

## Bis[benzyl *N'*-(3-phenylprop-2-enylidene)hydrazinecarbodithioato- $\kappa^2 N', S$ ]zinc(II)

Hoong-Kun Fun,<sup>a‡</sup> Suchada Chantrapromma,<sup>b§</sup> M. T. H. Tarafder,<sup>c\*</sup> M. Tohidul Islam,<sup>c</sup> C. M. Zakaria<sup>c</sup> and M. A. A. A. Islam<sup>d</sup>

<sup>a</sup>X-ray Crystallography Unit, School of Physics, Universiti Sains Malaysia, 11800 USM, Penang, Malaysia, <sup>b</sup>Department of Chemistry, Faculty of Science, Prince of Songkla University, Hat-Yai, Songkhla 90112, Thailand, <sup>c</sup>Department of Chemistry, Rajshahi University, Rajshahi 6205, Bangladesh, and <sup>d</sup>Department of Chemistry, Rajshahi University of Engineering and Technology, Rajshahi 6205, Bangladesh  
Correspondence e-mail: tofazzal@yahoo.com

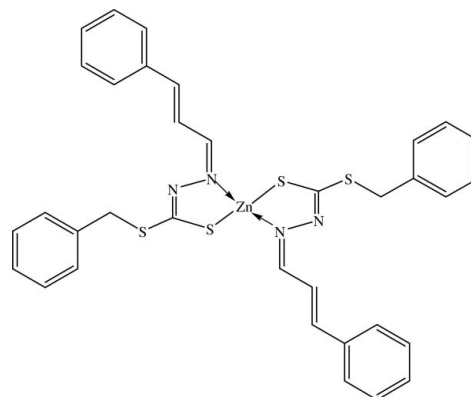
Received 25 February 2008; accepted 28 February 2008

Key indicators: single-crystal X-ray study;  $T = 100$  K; mean  $\sigma(C-C) = 0.002$  Å;  $R$  factor = 0.029;  $wR$  factor = 0.092; data-to-parameter ratio = 23.5.

In the title  $Zn^{II}$  complex,  $[Zn(C_{17}H_{15}N_2S_2)_2]$ , the  $Zn^{II}$  atom lies on a twofold rotation axis. It exists in a tetrahedral geometry, chelated by two deprotonated Schiff base ligands. The dihedral angle between each ligand is  $71.48(8)^\circ$ . Molecules are connected by weak  $C-H \cdots S$  intermolecular interactions into chains along the  $c$  axis. The crystal structure is further stabilized by  $C-H \cdots \pi$  interactions involving the phenyl ring of the 3-phenylprop-2-enylidene unit.

### Related literature

For the synthesis and structure of *S*-benzylthiocarbazates, see: Ali & Tarafder (1977); Shanmuga Sundara Raj *et al.* (2000). For the structures of  $Zn^{II}$  complexes, see: Latheef *et al.* (2007); Tarafder, Chew *et al.* (2002). For the structures of other metal dithiocarbazates, see: Ali *et al.* (2001, 2002, 2008); Chew *et al.* (2004); Crouse *et al.* (2004); Tarafder *et al.* (2001, 2008); Tarafder, Chew *et al.* (2002); Tarafder, Jin *et al.* (2002). For the bioactivity of metal *S*-benzylthiocarbazates, see, for example: Ali *et al.* (2001, 2002); Tarafder *et al.* (2001); Tarafder, Jin *et al.* (2002).



### Experimental

#### Crystal data

$[Zn(C_{17}H_{15}N_2S_2)_2]$   
 $M_r = 688.23$   
Orthorhombic, *Pbcn*  
 $a = 36.0897(4)$  Å  
 $b = 9.9310(1)$  Å  
 $c = 8.7633(1)$  Å

$V = 3140.83(6)$  Å<sup>3</sup>  
 $Z = 4$   
Mo  $K\alpha$  radiation  
 $\mu = 1.08$  mm<sup>-1</sup>  
 $T = 100.0(1)$  K  
 $0.37 \times 0.25 \times 0.17$  mm

#### Data collection

Bruker SMART APEXII CCD  
area-detector diffractometer  
Absorption correction: multi-scan  
(*SADABS*; Bruker, 2005)  
 $T_{min} = 0.692$ ,  $T_{max} = 0.841$

82655 measured reflections  
4580 independent reflections  
4071 reflections with  $I > 2\sigma(I)$   
 $R_{int} = 0.042$

#### Refinement

$R[F^2 > 2\sigma(F^2)] = 0.028$   
 $wR(F^2) = 0.091$   
 $S = 1.15$   
4580 reflections

195 parameters  
H-atom parameters constrained  
 $\Delta\rho_{max} = 0.49$  e Å<sup>-3</sup>  
 $\Delta\rho_{min} = -0.32$  e Å<sup>-3</sup>

**Table 1**

Hydrogen-bond geometry (Å, °).

$D-H \cdots A$	$D-H$	$H \cdots A$	$D \cdots A$	$D-H \cdots A$
$C13-H13A \cdots S2^i$	0.93	2.76	3.6697 (17)	167
$C11-H11B \cdots C81^{ii}$	0.97	2.98	3.5785 (17)	121

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

Data collection: *APEX2* (Bruker, 2005); cell refinement: *APEX2*; data reduction: *SAINT* (Bruker, 2005); program(s) used to solve structure: *SHELXTL* (Sheldrick, 2008); program(s) used to refine structure: *SHELXTL*; molecular graphics: *SHELXTL*; software used to prepare material for publication: *SHELXTL* and *PLATON* (Spek, 2003).

MTHT and MTI thank Rajshahi University for financial support. SC thanks Prince of Songkla University for generous support. The authors also thank the Malaysian Government and Universiti Sains Malaysia for the Scientific Advancement Grant Allocation (SAGA) grant No. 304/PFIZIK/653003/A118.

‡ Additional correspondence author, e-mail: hkfun@usm.my.  
§ Additional correspondence author, e-mail: suchada.c@psu.ac.th.

Supplementary data and figures for this paper are available from the IUCr electronic archives (Reference: NG2427).

## References

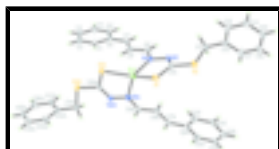
- Ali, M. A., Baker, H. J. H. A., Mirza, A. H., Smith, S. J., Gahan, L. R. & Bernhardt, P. V. (2008). *Polyhedron*, **27**, 71–79.
- Ali, M. A., Mirza, A. H., Butcher, R. J., Tarafder, M. T. H. & Ali, A. M. (2001). *Inorg. Chim. Acta*, **320**, 1–6.
- Ali, M. A., Mirza, A. H., Butcher, R. J., Tarafder, M. T. H., Keat, T. B. & Ali, A. M. (2002). *J. Inorg. Biochem.* **92**, 141–148.
- Ali, M. A. & Tarafder, M. T. H. (1977). *J. Inorg. Nucl. Chem.* **39**, 1785–1788.
- Bruker (2005). *APEX2* (Version 1.27), *SAINT* (Version 7.12A) and *SADABS* (Version 2004/1). Bruker AXS Inc., Madison, Wisconsin, USA.
- Chew, K.-B., Tarafder, M. T. H., Crouse, K. A., Ali, A. M., Yamin, B. M. & Fun, H.-K. (2004). *Polyhedron*, **23**, 1385–1392.
- Crouse, K. A., Chew, K.-B., Tarafder, M. T. H., Kasbollah, A., Ali, A. M., Yamin, B. M. & Fun, H.-K. (2004). *Polyhedron*, **23**, 161–168.
- Latheef, L., Manoj, E. & Kurup, M. R. P. (2007). *Polyhedron*, **26**, 4107–4113.
- Shanmuga Sundara Raj, S., Yamin, B. M., Yussof, Y. A., Tarafder, M. T. H., Fun, H.-K. & Grouse, K. A. (2000). *Acta Cryst.* **C56**, 1236–1237.
- Sheldrick, G. M. (2008). *Acta Cryst.* **A64**, 112–122.
- Spek, A. L. (2003). *J. Appl. Cryst.* **36**, 7–13.
- Tarafder, M. T. H., Chew, K.-B., Crouse, K. A., Ali, A. M., Yamin, B. M. & Fun, H.-K. (2002). *Polyhedron*, **21**, 2683–2690.
- Tarafder, M. T. H., Islam, M. T., Islam, M. A. A. A., Chantrapromma, S. & Fun, H.-K. (2008). *Acta Cryst.* **E64**, m416–m417.
- Tarafder, M. T. H., Jin, K.-T., Crouse, K. A., Ali, A. M., Yamin, B. M. & Fun, H.-K. (2002). *Polyhedron*, **21**, 2547–2554.
- Tarafder, M. T. H., Kasbollah, A., Crouse, K. A., Ali, M. A., Yamin, B. M. & Fun, H.-K. (2001). *Polyhedron*, **20**, 2363–2370.



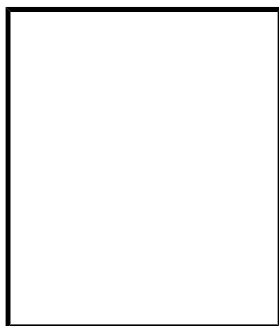


!\* & \$ ! " < " ! \$ !\* ! 1 ! !\*  
" ! \$ !\* ! ! \* \$ ! " - \*!  
, + + ! J ! K " ?<L J !! + " ! !  
5 \* !\* ! E \$ !E 6! 1 K , \* \*  
! 6 ! \$ ! + # , ? , M 6 1 G 6 M

-!! A + , " !! !! + , F ! + )@  
1 = ) A D N) " \* ! ! , F !  
, ! ! 6 = 9



: " \* " - ! , \* + " L , \$ \$ !  
! , , OE O \* \$ " - ! \$ !! + \* 5 - "



: " ! , F " ! , \* # + 7 ! " ! \*!  
) @ A H H H & + F + !

! " # " \$ 6! %& \$ ' '#

9 )1A ; & 5 D 6 P  
D ? < P ! " , K 6 1 6 M  
B \$ P Q  
A !! \$ ! K S \$ RD 1 1 < =  
D < ? 1 6 = ) !! , 6 !  
D < = TD G < U  
D 1 ? < < = V D O  
D < 6 < ? = D M  
D 6 ' ! F !! +  
D 6 6 < 1 W W 1













