




**Figure 2**

A partial packing view, showing the formation of the two-dimensional sheet. [Symmetry codes: (i)  $x - 1, y, z$ ; (ii)  $2 - x, 1 - y, 2 - z$ ; (iii)  $1 - x, 1 - y, 1 - z$ ; (iv)  $1 + x, y, z$ .]

The *N*-oxide groups exhibit a bridging coordination mode, while the carboxylate groups are coordinated to the  $\text{Ag}^{\text{I}}$  ions in an unprecedented bridging coordination mode, different from the monodentate mode observed in previous reports (Li *et al.*, 2005). Thus, within the pydco ligand, the O atoms of the carboxylate groups exhibit two modes. One carboxylate group bridges one  $\text{Ni}^{\text{II}}$  ion and one  $\text{Ag}^{\text{I}}$  ion in a monodentate fashion involving only atom O4, while the other group adopts a bidentate mode *via* both O2 and O3, so each ligand links four  $\text{Ag}^{\text{I}}$  ions and two  $\text{Ni}^{\text{II}}$  ions. This results in a 16-membered metal-organic ring which is composed of two pydco ligands and two  $\text{Ag}^{\text{I}}$  ions, with one six-coordinated  $\text{Ni}^{\text{II}}$  ion located in the centre of the ring. These rings are linked through the pyridylcarboxylate groups to form one-dimensional zigzag chains (Fig. 2). Furthermore, the bridging O atoms of pydco extend adjacent chains by coordinating to the  $\text{Ag}^{\text{I}}$  and  $\text{Ni}^{\text{II}}$  atoms of the cyclic unit to generate a two-dimensional network (Fig. 2).

It noteworthy that, in this two-dimensional coordination polymer, there is one short ligand-supported  $\text{Ag}^{\text{I}} \cdots \text{Ag}^{\text{I}}$  contact,  $\text{Ag}^{\text{I}} \cdots \text{Ag}^{\text{I}} = 3.2859(14) \text{ \AA}$  [symmetry code: (ii)  $2 - x, 1 - y, 2 - z$ ], which is less than the van der Waals diameter of Ag (3.44 Å).

In conclusion, this two-dimensional sheet structure with helical chains can be described as a new type of mixed-metal coordination polymer with the pydco ligand in which the framework is composed of tetrahedrally coordinated  $\text{Ag}^{\text{I}}$  and octahedrally coordinated  $\text{Ni}^{\text{II}}$  with the pydco ligand.

## Experimental

A solution of  $\text{Na}_2(\text{pydco})$  (21.8 mg, 0.01 mmol) in  $\text{CH}_3\text{CH}_2\text{OH}$  (15 ml) was layered upon an aqueous solution of  $\text{NiCl}_2 \cdot 2\text{H}_2\text{O}$  (16 mg, 0.016 mmol) and silver acetate (10 mg, 0.025 mmol). The resultant solution were kept at room temperature for three weeks and yielded pale-green crystals of (I).

## Crystal data

$[\text{Ag}_2\text{Ni}(\text{C}_7\text{H}_3\text{NO}_5)_2]$   
 $M_r = 636.66$   
 Triclinic,  $P\bar{1}$   
 $a = 4.9739(9) \text{ \AA}$   
 $b = 8.8459(15) \text{ \AA}$   
 $c = 9.1479(16) \text{ \AA}$   
 $\alpha = 93.829(2)^\circ$   
 $\beta = 94.930(2)^\circ$

$\gamma = 103.0610(10)^\circ$   
 $V = 389.09(12) \text{ \AA}^3$   
 $Z = 1$   
 Mo  $K\alpha$  radiation  
 $\mu = 3.76 \text{ mm}^{-1}$   
 $T = 298(2) \text{ K}$   
 $0.25 \times 0.21 \times 0.18 \text{ mm}$

## Data collection

Bruker APEX2 area-detector diffractometer  
 Absorption correction: multi-scan (SADABS; Sheldrick, 1996)  
 $T_{\text{min}} = 0.454, T_{\text{max}} = 0.551$   
 (expected range = 0.418–0.509)

2890 measured reflections  
 1422 independent reflections  
 1346 reflections with  $I > 2\sigma(I)$   
 $R_{\text{int}} = 0.012$

## Refinement

$R[F^2 > 2\sigma(F^2)] = 0.045$   
 $wR(F^2) = 0.097$   
 $S = 1.14$   
 1422 reflections

133 parameters  
 H-atom parameters constrained  
 $\Delta\rho_{\text{max}} = 3.04 \text{ e \AA}^{-3}$   
 $\Delta\rho_{\text{min}} = -2.51 \text{ e \AA}^{-3}$

The H atoms were positioned geometrically and treated as riding on their parent atoms, with C–H distances of 0.93 Å, and with  $U_{\text{iso}}(\text{H}) = 1.2U_{\text{eq}}(\text{C})$ .

Data collection: APEX2 (Bruker, 2004); cell refinement: APEX2; data reduction: SAINT (Bruker, 1999); program(s) used to solve structure: SHELXS97 (Sheldrick, 1997); program(s) used to refine structure: SHELXL97 (Sheldrick, 1997); molecular graphics: SHELXTL (Bruker, 1998); software used to prepare material for publication: SHELXTL.

The author is grateful to Lishui University (grant No. FB06048) for financial support.

Supplementary data for this paper are available from the IUCr electronic archives (Reference: DN3061). Services for accessing these data are described at the back of the journal.

## References

- Bruker (1998). SHELXTL. Version 5.1. Bruker AXS Inc, Madison, Wisconsin, USA.  
 Bruker (1999). SAINT. Bruker AXS Inc., Madison, Wisconsin, USA.  
 Bruker (2004). APEX2. Version 1.22. Bruker AXS Inc, Madison, Wisconsin, USA.  
 Cingolani, A., Galli, S., Masciocchi, N., Pandolfo, L., Pettinari, C. & Sironi, A. (2005). *J. Am. Chem. Soc.* **127**, 6144–6145.  
 Dikarev, E. V., Zhang, H. & Li, B.-J. (2005). *J. Am. Chem. Soc.* **127**, 6156–6157.  
 Dong, Y.-B., Zhao, X., Huang, R.-Q., Smith, M. D. & Zur Loye, H.-C. (2004). *Inorg. Chem.* **43**, 5603–5612.  
 Fujita, M., Kwon, Y. J., Sasaki, O., Yamaguchi, K. & Ogura, K. (1995). *J. Am. Chem. Soc.* **117**, 7287–7288.  
 Larionova, J., Kahn, O., Gohlen, S., Ouahab, L. & Clérac, R. (1999). *J. Am. Chem. Soc.* **121**, 3349–3350.  
 Li, F.-F., Ma, J.-F., Song, S.-Y., Yang, J., Liu, Y.-Y. & Su, Z.-M. (2005). *Inorg. Chem.* **44**, 9374–9383.  
 Lin, J.-G., Zhu, H.-Z., Wen, L.-L., Tian, Z.-F. & Meng, Q.-J. Z. (2006). *Z. Anorg. Allg. Chem.* **632**, 689–694.  
 Nathan, L. C., Doyle, C. A., Mooring, A. M., Zapfen, D. C., Larsen, S. K. & Pierpont, C. G. (1985). *Inorg. Chem.* **24**, 2763–2766.  
 Noro, S.-I., Miyasaka, H., Kitagawa, S., Wada, T., Okubo, T., Yamashita, M. & Mitani, T. (2005). *Inorg. Chem.* **44**, 133–146.  
 Sheldrick, G. M. (1996). SADABS. University of Göttingen, Germany.  
 Sheldrick, G. M. (1997). SHELXS97 and SHELXL97. University of Göttingen, Germany.  
 Wen, L.-L., Dang, D.-B., Duan, C.-Y., Li, Y.-Z., Tian, Z.-F. & Meng, Q.-J. (2005). *Inorg. Chem.* **44**, 7161–7170.