

## Supporting Information

### **New photochromic-ligand-based luminescent coordination polymer as MnO<sub>4</sub><sup>-</sup> sensor with extremely high sensitivity and excellent selectivity**

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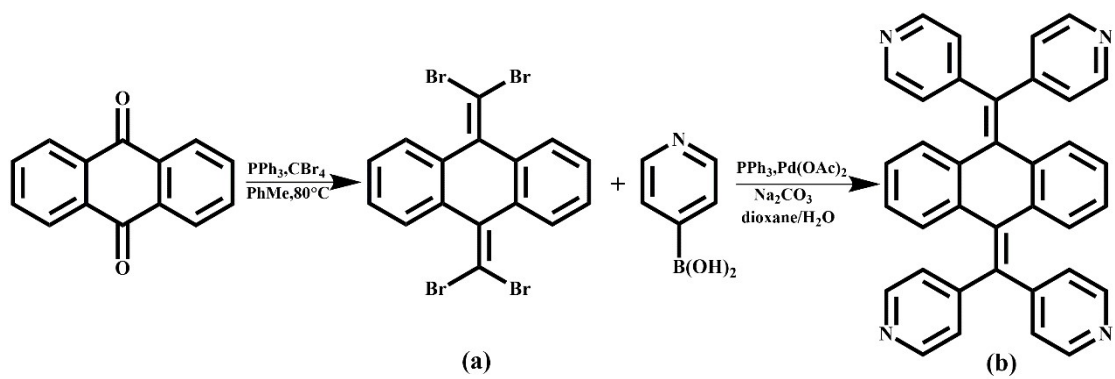
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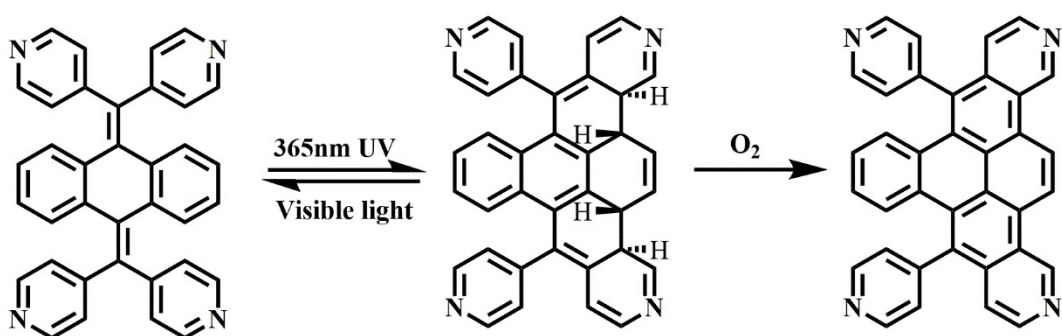
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Scheme S1 Synthetic route of ligand L.



Scheme S2 Photocyclization and dehydrogenation process of L.

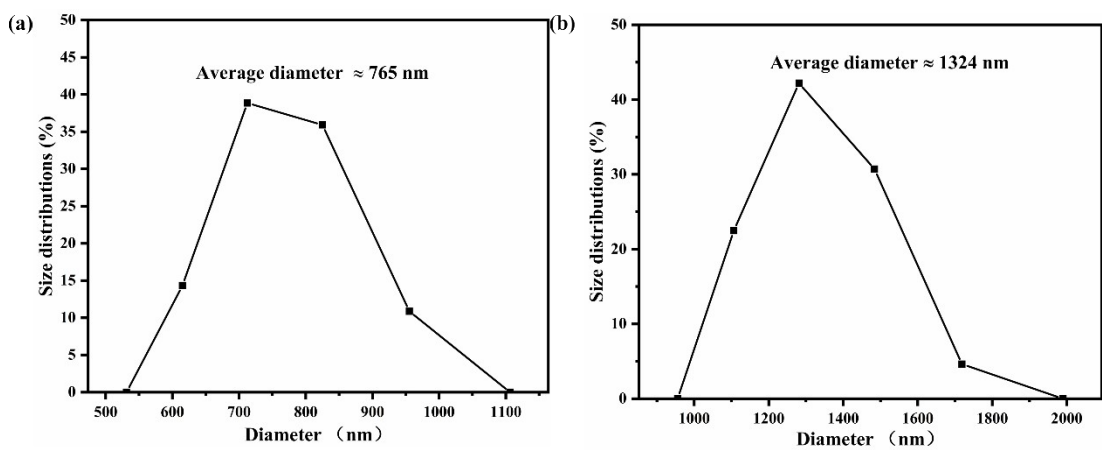
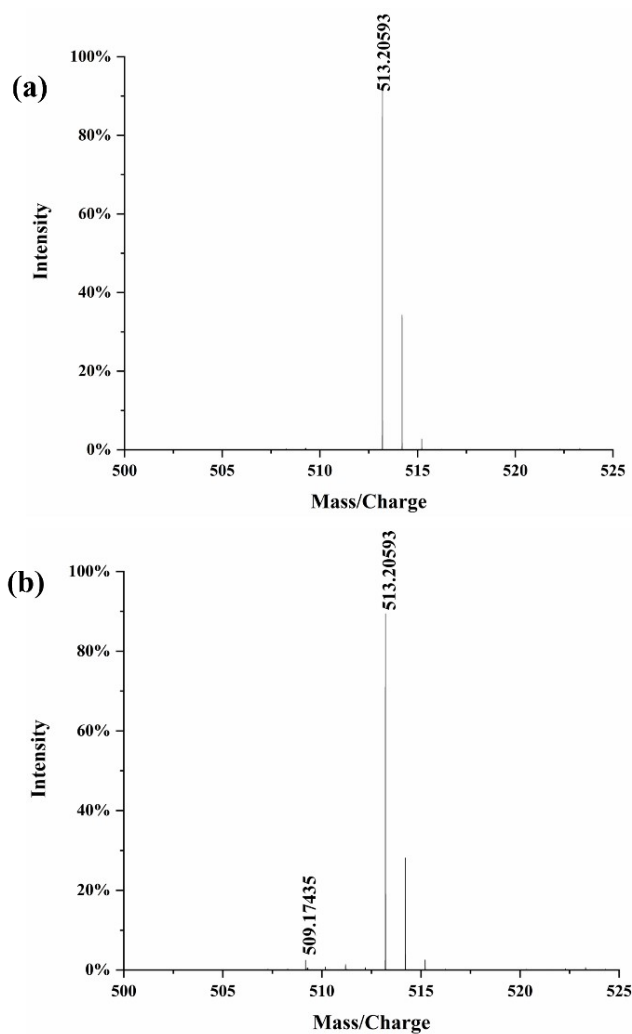
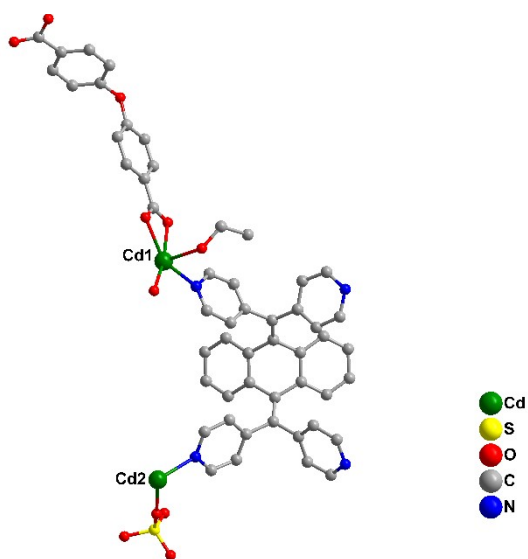


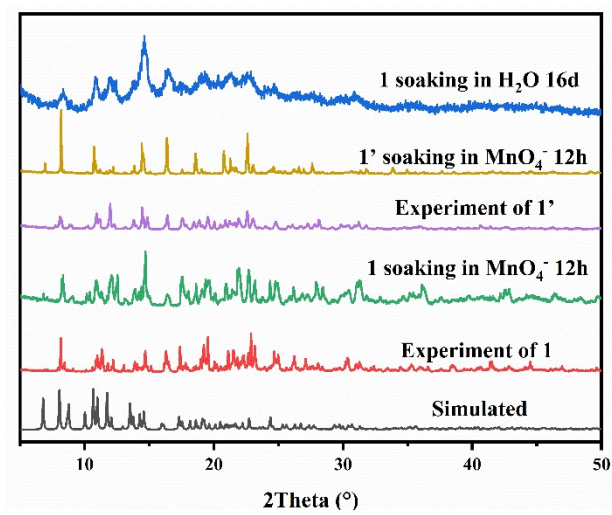
Fig. S1 The particle size distributions for 1 and 1' in H<sub>2</sub>O suspension.



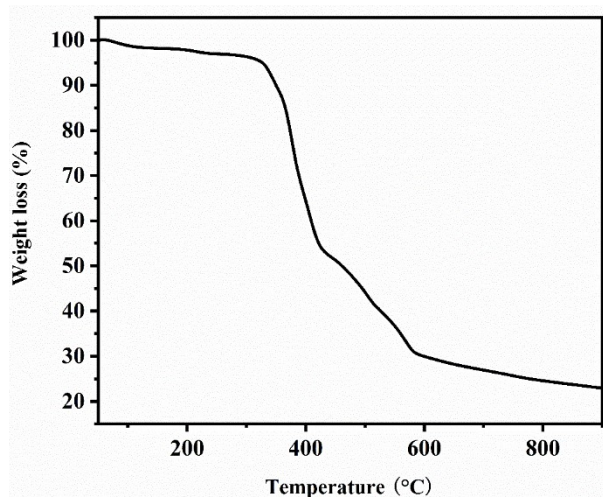
**Fig. S2** (a) HRMS spectrum of **L** in  $\text{CH}_2\text{Cl}_2$  solution ( $10^{-6}\text{M}$ ) before 365nm UV irradiation and  $\text{O}_2$ , (b) HRMS spectrum of **L** in  $\text{CH}_2\text{Cl}_2$  solution ( $10^{-6}\text{M}$ ) after 365nm UV irradiation and  $\text{O}_2$ .



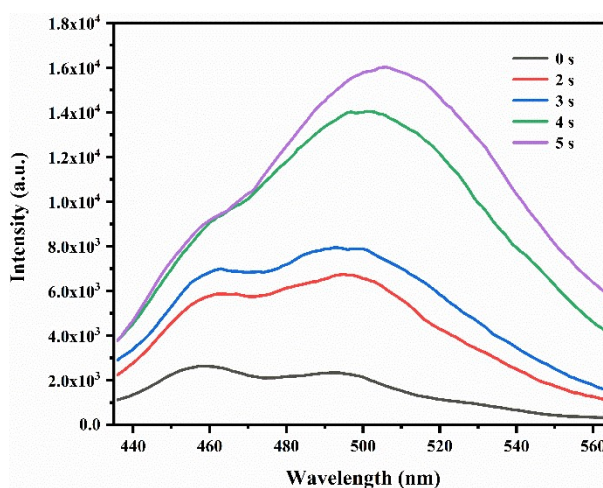
**Fig. S3** The asymmetric unit of **1**.



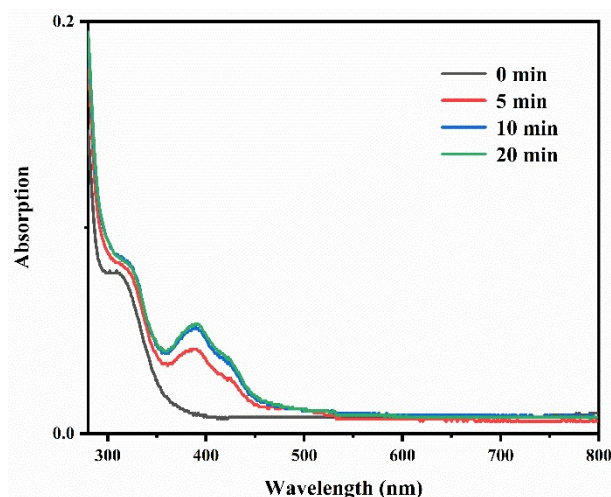
**Fig. S4** The simulated and experimental PXRD of **1** and **1'**.



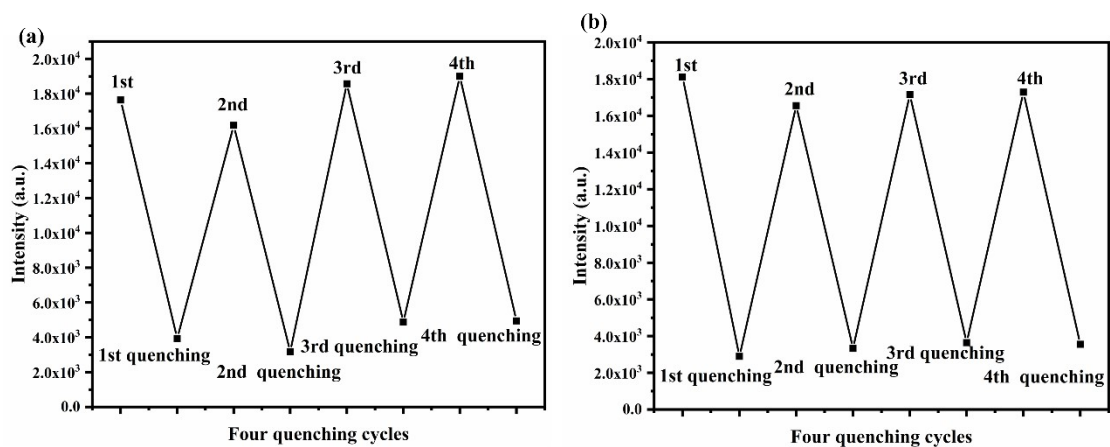
**Fig. S5** The TGA of **1**.



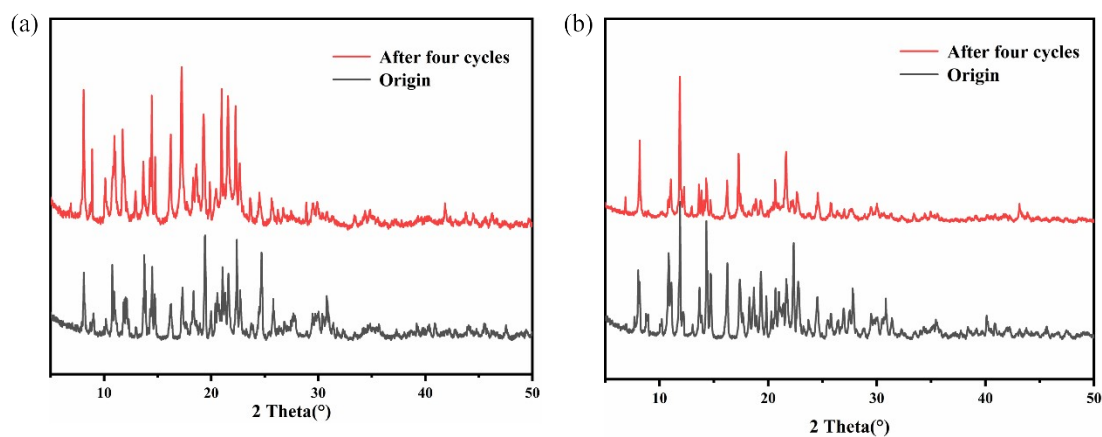
**Fig. S6** Time-dependent PL spectra of H<sub>2</sub>O suspension of crystal **1** (0.02 mg/ml) irradiated by 365nm UV light ( $\lambda_{\text{ex}} = 396$  nm).



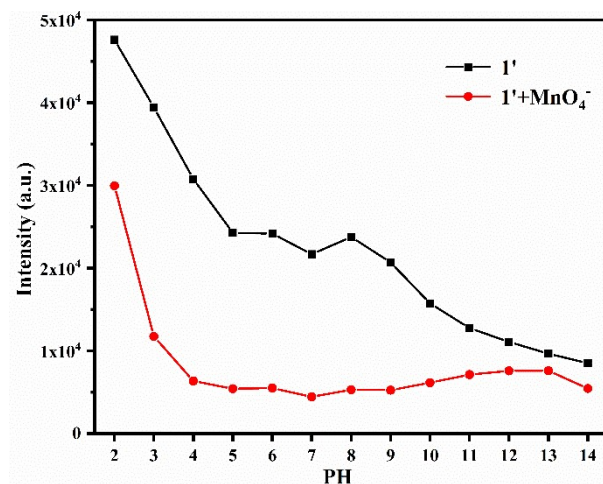
**Fig. S7** Time-dependent UV-Vis spectra suspension of crystal **1** in water (0.005mg/ml) irradiated by 365nm UV light.



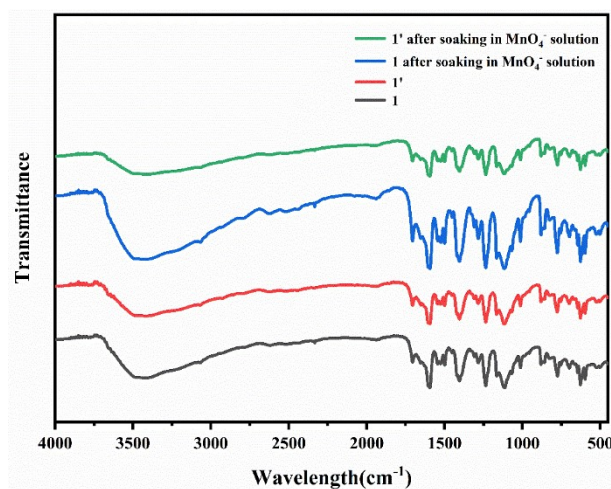
**Fig. S8** Reusability of **1** (a) and **1'** (b) for sensing  $\text{MnO}_4^-$  in  $\text{H}_2\text{O}$ .



**Fig. S9** PXRD patterns of **1** (a) and **1'** (b) after four cycles detecting  $\text{MnO}_4^-$  compared with original patterns.

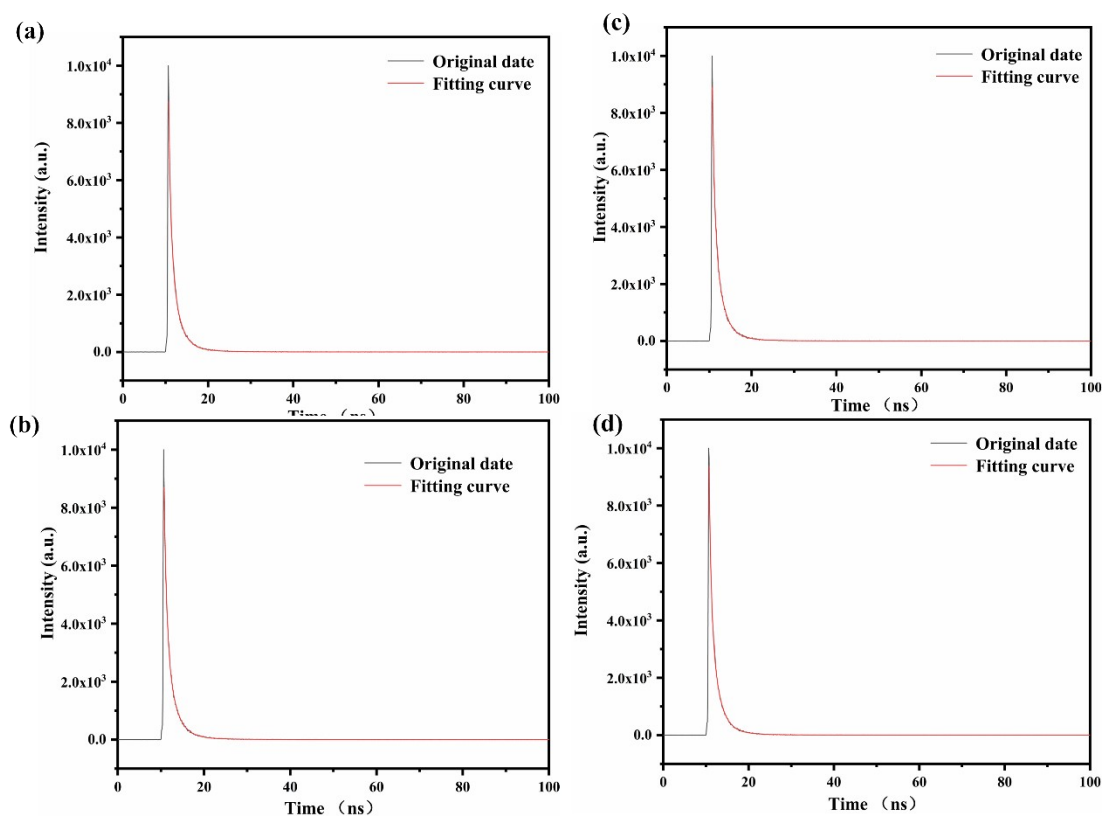


**Fig. S10** pH effect on the emission intensity of  $1'$  and  $1'+\text{MnO}_4^-$  from pH 2-14.

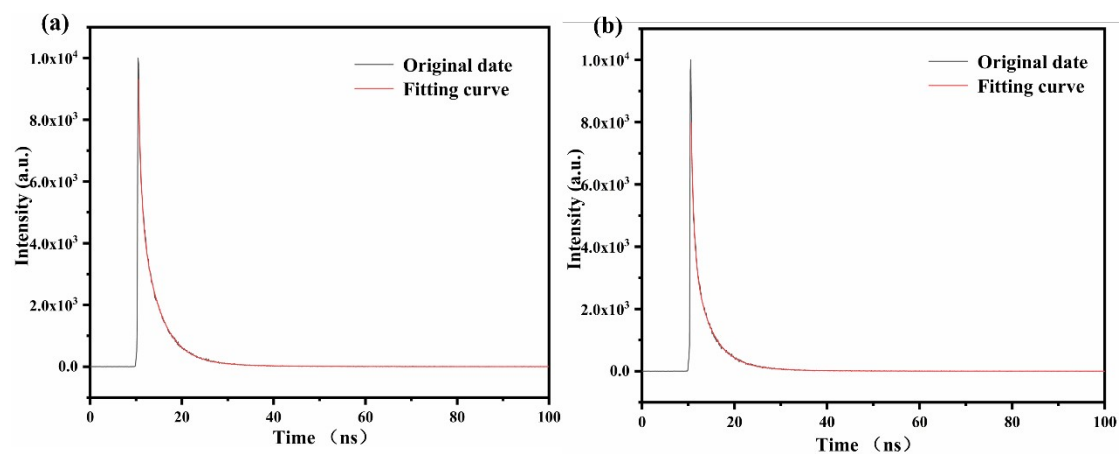


**Fig. S11** FT-IR spectra of  $1$  and  $1'$  before and after soaking in  $\text{MnO}_4^-$  for 12 hours.

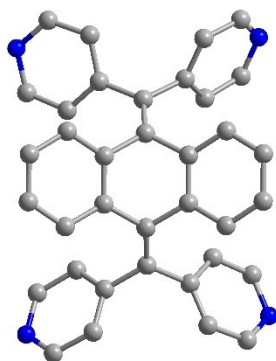




**Fig. S12** The emission lifetimes of **1** dispersed in  $\text{H}_2\text{O}$  before (a) and after detecting  $\text{CrO}_4^{2-}$  (b),  $\text{Cr}_2\text{O}_7^{2-}$  (c), and  $\text{MnO}_4^-$  (d).



**Fig. S13** The emission lifetimes of **1'** dispersed in  $\text{H}_2\text{O}$  before (a) and after detecting  $\text{MnO}_4^-$  (b).



**Fig. S14** Crystal structure of **L**.

**Table S1** Crystallographic data and structure refinement for **L** and **1**.

Compound	<b>L</b>	<b>1</b>
Molecular formula	C <sub>36</sub> H <sub>24</sub> N <sub>4</sub>	C <sub>52</sub> H <sub>39</sub> Cd <sub>1.5</sub> N <sub>4</sub> O <sub>11</sub> S
formula weight	512.59	1096.53
Temperature (K)	293(2)	293(2)
Wavelength (Å)	1.54178 Å	1.54178 Å
Crystal system	Monoclinic	Triclinic
Space group	P2(1)/c	P-1
<i>a</i> (Å)	10.3749(2)	10.6151(3)
<i>b</i> (Å)	16.3863(3)	13.2680(5)
<i>c</i> (Å)	16.0337(3)	21.1599(8)
$\alpha$ (°)	90°	87.133(2)
$\beta$ (°)	97.9910(10)°	75.585(2)
$\gamma$ (°)	90°	78.772(2)
<i>V</i> (Å <sup>3</sup> )	2699.36(9) Å <sup>3</sup>	2831.11(17)
<i>Z</i>	4	2
$\rho_{\text{calc}} / \text{Mg} \cdot \text{m}^{-3}$	1.261	1.286
$\mu / \text{mm}^{-1}$	0.584	5.366
<i>F</i> (000)	1072	1110

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Reflections collected	35524	34443
Unique reflections	5506	11415
$R_{\text{int}}$	0.0549	0.0732
No. parameters	361	643
$GOF$	1.037	1.079
$R_1 [I > 2\sigma(I)]$	0.0489	0.0488
$wR_2 [I > 2\sigma(I)]$	0.1203	0.1277
$\Delta\rho_{\text{max}} / \Delta\rho_{\text{min}} (\text{e } \text{\AA}^{-3})$	0.294 /-0.259	0.723/-1.241

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