0.99277(14)	0.0526(5)
H20	0.844774	0.339955	1.034441	0.063*
C21	0.7368(2)	0.43543(19)	0.94345(13)	0.0462(5)
H21	0.834958	0.510892	0.952215	0.055*
C22	0.6735(2)	0.89055(16)	0.79191(12)	0.0349(4)
C23	0.5451(2)	0.93981(16)	0.73936(12)	0.0356(4)
C24	0.3809(2)	0.89496(18)	0.75326(13)	0.0419(4)
H24	0.356054	0.841095	0.799677	0.050*
C25	0.2554(2)	0.9298(2)	0.69880(14)	0.0491(5)
H25	0.147203	0.899307	0.708901	0.059*
C26	0.2902(3)	1.0098(2)	0.62945(15)	0.0548(5)
H26	0.205381	1.032254	0.592411	0.066*
C27	0.4524(3)	1.0565(2)	0.61536(15)	0.0554(5)
H27	0.476188	1.111245	0.569364	0.067*
C28	0.5796(2)	1.02198(18)	0.66952(14)	0.0463(5)
H28	0.687690	1.053463	0.659383	0.056*
C29	0.8372(2)	0.97846(17)	0.83992(13)	0.0386(4)
C30	0.9683(2)	0.92835(18)	0.87584(14)	0.0435(4)
C31	0.8933(2)	1.12735(19)	0.85718(14)	0.0479(5)
H31	0.810771	1.164302	0.842233	0.057*
N1	0.1564(2)	0.16341(18)	0.44536(13)	0.0675(6)
N2	0.48267(17)	0.51762(13)	0.72977(10)	0.0341(3)
N3	1.0779(2)	0.89456(18)	0.90389(14)	0.0591(5)
O1	1.03928(18)	1.20472(14)	0.88948(12)	0.0663(4)

Source of material

Add phenylmagnesium bromide (24 mmol) to 1-benzyl-3-cyano-4-phenylpyridine bromide (20 mmol) under dark conditions [4–6], Stirring was continued for 20 min on cooling until RT was reached. Then wash the solution three times with water. After drying of the organic layer over sodium sulfate the solution was filtered and evaporated to dryness. The resulting oil was purified by silica gel column chromatography using a mixture of petroleum ether and ethyl acetate (10:1) as eluent (1-benzyl-3-cyano-4-phenyl-1,4-dihydropyridine). The final product is synthesized by the literature known method [7]. 1-Benzyl-3-cyano-4-phenyl-1,4-dihydropyridine (0.2 mmol) was added to 2-methoxy-3,6-diphenylhexyl-4-nitrile (0.2 mmol), tris(dibenzylideneacetone)dipalladium (0.01 mmol), 10% bis[(2-diphenylphosphino)phenyl] ether (DPE-Phos, 0.02 mmol), potassium carbonate (0.4 mmol) as catalyst, and dimethyl sulfoxide (2 mL). The mixture was reacted for 16 h at 140 °C under nitrogen atmosphere. Finally, the resulting solution was evaporated to dryness *in vacuo* to give the title compound as colorless crystals.

Experimental details

All hydrogen atoms were placed in the calculated positions.

Comment

Although major part of the research on indolizine derivatives is focused on anti-cancer drug discovery, these derivatives have also been screened for different biological and medicinal activities [8–10]. For most drugs, there is a problem of poor fat solubility. In this study, appropriate introduction of some lipophilic groups, such as phenyl groups at the core of indoxazine can increase the lipid solubility of the derivatives and promote the absorb.

It is not difficult to see from the structure that the pyridine ring is selectively cyclized with a carbon-carbon triple bond under the palladium catalysis, and finally an indole compound is formed. It is worth noting that the three phenyl rings are not in a plane. The bond lengths and angles are in the expected ranges.

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