**Lead(II) Coordination Polymers Based on Rigid-Flexible
3,5-Bis-Oxyacetate-Benzoic Acid: Structural Transition Driven by Temperature Control**

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Abstract

Three Pb(II) complexes $\{[\text{Pb}_3(\text{BOABA})_2(\text{H}_2\text{O})]\cdot\text{H}_2\text{O}\}_n$ (**1**), $\{[\text{Pb}_4(\text{BOABA})_2(\mu_4\text{-O})(\text{H}_2\text{O})_2]\cdot\text{H}_2\text{O}\}_n$ (**2**), and $[\text{Pb}_3(\text{BOABA})_2(\text{H}_2\text{O})]_n$ (**3**) (H_3BOABA = 3,5-bis-oxyacetate-benzoic acid) were obtained under the same reaction systems with different temperatures. Complexes **1** and **2** are two dimensional (2D) networks based on Pb-BOABA chains and $\text{Pb}_4(\mu_4\text{-O})(\text{COO})_6$ SBUs, respectively. Complex **3** presents an interesting three dimensional (3D) framework, was obtained by increasing the reaction temperature. Structural transition of the crystallization products is largely dependent on the reaction temperature. Moreover, the fluorescence properties of complexes **1-3** have been investigated.

Keywords: Coordination polymer; Lead(II); Rigid-flexible ligand; Structure transition; Property

1. Introduction

Up to now, as an emerging class of crystalline materials, coordination polymers (CPs) have witnessed the explosive growth owing to their intriguing structures, and potential applications in a wide range of fields [1-3]. Thus, the area of CPs (especially for metal-organic frameworks, MOFs) has become one of the fastest growing fields in chemistry [4]. So far, the majority of work in this area is still focused on the controllable assemblies of CPs, expecting to achieve products with targeted structural features and predesigned functions in the realm of crystalline materials [5]. However, how to rationally control and realize the desirable CPs, and how to interpret the law of self-assembly still remains a realistic and fundamental scientific challenge.

For the self-assembly processes of CPs, two primary topics (the reaction conditions and the synthesis systems) ought to be highly considered. As we all known, if the synthesis system (including metal ion and ligand) is well defined, the reaction condition would play a key role in the formation of the resulting materials. Generally, with regard to the reaction condition, many factors, such as temperature, pH values, solvents, and template agents can affect the formation and topology of CPs bearing the same metal ion and ligand [6]. Among the various reaction conditions, the reaction temperature is one of the most effective ways to synthesize new materials with predictable structural transition and function [7-9]. So the investigation on

the reaction condition can help us directly and accurately reveal the relationships between the structure and properties.

In addition, multi-carboxylates have been intensively investigated in the field of CPs with an intriguing variety of topologies and potential applications [10-12]. While, numerous investigations mainly focused on the entirely rigid or flexible multi-carboxylate coordination systems [13-16], very few were performed on mixed rigid-flexible multi-carboxylic acid ligands. As a good tripodal ligand with two highly flexible arms and one rigid carboxyl group, 3,5-bis-oxyacetate-benzoic acid (H_3BOABA), has not been well explored to date [17-22], especially in the presence of Pb(II) as the center ion. Pb(II) complexes, a subfamily of CPs, are excellent candidates as photoluminescence materials because their large ionic radius of lead(II) induces a wide range of coordination numbers and the presence of $6s^2$ outer electrons [23-25]. Hence, we selected H_3BOABA as the primary ligand and adopted the “temperature control” strategy to construct Pb(II) CPs, and three new complexes were obtained. Complexes **1** and **2** feature 2D networks based on different secondary building units (SBUs). Whereas, **3** shows a 3D framework formed by Pb–O–C rods and BOABA ligands.

(Insert Scheme 1)

2. Experimental

2.1. Materials and general methods

All the chemicals used for synthesis were of analytical grade and commercially available. H_3BOABA was synthesized according to the literature [17]. IR spectra were measured on a Tensor 27 OPUS (Bruker) FT-IR spectrometer with KBr pellets. Powder X-ray diffraction (PXRD) spectra were recorded on a Rigaku D/Max-2500 diffractometer at 40 kV, 100 mA for a Cu-target tube and a graphite monochromator. Thermogravimetric (TG) analysis was carried out on a Rigaku standard TG-DTA analyzer with a heating rate of $10^\circ\text{C min}^{-1}$ from ambient temperature to 800°C , an empty Al_2O_3 crucible was used as reference. Fluorescent spectra were recorded at room temperature on a Hitachi F-4500 fluorescence/phosphorescence spectrophotometer.

2.2 Synthesis of complexes

A mixture of $\text{Pb}(\text{NO}_3)_2$ (0.066 g, 0.2 mmol), H_3BOABA (0.02 g, 0.1 mmol), and NaOH (1.5 mL, 0.2 mol/L) in 10 mL deionized water was sealed in a 25 mL Teflon-lined autoclave and heated to 140°C for 3 days. After the autoclave was cooled to room temperature at 10°C h^{-1} , colorless block crystals were collected by filtration, washed with 3×10 mL of deionized water and air-dried. Yield 35% based on

H₃BOABA. Anal. Calc. for C₂₂H₁₈O₁₈Pb₃: C, 22.17; H, 1.52%. Found: C, 22.14; H, 1.56%. IR (KBr, cm⁻¹): 3345w, 2358m, 2341m, 1575s, 1515s, 1406s, 1370s, 1301m, 1162s, 1069s, 785s, 720m, 676w.

{[Pb₄(BOABA)₂(μ₄-O)(H₂O)₂]·H₂O}_n (**2**): This complex was synthesized by a procedure similar to that of **1** except that the temperature was 160 °C. Yield 42% based on H₃BOABA. Anal. Calc. for C₂₂H₂₀O₂₀Pb₄: C, 18.44; H, 1.41%. Found: C, 18.41; H, 1.43%. IR (KBr, cm⁻¹): 3327w, 2358s, 2336m, 1598s, 1532s, 1384s, 1336s, 1169s, 1070m, 778s, 721m, 673w.

[Pb₃(BOABA)₂(H₂O)]_n (**3**): This complex was synthesized by a procedure similar to that of **1** except that the temperature was 180 °C. Yield 26% based on H₃BOABA. Anal. Calc. for C₂₂H₁₆O₁₇Pb₃: C, 22.51; H, 1.37%. Found: C, 22.49; H, 1.40%. IR (KBr, cm⁻¹): 3324w, 2361s, 2334m, 1563s, 1536s, 1381s, 1332s, 1163s, 1075m, 773s, 724m, 677w.

2.3. X-ray crystallography

X-ray single-crystal diffraction data of all complexes were collected on a Rigaku SCX-mini diffractometer with graphite monochromatic Mo-Kα radiation (λ = 0.71073 Å). The program CrystalClear was used for integration of the diffraction profiles [26]. An empirical absorption correction was applied using the SADABS program [27]. All structures were solved by direct methods using the SHELXS program of the SHELXTL package [28] and refined by full-matrix least-squares methods with SHELXL [29]. Metal atoms were located from the *E*-maps and other non-hydrogen atoms excluded in conterions were located in successive difference Fourier syntheses and refined with anisotropic thermal parameters on *F*². The H atoms were generated theoretically onto the specific atoms and refined isotropically with fixed thermal factors. The diffuse electron densities resulting from these residual solvent molecules of complex **2** were removed from the data set using the SQUEEZE routine of PLATON and refined further using the data generated [30]. All the crystal data and structure refinement details for three complexes are given in Table 1. The data of relevant bond distances and angles are listed in Table S1. CCDC 1501256 (**1**), 1501257 (**2**) and 1501258 (**3**).

(Insert Table 1)

3. Results and discussion

3.1. Description of the crystal structures

{[Pb₃(BOABA)₂(H₂O)]·H₂O}_n (**1**)

Single-crystal X-ray analysis indicates that complex **1** crystallizes in space group $P\bar{1}$ (see Table 1). The selected bond lengths and angles are summarized in Table S1, (Supporting Information, SI). Complex **1** reveals a 2D layer structure based on the Pb-BOABA secondary building units (SBUs). There are three crystallographically independent Pb(II) ions assuming different coordination geometry. As shown in Fig. 1, Pb(1) ion is hexa-coordinated by six oxygen atoms belonging to BOABA ligands (Pb–O 2.417(11)–2.765(11) Å). The Pb(2) ion is also hexa-coordinated, whereby five oxygen atoms from BOABA ligands, one oxygen atom from one water molecule (Pb–O 2.308(11)–2.815(11) Å). The Pb(3) ion sits in an irregular penta-coordinated environment accomplished by five oxygen atoms from three separated BOABA ligands with the Pb–O bond lengths ranging from 2.372(12) to 2.771(11) Å. All three Pb(II) ions are in hemidirected coordination spheres. In **1**, all BOABA ligands adopt $\mu_5\text{-}\eta^1\text{:}\eta^2\text{:}\eta^1\text{:}\eta^1\text{:}\eta^1\text{:}\eta^2$ and $\mu_5\text{-}\eta^1\text{:}\eta^1\text{:}\eta^1\text{:}\eta^1\text{:}\eta^1\text{:}\eta^2$ coordination modes (Scheme 1a and 1b). Pairs of BOABA ligands acts as a hexa-connector to link the neighboring Pb(II) ions to form a 1D chain substructure (Fig. 2a). Furthermore, these 1D chains are interconnected by BOABA ligands to afford a 2D network (Fig. 2b).

(Insert Fig. 1 and Fig. 2)

Complex **2** also crystallizes in the triclinic space group $P\bar{1}$, and the coordination environment around Pb(II) is shown in Fig. 3. Complex **2** reveals a 2D (3,6) layer structure based on the Pb_4 SBUs. There are four crystallographically independent Pb(II) ions assuming the identical penta-coordinated geometry. Pb(1) ion is coordinated by four oxygen atoms from the carboxylate groups of three unique BOABA anions [Pb–O 2.542(11)–2.799(11) Å] and one fully deprotonated water ligand O^{2-} in the center positions [Pb–O 2.352(11) Å]. The Pb(2) ion is bounded to four oxygen atoms of four BOABA anions and one O^{2-} anion [Pb–O 2.333(10)–2.592(13) Å]. However, Pb(3) and Pb(4) ions are defined by three oxygen atoms from three unique BOABA anions, one water molecule and one O^{2-} anion [Pb–O 2.287(10)–2.773(11) Å], respectively. Like **1**, all BOABA anions adopt two coordination modes, namely $\mu_7\text{-}\eta^1\text{:}\eta^2\text{:}\eta^0\text{:}\eta^2\text{:}\eta^0\text{:}\eta^2$ and $\mu_6\text{-}\eta^0\text{:}\eta^2\text{:}\eta^1\text{:}\eta^2\text{:}\eta^0\text{:}\eta^2$, respectively (Scheme 1c and 1d), and all Pb(II) ions are in hemidirected coordination spheres. Interestingly, four neighboring Pb(II) ions are connected by six carboxylate groups with different coordination modes and one O^{2-} anion to form a tetranuclear cluster $\text{Pb}_4(\mu_4\text{-O})(\text{COO})_6$ SBU. Each tetranuclear cluster SBU was further linked to six adjacent ones by six BOABA linkers, and each BOABA linker connected three SBUs to give a 2D network structure (Fig. 4a and 4b). To provide further insight into the structure of **2**, it is necessary to simplify the node-and-linker reference net from the topological point of

view. Each BOABA ligand can be considered as a three-connected node, meanwhile each $\text{Pb}_4(\mu_4\text{-O})(\text{COO})_6$ SBU acts as a six-connected node which links six BOABA ligands. As a result, the overall 2D network of **2** can be rationalized as a binodal (3,6)-connected net with Schläfli symbol $\{4^3\}_2\{4^6.6^6.8^3\}$ (topological type is *kfd*, TD10=251) (Fig. 4c) [31]. Recently, many Pb(II) based CPs bearing multidentate carboxylic acid ligands have been reported, but those with high dimensional structure linked by mixed rigid-flexible multi-carboxylic acid ligand are rare. The related complex $[\text{Pb}_2(\mu_5\text{-HL})(\mu_6\text{-HL})]_n$ ($\text{H}_3\text{L} = 4\text{-(5-Carboxypyridin-2-yl)isophthalic acid}$) [32], exhibits a binodal 5,6-connected net formed by μ_5 - and $\mu_6\text{-HL}^{2-}$ moieties. However, complex **2** is quite different in our work. Notably, the most important feature of complex **2** is that the bridging moieties and numbers are higher than the related complex, giving rise to the resulting a binodal (3,6)-connected net.

(Insert Fig. 3 and Fig. 4)

$[\text{Pb}_3(\text{BOABA})_2(\text{H}_2\text{O})]_n$ (**3**)

When the reaction temperature was 180 °C, a 3D Pb(II) framework supported by BOABA ligands was obtained. Different from complexes **1** and **2**, **3** crystallizes in the monoclinic space group $\text{P2}_1/\text{c}$. As shown in Fig. 5, the asymmetric unit of **3** contains three Pb(II) cations, one coordination water molecule, and two BOABA ligands. Compared with aforementioned complexes, the Pb(II) ions in **3** show different coordination sphere. The Pb(1) ion sits in an irregular hepta-coordinated environment by six oxygen atoms from six separated BOABA anions with the Pb–O bond lengths ranging from 2.424(8) to 2.774(6) Å, and one oxygen atom from water molecule [Pb–O 2.577(7) Å], which is in a holodirected coordination sphere. The Pb(2) ion is hexa-coordinated by six oxygen atoms belonging to four separated BOABA ligands (Pb–O 2.517(5)–2.692(7) Å). It is noteworthy that Pb(3) ion only assumes tetra-coordinated mode defined by four oxygen atoms from three distinct BOABA ligands with the Pb–O bond lengths ranging from 2.328(7) to 2.710(7) Å. Similarly to that of **1** and **2**, Pb(2) and Pb(3) ions also are in the hemidirected coordination spheres in complex **3**. Similarly, BOABA liand also exhibit two types of coordination modes $\mu_6\text{-}\eta^1\text{:}\eta^1\text{:}\eta^1\text{:}\eta^1\text{:}\eta^1\text{:}\eta^2$ and $\mu_7\text{-}\eta^1\text{:}\eta^1\text{:}\eta^1\text{:}\eta^2\text{:}\eta^2\text{:}\eta^2$ in **3**, respectively (Scheme 1e and 1f). In complex **3**, carboxyl groups of all BOABA ligands adopt three bridging coordination modes, which results in infinite Pb–O–C rod SBUs running along the a-axis direction, with Pb···Pb distance of 3.955 (7) Å and 4.293 (7) Å, respectively (Fig. 6a). The adjacent rods are linked by the BOABA ligands with different bridging mode and extended

into 2D network structure (Fig. 6b). Finally, these layers are interconnected by BOABA ligands to afford a 3D framework (Fig. 6c).

(Insert Fig. 5 and Fig. 6)

Effect of the center ion and temperature on the structures of the complexes

A lead(II) center, bearing a stereochemically active electron lone-pair and large ionic radius, can adopt variable coordination numbers and versatile coordination geometries, which may become the decisive factors to successfully construct Pb(II) complexes with different structures and dimensions [33]. For complexes **1** and **2**, the only hemidirected coordination sphere of Pb(II) ion was observed showing the presence of a stereochemically active lone pair of electrons, whereas in complex **3** two types of coordination spheres (hemidirection and holodirection) exist. Meanwhile, among these three complexes, different coordination numbers are observed. Complex **3** possesses the highest (hepta-coordinated for Pb(II)) and most widely (from tetra-coordinated to hepta-coordinated mode) coordination number. According to the related report, when the coordination geometry of Pb(II) transforms from hemidirected to holodirected or the number of the coordination site for the Pb(II) center increases for the Pb(II) complexes, higher dimensional framework structure usually occur [34]. As a result, the structural and dimensional differences of **1-3** imply that the coordination geometry and the number of the coordination site of the center Pb(II) ion have an important influence on the formation of their structures. On the other hand, formations of the three complexes are thermodynamically controlled. For **1**, the reaction system at lower temperature (140 °C), a 2D network was obtained based on Pb-BOABA chains. When the reaction temperature was increased to 160 °C, a new 2D *kgd* layer composed of the stabilized tetranuclear cluster $\text{Pb}_4(\mu_4\text{-O})(\text{COO})_6$ SBUs was isolated. At the highest reaction temperature (180 °C) of Pb- H_3BOABA architecture, an interesting 3D framework was prepared by the infinite Pb-O-C rod SBUs and BOABA ligands. Thus, the differences of SBUs and structures of **1-3** indicate that the reaction temperature is an important factor in the formation of such coordination architectures in the presence of the same H_3BOABA ligand.

3.2. IR spectra, thermal stabilities and powder XRD patterns

The bands at about 1069, 1070, and 1075 cm^{-1} for complexes **1-3** may be attributed to the $\nu_{\text{C-O}}$ (alkoxy) stretching of C-O in BOABA ligand. The $\nu_{\text{asymmetric}}$ and $\nu_{\text{symmetric}}$ vibrations of carboxylate groups are detected as four high intensity bands in complexes **1-3**. For complex **1**, the asymmetric and symmetric vibrations of carboxylate groups appeared at 1575, 1515, 1406, and 1370 cm^{-1} , respectively. For complex **2**, its characteristic bands of the carboxylate groups are shown at 1598 and 1532 cm^{-1} for asymmetric vibrations

and at 1384 and 1336 cm^{-1} for symmetric vibrations. In complex **3**, the bands at 1563 cm^{-1} , 1536 cm^{-1} and 1381 cm^{-1} , 1332 cm^{-1} correspond to $\nu_{\text{asymmetric}}$ and $\nu_{\text{symmetric}}$ vibrations of carboxylate groups, respectively. These IR spectra are in good agreement with the results of X-ray structural analysis and the coordination modes of BOABA ligands.

Thermogravimetric analyses (TG) of all complexes were carried out in the temperature range of 25-800 $^{\circ}\text{C}$. As shown in Fig. S1, complexes **1-3** all featured two weight loss stages, which were corresponding to the loss of water molecules and all organic ligands. The TG curve of **1** showed that it possesses relatively high thermal stability. Herein, a rapid mass loss of 43.83% (calcd. 43.88%) began at 319 $^{\circ}\text{C}$, which corresponded to the decomposition of organic ligands. For **2**, the TG curve shows the first stage weight loss of a 3.79% in the temperature range 105-161 $^{\circ}\text{C}$ corresponding to the release of the lattice and coordinated water molecules (calcd. 3.77%). The second loss of 37.79% began at 312 $^{\circ}\text{C}$ and completed at 491 $^{\circ}\text{C}$ corresponding to the combustion of organic linkers (calcd. 37.75%). The coordination water molecule of **3** is lost between 40-98 $^{\circ}\text{C}$, after which the main framework start to decompose at 184 $^{\circ}\text{C}$.

In order to confirm the phase purity of all three samples, the PXRD patterns were characterized. As shown in Fig. S2-S4 (SI), the experimental PXRD patterns of **1-3** are in good agreement with their corresponding simulated patterns, indicating phase purity of all three samples.

3.3. Fluorescence properties

As we all know, luminescence is of great importance in photochemistry and photophysics. Complexes of heavy metal Pb with s^2 electron configuration may reduce the radiative lifetime of triplets by increasing spin-orbit coupling and promote emission from the triplet state under ambient conditions [35]. Therefore, these coordination polymers are a potential class of functional materials with interesting optic properties, which have attracted much attention. However, compared with the wide investigations in transition metal or lanthanide coordination systems, the Pb-based coordination polymers have rarely been reported [36,37]. Thus, the fluorescence spectra of complexes **1-3** were examined in the solid state at room temperature (Fig. 7). The free H_3BOABA ligand displays emission at 372 nm ($\lambda_{\text{ex}} = 310$ nm). The emission band of the free ligand can probably be assigned to the $\pi \rightarrow \pi^*$ transitions. For complexes **1-3**, it is clear that there are emission bands at 588 nm ($\lambda_{\text{ex}} = 310$ nm) for **1**, 583 nm ($\lambda_{\text{ex}} = 310$ nm) for **2**, and 581 nm ($\lambda_{\text{ex}} = 310$ nm) for **3**, respectively. Obviously, complexes **1-3** display similar luminescence behavior under the same excitation. Compared with the emission spectra of the free ligand, the main emission peaks of **1-3** show large red shifts,

which may be attributed to the metal-centered transitions involving s and p orbitals, and the coordination interactions between ligand and Pb(II) ion [38,39].

(Insert Fig. 7)

4. Conclusions

In summary, three new CPs have been successfully isolated under hydrothermal conditions by reactions of H₃BOABA ligand and Pb(II) salt. The H₃BOABA ligand exhibits six coordination modes in complexes **1-3**, respectively. Complexes **1** and **2** are 2D layer structures based on different SBUs, while **3** exhibits a 3D framework. Structure transition from 2D to 3D among three complexes was realized via adopting distinct reaction temperatures under the same reaction systems. The luminescence property studies reveal that all three complexes exhibit yellow fluorescence emission behavior and might be good candidates for obtaining photoluminescent materials.

Supporting Information

CCDC 1501256 (**1**), 1501257 (**2**) and 1501258 (**3**) contain the supplementary crystallographic data for this paper. These data can be obtained free of charge from The Cambridge Crystallographic Data Centre via http://www.ccdc.cam.ac.uk/data_request/cif. The selected bond lengths and angles, and general characterizations (PXRD and TGA). These materials are available free of charge via the Internet at <http://www.sciencedirect.com/>.

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Captions to Scheme and Figures

Scheme 1. Coordination modes of BOABA ligand in **1-3**.

Fig. 1. The coordination environment of Pb(II) in complex **1**, Hydrogen atoms and the disordered solvent molecules have been omitted for clarity (similarly hereafter). #1: $-x + 1, -y + 1$.

Fig. 2. (a) The 1D chain structure; (b) the 2D network of **1**.

Fig. 3. The coordination environment of Pb(II) in complex **2**.

Fig. 4. (a) The 2D layer structure, the polyhedron represents tetranuclear Pb(II) cluster; (b) the linking mode of BOABA ligand of **2**; (c) the binodal (3,6)-connected net of **2**.

Fig. 5. The coordination environment of Pb(II) in complex **3**.

Fig. 6. (a) The 1D rod-shaped Pb–O–C chain; (b) the 2D network of **3**; (c) the whole 3D framework of **3**, the polyhedron represents center Pb(II) ions.

Fig. 7. Emission spectra for the ligand (L = H₃BOABA) and complexes **1-3**.

Table 1. Crystal data and structure refinement summary for complexes

Complex	1	2	3
Formula	C ₂₂ H ₁₈ O ₁₈ Pb ₃	C ₂₂ H ₂₀ O ₂₀ Pb ₄	C ₂₂ H ₁₆ O ₁₇ Pb ₃
Fw	1191.93	1433.14	1173.92
space group	<i>P</i> $\bar{1}$	<i>P</i> $\bar{1}$	<i>P</i> 2 ₁ / <i>c</i>
crystal size/mm	0.32×0.30×0.28	0.35×0.33×0.29	0.31×0.29×0.27
<i>a</i> [Å]	10.235(2)	8.9756(18)	9.1255(18)
<i>b</i> [Å]	11.354(2)	11.556(2)	11.542(2)
<i>c</i> [Å]	12.597(3)	15.721(3)	23.556(5)
α [°]	88.53(3)	100.02(3)	90
β [°]	74.14(3)	102.77(3)	97.81(3)
γ [°]	67.91(3)	97.23(3)	90
<i>V</i> (Å ³)	1299.9(5)	1542.9(5)	2458.1(8)
<i>Z</i>	2	2	4
<i>D</i> _{calcd} /mg·m ^{−3}	3.045	3.085	3.172
<i>F</i> (000)	1080	1280	2120
Reflections collected /	11361/4576	13345/5416	24578/5362
θ range /°	3.14-25.00	3.00-25.00	3.03-27.00
μ /mm ^{−1}	19.471	21.844	20.588
<i>R</i> / <i>wR</i> [<i>I</i> >2σ(<i>I</i>)] ^a	0.0560/0.1393	0.0567/0.1019	0.0487/0.0668
<i>R</i> indices (all data)	0.0806/0.1550	0.0956/0.1121	0.0746/0.0724
GOF on <i>F</i> ²	0.926	0.864	0.993
completeness	99.7 %	99.6 %	99.8 %

^a $R = \Sigma(|F_0| - |F_C|)/\Sigma|F_0|$ $wR_2 = [\Sigma w(|F_0|^2 - |F_C|^2)^2/(\Sigma w|F_0|^2)^2]^{1/2}$

Scheme and Figures

Scheme 1.

Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

Fig. 6

Fig. 7

**Lead(II) Coordination Polymers Based on Rigid-Flexible
3,5-Bis-Oxyacetate-Benzoic Acid: Structural Transition Driven by Temperature
Control**

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Three Pb(II) coordination polymers were obtained under the same reaction systems with different temperatures. Both of complexes **1** and **2** are 2D network. **3** presents a 3D framework based on Pb–O–C rods SBUs. The 2D to 3D structures transition between three complexes was achieved successfully by temperature control.