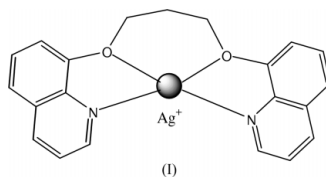


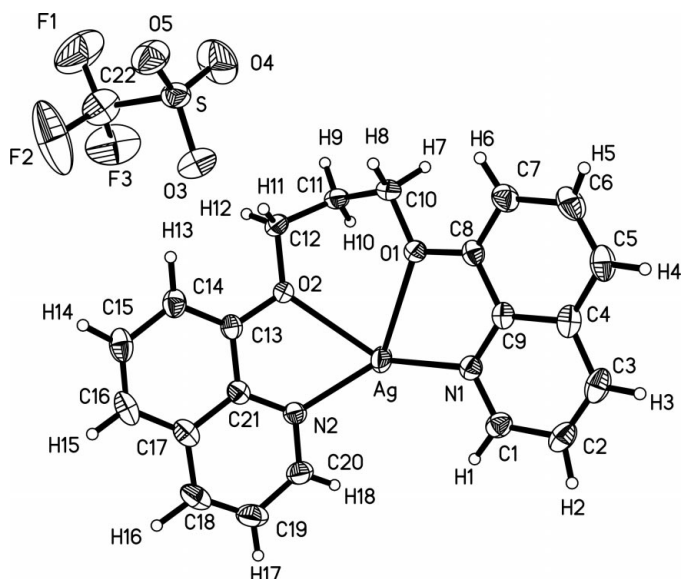
An-Wu Xu,<sup>a</sup> Yue-Peng Cai,<sup>a\*</sup>  
Li-Zhi Zhang,<sup>b</sup> Cheng-Yong Su<sup>a</sup>  
and Bei-Sheng Kang<sup>a</sup><sup>a</sup>Department of Chemistry, Zhongshan University, Guangzhou, People's Republic of China, and <sup>b</sup>Department of Chemistry, The Chinese University of Hong Kong, Shatin NT, Hong Kong, People's Republic of ChinaCorrespondence e-mail:  
ypcaizsu@yahoo.com.cn

## Key indicators

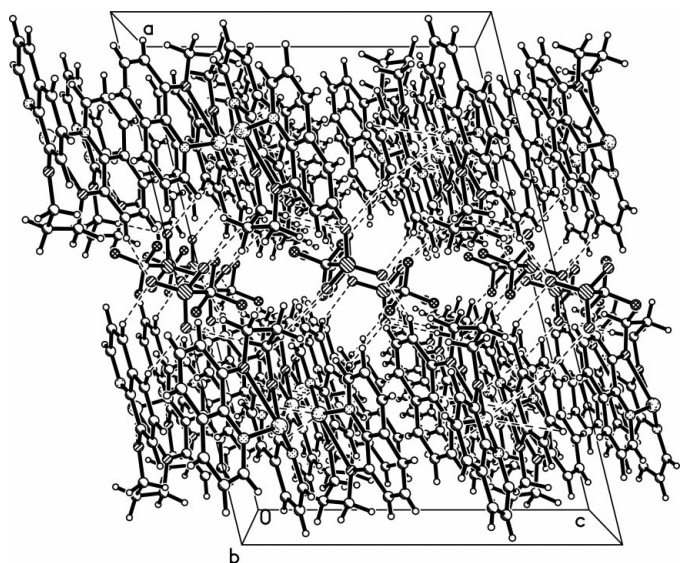
Single-crystal X-ray study  
T = 293 K  
Mean  $\sigma(C-C) = 0.005 \text{ \AA}$   
R factor = 0.043  
wR factor = 0.123  
Data-to-parameter ratio = 13.5For details of how these key indicators were automatically derived from the article, see <http://journals.iucr.org/e>.**[8,8'-(Propane-1,3-diylidioxy)diquinoline- $\kappa^4 N, O, O', N'$ ]silver(I) trifluoromethanesulfonate**Colourless prismatic crystals of the title compound,  $[\text{Ag}(\text{C}_{21}\text{H}_{18}\text{N}_2\text{O}_2)](\text{CF}_3\text{SO}_3)$ , form from ethanol solution of equivalent amounts of  $\text{Ag}(\text{CF}_3\text{SO}_3)$  and *O, O'*-bis(8-quinolyl)-1,5-dioxapentane [DPOQ; systematic name: 8,8'-(propane-1,3-diylidioxy)diquinoline]. Building-block  $[\text{Ag}(\text{DPOQ})]$  motifs and  $\text{CF}_3\text{SO}_3^-$  anions are connected *via* alternating weak C—H $\cdots$ O hydrogen-bond interactions into a three-dimensional network.

## Comment

Much interest has been shown during the last decade in the coordination chemistry of the lithium ion (Subramanian *et al.*, 1995) since it has been successfully used in the treatment of manic depression, neurological and psychological disorder. *O, O'*-Bis(8-quinolyl)-1,5-dioxapentane (DPOQ) and its derivatives have been investigated for both transportation and quantitative estimation of lithium (Hiratani, 1987). In previous studies, we have used this highly flexible ligand with a long spacer,  $(\text{CH}_2)_6$ , *O, O'*-bis(8-quinolyl)-1,5-dioxaoctane (ODOQ; Cai *et al.*, 2001). In those complexes, the high flexibility of ODOQ seemed to play an important role in the formation of single-strand double-helical structures. Very recently, we have obtained discrete single-strand helical complexes constructed by the ligand *O, O'*-bis(8-quinolyl)-1,8-dioxaheptane (OHOQ), containing the non-restrained spacer  $(\text{CH}_2)_5$  (Cai *et al.*, 2002). These findings prompted us to systematically investigate the influence of the spacers on fabricating new supramolecular structures. Herein we report the crystal structure of the title complex, (I).The molecule of (I) consists of the  $\text{CF}_3\text{SO}_3^-$  anion and  $\text{Ag}(\text{DPOQ})^+$  cation, which looks like a bat. Each silver(I) ion in the  $\text{Ag}(\text{DPOQ})^+$  cation is coordinated by two imino N atoms and two O atoms of two 8-quinoline groups. The average Ag—N and Ag—O bond distances are 2.21 (3) and 2.56 (3)  $\text{\AA}$ , respectively. The N—Ag—N and O—Ag—O angles are 136.73 (8) and 72.09°, respectively. The environment of the silver(I) ion may be regarded as a tetrahedron. The  $\text{CF}_3\text{SO}_3^-$  anion does not bind to  $\text{Ag}^+$ , but is involved in the formation of intermolecular interactions through its O atoms. Each  $\text{CF}_3\text{SO}_3^-$  anion accepts weak C—H $\cdots$ O hydrogen bonds from four neighboring  $\text{Ag}(\text{DPOQ})^+$  cations,Received 14 October 2002  
Accepted 21 November 2002  
Online 30 November 2002



**Figure 1**  
View of the title compound, with the atomic labelling. Displacement ellipsoids are drawn at the 30% probability level.



**Figure 2**  
The three-dimensional coordination network in (I), viewed along the *b* axis.

with a mean C—O bond distance of 3.35 Å and C—H...O angle of 153° (Braga *et al.*, 1998), thus forming a three-dimensional network.

## Experimental

The title compound was prepared and characterized by a modification of the procedure of Cai *et al.* (2001). A solution of Ag(CF<sub>3</sub>SO<sub>3</sub>) (0.031 g, 0.12 mmol) in acetonitrile (10 ml) was added dropwise to a stirred solution of ligand DPOQ (0.04 g, 0.12 mmol) in MeOH

(10 ml) at room temperature and the resulting mixture stirred for 30 min. Pale-yellow single crystals (0.06 g, 85%) were obtained from acetone by slow evaporation of the solvent. The assigned structure was substantiated by EA and MS data. Elemental analysis calculated for C<sub>22</sub>H<sub>18</sub>AgF<sub>3</sub>N<sub>2</sub>O<sub>5</sub>S: C 44.97, H 3.07, N 4.77%; found: C 44.85%, H 3.13, N 4.79%. FAB-MS *m/z* (%): 588 (*M*<sup>+</sup> + 1, 68), 587 (*M*<sup>+</sup>, 56), 459 (*M*<sup>+</sup> - C<sub>9</sub>H<sub>6</sub>N, 100), 330 (*M*<sup>+</sup> - Ag, 81).

## Crystal data

[Ag(C<sub>22</sub>H<sub>18</sub>N<sub>2</sub>O<sub>2</sub>)](CF<sub>3</sub>O<sub>3</sub>S)  
*M<sub>r</sub>* = 587.31  
 Monoclinic, C2/c  
*a* = 21.9899 (11) Å  
*b* = 13.3576 (11) Å  
*c* = 15.2317 (10) Å  
 $\beta$  = 103.828 (2)°  
*V* = 4344.4 (5) Å<sup>3</sup>  
*Z* = 8

*D<sub>x</sub>* = 1.796 Mg m<sup>-3</sup>  
 Mo K $\alpha$  radiation  
 Cell parameters from 5699 reflections  
 $\theta$  = 4.8–55.0°  
 $\mu$  = 1.09 mm<sup>-1</sup>  
*T* = 293 (2) K  
 Prism, pale yellow  
 0.28 × 0.12 × 0.10 mm

## Data collection

Bruker SMART CCD area-detector diffractometer  
 $\varphi$  and  $\omega$  scans  
 Absorption correction: multi-scan (SADABS; Sheldrick, 1997)  
*T<sub>min</sub>* = 0.664, *T<sub>max</sub>* = 0.897  
 12912 measured reflections

5118 independent reflections  
 3801 reflections with *I* > 2 $\sigma$ (*I*)  
*R<sub>int</sub>* = 0.065  
 $\theta_{max}$  = 28.3°  
*h* = -28 → 29  
*k* = -17 → 17  
*l* = -13 → 20

## Refinement

Refinement on *F*<sup>2</sup>  
*R* [*F*<sup>2</sup> > 2 $\sigma$ (*F*<sup>2</sup>)] = 0.043  
*wR*(*F*<sup>2</sup>) = 0.123  
*S* = 1.03  
 5118 reflections  
 380 parameters  
 All H-atom parameters refined

$w = 1/[\sigma^2(F_o^2) + (0.068P)^2 + 0.8339P]$   
 where  $P = (F_o^2 + 2F_c^2)/3$   
 $(\Delta/\sigma)_{max} = 0.001$   
 $\Delta\rho_{max} = 0.96 \text{ e \AA}^{-3}$   
 $\Delta\rho_{min} = -1.00 \text{ e \AA}^{-3}$   
 Extinction correction: SHELXL97  
 Extinction coefficient: 0.00076 (13)

All H atoms were located in a difference map and were refined isotropically. The range of C—H distances is 0.88 (4)–1.02 (4) Å.

Data collection: SMART (Bruker, 1998); cell refinement: SMART; data reduction: SMART (Bruker, 1998) and SHELXTL (Bruker, 1998); program(s) used to solve structure: SHELXS97 (Sheldrick, 1997); program(s) used to refine structure: SHELXL97 (Sheldrick, 1997); molecular graphics: XP in SHELXTL; software used to prepare material for publication: SHELXTL.

We are grateful for funding from the National Natural Science Foundation of the People's Republic of China, and the NSF of Guangdong Province.

## References

- Braga, D., Grepioni, F. & Desiraju, G. R. (1998). *Chem. Rev.* **98**, 1375–1405.  
 Bruker (1998). SAINTE (Version 5.0), SMART (Version 5.0) and SHELXTL (Version 5.1). Bruker AXS Inc., Madison, Wisconsin, USA.  
 Cai, Y. P., Su, C. Y. & Kang, B. S. (2002). *Chem. Eur. J.* In the press.  
 Cai, Y. P., Zhang, H. X., Xu, A. W., Su, C. Y., Chen, C. L., Liu, H. Q., Zhang, L. & Kang, B. S. (2001). *J. Chem. Soc. Dalton Trans.* **16**, 2429–2434.  
 Hiratani, K. (1987). *J. Chem. Soc. Chem. Commun.* **13**, 960–961.  
 Sheldrick, G. M. (1997). SHELXS97 and SHELXL97. University of Göttingen, Germany.  
 Subramanian, S., Bridson, J. & Miller, D. (1995). *J. Chem. Crystallogr.* **25**, 743–745.