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# (1*R**,2*S**,3*R**,4*S**)-*N*-(1-Naphthyl)-5-norbornene-2,3-dicarboximide

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**Key indicators**

Single-crystal X-ray study
*T* = 298 K
Mean σ(C–C) = 0.004 Å
*R* factor = 0.045
*wR* factor = 0.102
Data-to-parameter ratio = 9.7

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

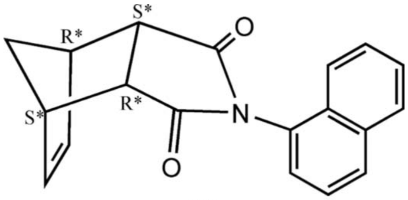
In the title compound, $C_{19}H_{15}NO_2$, the norbornene is fused to a cyclodicarbonimide, and the naphthyl ring is directly linked to the N atom. The crystal packing is stabilized by two kinds of intermolecular C—H···O hydrogen bonds and one intramolecular C—H···N hydrogen bond as well as by C—H···π-ring interactions.

## Comment

In recent years, many researchers have been interested in the synthesis and characterization of fluorescent polymers (Gao & Yan, 2000; Yan *et al.*, 2000).

There are two approaches to the preparation of fluorescent polymers (Lee & Ahn, 1999). The first consists in polymerization of a monomer containing a fluorescent chromophore (Yan *et al.*, 2000). The second is based in a chemical modification of commercially available polymers by reaction of their reactive groups with fluorescent dyes or organic molecules (Wang *et al.*, 2002). However, the drawback of the second method is a possible degradation of the polymer during the chemical reaction.

In order to avoid this disadvantage we have decided on the first method and we have embarked upon the preparation of a series of *N*-aryl-5-norbornene-2,3-dicarboximide compounds. The preparation and structure determination of the title compound, (I) (Fig. 1), is a part of this work.



(I)

The intramolecular bond lengths and angles are normal (Wellman *et al.*, 1997). By means of two C—H···O hydrogen bonds, the molecules are linked into a ribbon along the [100] direction (Table 1, Fig. 2). One of the carbonyl O atoms acts as a bifurcated acceptor for these two hydrogen bonds. There is also an intramolecular C—H···N hydrogen bond in the structure. There are no π–π interactions between aromatic rings of the molecule. The reason may be that the molecule of (I) is not flat; the dihedral angle C19—C10—N1—C8 is 90.7 (3)° (Fig. 1).

On the other hand, analysis using *PLATON* (Spek, 2003) has indicated the presence of C—H···π-ring interactions (Table 2).

## Experimental

Compound (I) was prepared according to the following procedure (see Salvati *et al.*, 2005). 5-Norbornene-2,3-dicarboximide (1.64 g, 0.01 mol) was dissolved in 50 ml of ethyl acetate. To this solution, 1-naphthylamine (1.43 g, 0.01 mol) that had been previously dissolved in 10 ml of ethyl acetate was slowly added while stirring and keeping the temperature below 278 K. The mixture was stirred for 3 h and then it was filtered. The residue was washed with ethyl acetate and a white powder was obtained. A mixture of this solid with 40 ml of acetic anhydride and 0.5 g of sodium acetate was stirred at room temperature for about 2 h until the solid dissolved. The solution was stirred for another 4 h at room temperature. After that time water (40 ml) was poured into the mixture. Colourless and transparent block crystals of (I) developed after several days. Analysis, calculated for $C_{19}H_{15}NO_2$: C 78.89, H 5.19, N 4.84%; found: C 78.91, H 5.15, N 4.88%.

### *Crystal data*

$C_{19}H_{15}NO_2$
$M_r = 289.32$
Orthorhombic, $P2_12_12_1$
$a = 7.2279$ (7) Å
$b = 10.2493$ (10) Å
$c = 19.7706$ (19) Å
$V = 1464.6$ (2) Å$^3$
$Z = 4$
Mo $K\alpha$ radiation
$\mu = 0.09$ mm$^{-1}$
$T = 298$ (2) K
0.30 × 0.16 × 0.10 mm

### *Data collection*

Bruker SMART 4K CCD area-detector diffractometer
Absorption correction: none
8887 measured reflections
1934 independent reflections
1638 reflections with $I > 2\sigma(I)$
$R_{\rm int} = 0.033$

### *Refinement*

$R[F^2 > 2\sigma(F^2)] = 0.045$
$wR(F^2) = 0.102$
$S = 1.10$
1934 reflections
199 parameters
H-atom parameters constrained
$\Delta\rho_{\rm max} = 0.17$ e Å$^{-3}$
$\Delta\rho_{\rm min} = -0.16$ e Å$^{-3}$

**Table 1**
Hydrogen-bond geometry (Å, °).

| $D$—H$\cdots A$ | $D$—H | H$\cdots A$ | $D\cdots A$ | $D$—H$\cdots A$ |
|---|---|---|---|---|
| C7—H7$\cdots$O2$^{\rm i}$ | 0.98 | 2.53 | 3.082 (3) | 115 |
| C18—H18$\cdots$O2$^{\rm i}$ | 0.93 | 2.50 | 3.388 (3) | 161 |
| C18—H18$\cdots$N1 | 0.93 | 2.59 | 2.900 (3) | 100 |

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

**Table 2**
D—H$\cdots\pi$-ring interactions.

*Cg* is the centroid of the ring C10/C11/C12/C13/C14/C19.

| D—H$\cdots Cg$ | D—H | H$\cdots Cg$ | D$\cdots Cg$ | D—H$\cdots Cg$ |
|---|---|---|---|---|
| C7—H7$\cdots Cg1^{\rm ii}$ | 0.98 | 2.86 | 3.686 (2) | 142 |
| C16—H16$\cdots Cg1^{\rm iii}$ | 0.93 | 2.87 | 3.683 (3) | 147 |

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

All H atoms were discernible in a difference Fourier map. Nevertheless, all H atoms were constrained to ride on their parent atoms with $C—H_{\rm aryl}$, $C—H_{\rm methylene}$ and $C—H_{\rm methine}$ distances of 0.93, 0.97 and 0.98 Å, respectively. $U_{\rm iso}({\rm H}) = 1.2U_{\rm eq}({\rm C})$ in all cases. In the absence of significant anomalous scattering effects 1387 Friedel pairs have been merged.

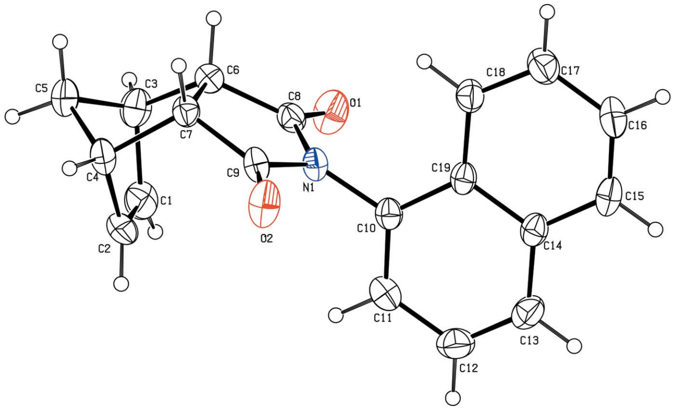


**Figure 1**
The molecular structure of (I) showing the atom-labelling scheme. Displacement ellipsoids are drawn at the 50% probability level. H atoms are represented by circles of arbitrary size.

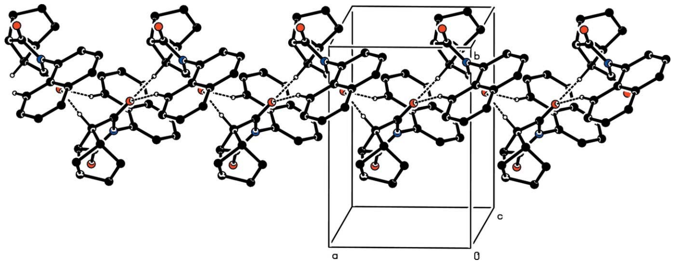


**Figure 2**
Part of the crystal packing showing the formation of the one-dimensional chain along the *a* axis. The H atoms not involved in the C—H$\cdots$O hydrogen bonds (dashed lines) have been omitted for clarity.

Data collection: *SMART* (Bruker, 2001); cell refinement: *SAINT-Plus* (Bruker, 2001); data reduction: *SAINT-Plus*; program(s) used to solve structure: *SHELXS97* (Sheldrick, 1997); program(s) used to refine structure: *SHELXL97* (Sheldrick, 1997); molecular graphics: *PLATON* (Spek, 2003); software used to prepare material for publication: *SHELXL97*.

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**o2394** Tian *et al.* • $C_{19}H_{15}NO_2$ *Acta Cryst.* (2007). E**63**, o2393–o2394