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## Structure Reports

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## 3-(2-Hydroxybenzylideneamino)-benzonitrile

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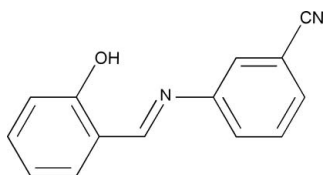
Received 21 January 2008; accepted 25 February 2008

Key indicators: single-crystal X-ray study;  $T = 293$  K; mean  $\sigma(\text{C}-\text{C}) = 0.005$  Å;  $R$  factor = 0.056;  $wR$  factor = 0.122; data-to-parameter ratio = 8.4.

In the title molecule,  $\text{C}_{14}\text{H}_{10}\text{N}_2\text{O}$ , an intramolecular  $\text{O} \cdots \text{H} \cdots \text{N}$  hydrogen bond contributes to the essential coplanarity of the two benzene rings, which form a dihedral angle of  $6.04$  ( $18$ )°.

## Related literature

For related crystal structures, see: Kosar *et al.* (2005); Cheng *et al.* (2005, 2006).



## Experimental

## Crystal data

 $\text{C}_{14}\text{H}_{10}\text{N}_2\text{O}$  $M_r = 222.24$ Orthorhombic,  $Pca2_1$  $a = 26.397$  (5) Å $b = 3.9211$  (8) Å $c = 10.773$  (2) Å $V = 1115.1$  (4) Å<sup>3</sup> $Z = 4$ Mo  $K\alpha$  radiation $\mu = 0.09$  mm<sup>-1</sup> $T = 293$  (2) K $0.22 \times 0.05 \times 0.05$  mm

## Data collection

Rigaku Mercury2 diffractometer  
Absorption correction: multi-scan  
(*CrystalClear*; Rigaku, 2005)  
 $T_{\min} = 0.812$ ,  $T_{\max} = 1.000$   
(expected range = 0.809–0.996)

9995 measured reflections  
1339 independent reflections  
901 reflections with  $I > 2\sigma(I)$   
 $R_{\text{int}} = 0.116$

## Refinement

 $R[F^2 > 2\sigma(F^2)] = 0.056$  $wR(F^2) = 0.121$  $S = 1.05$ 

1339 reflections

160 parameters

2 restraints

H atoms treated by a mixture of independent and constrained refinement

 $\Delta\rho_{\max} = 0.15$  e Å<sup>-3</sup> $\Delta\rho_{\min} = -0.16$  e Å<sup>-3</sup>

Table 1

Hydrogen-bond geometry (Å, °).

| $D-H \cdots A$                          | $D-H$    | $H \cdots A$ | $D \cdots A$ | $D-H \cdots A$ |
|---|----------|--------------|--------------|----------------|
| $\text{O1}-\text{H1B} \cdots \text{N1}$ | 0.82 (2) | 1.89 (4)     | 2.623 (4)    | 149 (7)        |

Data collection: *CrystalClear* (Rigaku, 2005); cell refinement: *CrystalClear*; data reduction: *CrystalClear*; program(s) used to solve structure: *SHELXS97* (Sheldrick, 2008); program(s) used to refine structure: *SHELXL97* (Sheldrick, 2008); molecular graphics: *SHELXTL* (Sheldrick, 2008); software used to prepare material for publication: *SHELXTL*.

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Supplementary data and figures for this paper are available from the IUCr electronic archives (Reference: CV2384).

## References

- Cheng, K., You, Z.-L., Li, Y.-G. & Zhu, H.-L. (2005). *Acta Cryst.* **E61**, o1137–o1138.  
Cheng, K., Zhu, H. L., Li, Z. B. & Yan, Z. (2006). *Acta Cryst.* **E62**, o2417–o2418.  
Kosar, B., Albayrak, C., Odabaşoğlu, M. & Büyükgüngör (2005). *Acta Cryst.* **E61**, o2106–o2108.  
Rigaku (2005). *CrystalClear*. Rigaku Corporation, Tokyo, Japan.  
Sheldrick, G. M. (2008). *Acta Cryst.* **A64**, 112–122.

## supporting information

*Acta Cryst.* (2008). E64, o638 [doi:10.1107/S1600536808005242]

## 3-(2-Hydroxybenzylideneamino)benzonitrile

Hai-Jun Xu, Xing-Xuan Gong and Han Wang

### S1. Comment

Schiff base compounds have attracted great attention for many years. These compounds play an important role in the development of coordination chemistry related to catalysis and enzymatic reactions, magnetism, photochromism and thermochromism. Here, we report the crystal structure of the title compound.

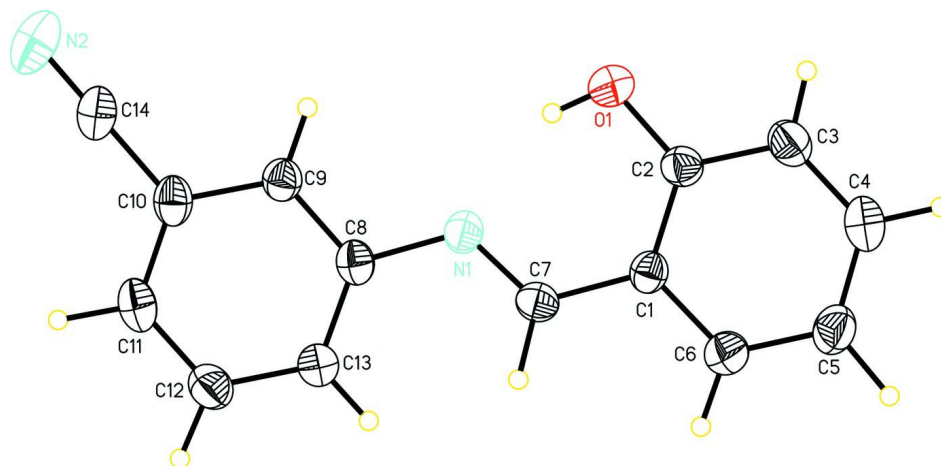
In the title compound (Fig. 1), all bond lengths are within normal ranges. The C7=N1 bond length of 1.277 (4) Å is a typical double bond, similar to the corresponding bond lengths in 4-methoxy-2-[(4-nitrophenyl)iminomethyl]phenol (Kosar *et al.*, 2005). The molecule is almost planar and displays a *trans* configuration with respect to the C7=N1 double bond. The dihedral angle between the benzene rings is 6.04 (18)°. Strong intramolecular O—H···N hydrogen-bond interaction (Talbe I), similar to the reported earlier (Cheng *et al.*, 2005, 2006), is observed in the molecule.

### S2. Experimental

3-Aminobenzonitrile and salicylaldehyde were available commercially and were used without further purification. 3-Aminobenzonitrile (1.18 g, 10 mmol) and salicylaldehyde (1.22 g, 10 mmol) were dissolved in ethanol (20 ml). The mixture was heated to reflux for 4 h, then cooled to room temperature overnight and large amounts of a yellow precipitate were formed. Yellow crystals were obtained by recrystallization from ethyl alcohol (yield: 82%). For the X-ray diffraction analysis, suitable single crystals were obtained after one week by slow evaporation from an ethyl alcohol solution.

### S3. Refinement

C-bound H atoms were geometrically positioned (C—H 0.93 Å) and refined as riding with  $U_{\text{iso}}(\text{H}) = 1.2U_{\text{eq}}(\text{C})$ . Atom H1B was located on a difference map and refined isotropically with bond restraint O1—H1B = 0.82 (2) Å. In the absence of significant anomalous scatterers, 1124 Friedel pairs were merged.

**Figure 1**

The molecular structure of the title compound with atomic numbering and displacement ellipsoids drawn at the 30% probability level.

### 3-(2-Hydroxybenzylideneamino)benzonitrile

#### Crystal data

$C_{14}H_{10}N_2O$

$M_r = 222.24$

Orthorhombic,  $Pca2_1$

Hall symbol: P 2c -2ac

$a = 26.397$  (5) Å

$b = 3.9211$  (8) Å

$c = 10.773$  (2) Å

$V = 1115.1$  (4) Å<sup>3</sup>

$Z = 4$

$F(000) = 464$

$D_x = 1.324$  Mg m<sup>-3</sup>

Mo  $K\alpha$  radiation,  $\lambda = 0.71073$  Å

Cell parameters from 8294 reflections

$\theta = 3.0$ – $27.6^\circ$

$\mu = 0.09$  mm<sup>-1</sup>

$T = 293$  K

Stick, yellow

$0.22 \times 0.05 \times 0.05$  mm

#### Data collection

Rigaku Mercury2

diffractometer

Radiation source: fine-focus sealed tube

Graphite monochromator

Detector resolution: 13.6612 pixels mm<sup>-1</sup>

$\omega$  scans

Absorption correction: multi-scan

(*CrystalClear*; Rigaku, 2005)

$T_{\min} = 0.812$ ,  $T_{\max} = 1.00$

9995 measured reflections

1339 independent reflections

901 reflections with  $I > 2\sigma(I)$

$R_{\text{int}} = 0.116$

$\theta_{\max} = 27.5^\circ$ ,  $\theta_{\min} = 3.1^\circ$

$h = -34 \rightarrow 34$

$k = -5 \rightarrow 5$

$l = -13 \rightarrow 13$

#### Refinement

Refinement on  $F^2$

Least-squares matrix: full

$R[F^2 > 2\sigma(F^2)] = 0.056$

$wR(F^2) = 0.121$

$S = 1.05$

1339 reflections

160 parameters

2 restraints

Primary atom site location: structure-invariant  
direct methods

Secondary atom site location: difference Fourier  
map

Hydrogen site location: inferred from  
neighbouring sites

H atoms treated by a mixture of independent  
and constrained refinement

$$w = 1/[\sigma^2(F_o^2) + (0.0413P)^2]$$

where  $P = (F_o^2 + 2F_c^2)/3$   
 $(\Delta/\sigma)_{\max} < 0.001$

$$\Delta\rho_{\max} = 0.15 \text{ e } \text{\AA}^{-3}$$

$$\Delta\rho_{\min} = -0.16 \text{ e } \text{\AA}^{-3}$$

*Special details*

**Geometry.** All e.s.d.'s (except the e.s.d. in the dihedral angle between two l.s. planes) are estimated using the full covariance matrix. The cell e.s.d.'s are taken into account individually in the estimation of e.s.d.'s in distances, angles and torsion angles; correlations between e.s.d.'s in cell parameters are only used when they are defined by crystal symmetry. An approximate (isotropic) treatment of cell e.s.d.'s is used for estimating e.s.d.'s involving l.s. planes.

**Refinement.** Refinement of  $F^2$  against ALL reflections. The weighted  $R$ -factor  $wR$  and goodness of fit  $S$  are based on  $F^2$ , conventional  $R$ -factors  $R$  are based on  $F$ , with  $F$  set to zero for negative  $F^2$ . The threshold expression of  $F^2 > \sigma(F^2)$  is used only for calculating  $R$ -factors(gt) *etc.* and is not relevant to the choice of reflections for refinement.  $R$ -factors based on  $F^2$  are statistically about twice as large as those based on  $F$ , and  $R$ -factors based on ALL data will be even larger.

*Fractional atomic coordinates and isotropic or equivalent isotropic displacement parameters ( $\text{\AA}^2$ )*

|      | <i>x</i>     | <i>y</i>     | <i>z</i>   | $U_{\text{iso}}^*/U_{\text{eq}}$ |
|------|--------------|--------------|------------|----------------------------------|
| N1   | 0.45687 (11) | 0.2218 (7)   | 0.2697 (3) | 0.0473 (8)                       |
| C1   | 0.54425 (12) | 0.2407 (8)   | 0.3273 (3) | 0.0427 (8)                       |
| C9   | 0.37076 (12) | 0.2616 (9)   | 0.2071 (3) | 0.0457 (9)                       |
| H9A  | 0.3823       | 0.3718       | 0.1360     | 0.055*                           |
| C6   | 0.57995 (14) | 0.1614 (9)   | 0.4188 (3) | 0.0559 (10)                      |
| H6A  | 0.5694       | 0.0602       | 0.4924     | 0.067*                           |
| C8   | 0.40534 (12) | 0.1480 (8)   | 0.2952 (3) | 0.0451 (8)                       |
| C7   | 0.49124 (12) | 0.1608 (8)   | 0.3501 (3) | 0.0460 (9)                       |
| H7A  | 0.4821       | 0.0624       | 0.4254     | 0.055*                           |
| C3   | 0.61133 (14) | 0.4649 (10)  | 0.2017 (3) | 0.0570 (11)                      |
| H3A  | 0.6223       | 0.5715       | 0.1294     | 0.068*                           |
| C2   | 0.56072 (13) | 0.3894 (9)   | 0.2167 (3) | 0.0468 (9)                       |
| C12  | 0.33597 (14) | -0.0682 (10) | 0.4162 (4) | 0.0601 (10)                      |
| H12A | 0.3245       | -0.1800      | 0.4869     | 0.072*                           |
| C10  | 0.31905 (13) | 0.2118 (9)   | 0.2243 (3) | 0.0510 (10)                      |
| C11  | 0.30193 (13) | 0.0476 (9)   | 0.3297 (3) | 0.0572 (11)                      |
| H11A | 0.2674       | 0.0157       | 0.3421     | 0.069*                           |
| C14  | 0.28378 (13) | 0.3427 (10)  | 0.1343 (4) | 0.0585 (10)                      |
| O1   | 0.52789 (11) | 0.4688 (8)   | 0.1250 (3) | 0.0683 (8)                       |
| C5   | 0.63050 (14) | 0.2312 (10)  | 0.4013 (4) | 0.0629 (11)                      |
| H5A  | 0.6540       | 0.1756       | 0.4622     | 0.076*                           |
| C4   | 0.64585 (14) | 0.3839 (10)  | 0.2928 (4) | 0.0632 (11)                      |
| H4A  | 0.6800       | 0.4331       | 0.2808     | 0.076*                           |
| C13  | 0.38733 (13) | -0.0193 (10) | 0.3986 (3) | 0.0542 (10)                      |
| H13A | 0.4101       | -0.1006      | 0.4575     | 0.065*                           |
| N2   | 0.25591 (14) | 0.4542 (10)  | 0.0648 (4) | 0.0896 (13)                      |
| H1B  | 0.4999 (10)  | 0.396 (12)   | 0.145 (7)  | 0.13 (2)*                        |

*Atomic displacement parameters ( $\text{\AA}^2$ )*

|    | $U^{11}$    | $U^{22}$    | $U^{33}$    | $U^{12}$    | $U^{13}$     | $U^{23}$     |
|----|-------------|-------------|-------------|-------------|--------------|--------------|
| N1 | 0.0426 (18) | 0.0517 (18) | 0.0474 (16) | 0.0006 (13) | -0.0038 (14) | -0.0007 (13) |

|     |             |             |             |              |              |              |
|-----|-------------|-------------|-------------|--------------|--------------|--------------|
| C1  | 0.038 (2)   | 0.0449 (17) | 0.045 (2)   | 0.0021 (14)  | 0.0015 (17)  | -0.0035 (16) |
| C9  | 0.042 (2)   | 0.048 (2)   | 0.046 (2)   | 0.0029 (16)  | 0.0022 (17)  | -0.0027 (17) |
| C6  | 0.053 (2)   | 0.058 (2)   | 0.057 (2)   | 0.0006 (18)  | -0.005 (2)   | 0.0031 (19)  |
| C8  | 0.0392 (19) | 0.0456 (19) | 0.051 (2)   | -0.0018 (15) | 0.0032 (17)  | -0.0088 (17) |
| C7  | 0.052 (2)   | 0.0445 (19) | 0.042 (2)   | 0.0000 (16)  | 0.0045 (17)  | 0.0015 (17)  |
| C3  | 0.054 (3)   | 0.061 (3)   | 0.056 (2)   | -0.0065 (18) | 0.0091 (19)  | -0.0002 (19) |
| C2  | 0.047 (2)   | 0.051 (2)   | 0.042 (2)   | -0.0009 (16) | 0.0012 (16)  | -0.0012 (18) |
| C12 | 0.056 (2)   | 0.065 (3)   | 0.060 (2)   | -0.0083 (19) | 0.006 (2)    | 0.006 (2)    |
| C10 | 0.042 (2)   | 0.054 (2)   | 0.057 (2)   | 0.0035 (17)  | 0.0024 (19)  | -0.0148 (19) |
| C11 | 0.0399 (19) | 0.061 (2)   | 0.071 (3)   | -0.0074 (17) | 0.0068 (19)  | -0.013 (2)   |
| C14 | 0.044 (2)   | 0.065 (3)   | 0.067 (2)   | 0.0038 (18)  | -0.006 (2)   | -0.011 (2)   |
| O1  | 0.0590 (17) | 0.092 (2)   | 0.0540 (15) | -0.0015 (16) | -0.0059 (17) | 0.0190 (16)  |
| C5  | 0.049 (2)   | 0.070 (3)   | 0.070 (3)   | 0.007 (2)    | -0.011 (2)   | 0.002 (2)    |
| C4  | 0.047 (2)   | 0.064 (2)   | 0.079 (3)   | -0.0066 (19) | 0.004 (2)    | -0.008 (2)   |
| C13 | 0.047 (2)   | 0.060 (2)   | 0.056 (2)   | -0.0005 (17) | 0.0015 (18)  | 0.007 (2)    |
| N2  | 0.066 (2)   | 0.097 (3)   | 0.105 (3)   | 0.012 (2)    | -0.032 (2)   | -0.004 (2)   |

*Geometric parameters (Å, °)*

|            |           |              |           |
|------------|-----------|--------------|-----------|
| N1—C7      | 1.277 (4) | C3—H3A       | 0.9300    |
| N1—C8      | 1.418 (4) | C2—O1        | 1.351 (4) |
| C1—C2      | 1.396 (4) | C12—C11      | 1.372 (5) |
| C1—C6      | 1.398 (5) | C12—C13      | 1.382 (5) |
| C1—C7      | 1.455 (4) | C12—H12A     | 0.9300    |
| C9—C8      | 1.390 (4) | C10—C11      | 1.381 (5) |
| C9—C10     | 1.391 (4) | C10—C14      | 1.439 (5) |
| C9—H9A     | 0.9300    | C11—H11A     | 0.9300    |
| C6—C5      | 1.375 (5) | C14—N2       | 1.137 (5) |
| C6—H6A     | 0.9300    | O1—H1B       | 0.82 (2)  |
| C8—C13     | 1.377 (5) | C5—C4        | 1.374 (5) |
| C7—H7A     | 0.9300    | C5—H5A       | 0.9300    |
| C3—C4      | 1.376 (5) | C4—H4A       | 0.9300    |
| C3—C2      | 1.378 (4) | C13—H13A     | 0.9300    |
| C7—N1—C8   | 120.8 (3) | C3—C2—C1     | 119.5 (3) |
| C2—C1—C6   | 119.0 (3) | C11—C12—C13  | 120.2 (3) |
| C2—C1—C7   | 122.2 (3) | C11—C12—H12A | 119.9     |
| C6—C1—C7   | 118.8 (3) | C13—C12—H12A | 119.9     |
| C8—C9—C10  | 120.5 (3) | C11—C10—C9   | 119.8 (3) |
| C8—C9—H9A  | 119.7     | C11—C10—C14  | 120.6 (3) |
| C10—C9—H9A | 119.7     | C9—C10—C14   | 119.6 (4) |
| C5—C6—C1   | 120.9 (4) | C12—C11—C10  | 119.9 (3) |
| C5—C6—H6A  | 119.6     | C12—C11—H11A | 120.1     |
| C1—C6—H6A  | 119.6     | C10—C11—H11A | 120.1     |
| C13—C8—C9  | 118.6 (3) | N2—C14—C10   | 178.2 (5) |
| C13—C8—N1  | 125.8 (3) | C2—O1—H1B    | 108 (5)   |
| C9—C8—N1   | 115.6 (3) | C4—C5—C6     | 119.3 (4) |
| N1—C7—C1   | 121.9 (3) | C4—C5—H5A    | 120.4     |

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|           |           |              |           |
|-----------|-----------|--------------|-----------|
| N1—C7—H7A | 119.0     | C6—C5—H5A    | 120.4     |
| C1—C7—H7A | 119.0     | C3—C4—C5     | 120.8 (3) |
| C4—C3—C2  | 120.5 (4) | C3—C4—H4A    | 119.6     |
| C4—C3—H3A | 119.7     | C5—C4—H4A    | 119.6     |
| C2—C3—H3A | 119.7     | C12—C13—C8   | 121.0 (3) |
| O1—C2—C3  | 119.1 (3) | C12—C13—H13A | 119.5     |
| O1—C2—C1  | 121.4 (3) | C8—C13—H13A  | 119.5     |

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*Hydrogen-bond geometry (Å, °)*

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| <i>D—H...A</i> | <i>D—H</i> | <i>H...A</i> | <i>D...A</i> | <i>D—H...A</i> |
|----------------|------------|--------------|--------------|----------------|
| O1—H1B...N1    | 0.82 (2)   | 1.89 (4)     | 2.623 (4)    | 149 (7)        |

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