Electronic Supplementary Information (ESI)

## Color tunable entangled coordination polymers based on long flexible bis(imidazole) ligands and phenylenediacetate

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**Figure S1.** (a) View of the 1D ringed ribbon-like chain. (b) Ball-and-stick and schematic illustration of the extended 2D layer along *ab* plan in **1**.



**Figure S2.** Ball-and-stick and schematic representation of the single 2D layer (a) and  $2D \rightarrow 3D$  polythreading architecture (b).



Figure S3. View of the 2D layer in 4 along [100] direction.



Figure S4. View of the 3D network in 5.



**Figure S5.** Ball-and-stick and schematic representation of the three-fold parallel interpenetrated diamond network.



Figure S6. Experimental and simulated PXRD patterns for 1–6.



Figure S7. The TGA curves for 1–6.

Table S1	Selected	bond ]	lengths (	(Å)	) and a	ngles (°	) for	<b>1–6</b> <sup><i>a</i></sup>
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Complex 1			
Co(1)-O(1)	1.948(3)	Co(2)-O(9)	1.958(4)
Co(1)-O(4)A	1.951(3)	Co(2)-N(5)	2.001(4)
Co(1)-N(8)	1.987(4)	Co(2)-N(1)	2.001(4)
Co(1)-N(4)	2.018(4)	Co(2)-O(6)	2.016(5)
O(1)-Co(1)-O(4)A	107.70(16)	O(9)-Co(2)-N(5)	107.71(17)
O(1)-Co(1)-N(8)	111.31(16)	O(9)-Co(2)-N(1)	111.66(17)
O(4)A-Co(1)-N(8)	119.49(16)	N(5)-Co(2)-N(1)	114.95(17)
O(1)-Co(1)-N(4)	94.57(16)	O(9)-Co(2)-O(6)	94.9(2)
O(4)A-Co(1)-N(4)	109.88(16)	N(5)-Co(2)-O(6)	118.0(2)
N(8)-Co(1)-N(4)	111.02(16)	N(1)-Co(2)-O(6)	107.89(19)
Complex 2			
Pd(1)-N(1)	2.252(4)	Pd(1)-O(1)	2.348(3)
Pd(1)-N(3)	2.309(4)	Pd(1)-O(2)	2.443(3)
Pd(1)-Cl(1)	2.5641(11)	Pd(1)-Cl(1)A	2.6440(12)
N(1)-Pd(1)-N(3)	103.67(14)	O(1)-Pd(1)-Cl(1)	167.08(9)
N(1)-Pd(1)-O(1)	90.93(13)	O(2)-Pd(1)-Cl(1)	113.69(9)
N(3)-Pd(1)-O(1)	85.33(14)	N(1)-Pd(1)-Cl(1)A	92.19(11)
N(1)-Pd(1)-O(2)	144.43(14)	N(3)-Pd(1)-Cl(1)A	163.96(11)
N(3)-Pd(1)-O(2)	81.49(13)	O(1)-Pd(1)-Cl(1)A	96.99(11)
O(1)-Pd(1)-O(2)	54.01(12)	O(2)-Pd(1)-Cl(1)A	87.04(9)
N(1)-Pd(1)-Cl(1)	101.68(11)	Cl(1)-Pd(1)-Cl(1)A	85.46(4)
N(3)-Pd(1)-Cl(1)	88.91(10)		
Complex 3			
Cd(1)-N(1)	2.242(3)	Cd(2)-N(4)B	2.212(3)
Cd(1)-N(1)A	2.242(3)	Cd(2)-N(4)	2.212(3)
Cd(1)-O(2)A	2.326(3)	Cd(2)-O(3)C	2.251(3)
Cd(1)-O(2)	2.326(3)	Cd(2)-O(3)D	2.251(3)
Cd(1)-O(1)	2.461(3)	Cd(2)-O(4)D	2.636(3)
Cd(1)-O(1)A	2.461(3)	Cd(2)-O(4)C	2.636(3)

	107.62(17)		106.12(18)
N(1)-Cd(1)-N(1)A		N(4)B-Cd(2)-N(4)	
N(1)-Cd(1)-O(2)A	133.63(10)	N(4)B-Cd(2)-O(3)C	105.71(12)
N(1)A-Cd(1)-O(2)A	95.23(11)	N(4)-Cd(2)-O(3)C	123.82(11)
N(1)-Cd(1)-O(2)	95.23(11)	N(4)B-Cd(2)-O(3)D	123.82(11)
N(1)A-Cd(1)-O(2)	133.63(10)	N(4)-Cd(2)-O(3)D	105.71(12)
O(2)A-Cd(1)-O(2)	97.17(14)	O(3)C-Cd(2)-O(3)D	93.00(16)
N(1)-Cd(1)-O(1)	89.80(12)	N(4)B-Cd(2)-O(4)D	83.83(11)
N(1)A-Cd(1)-O(1)	86.06(10)	N(4)-Cd(2)-O(4)D	88.90(12)
O(2)A-Cd(1)-O(1)	132.50(12)	O(3)C-Cd(2)-O(4)D	139.52(12)
O(2)-Cd(1)-O(1)	53.52(10)	O(3)D-Cd(2)-O(4)D	52.01(11)
N(1)-Cd(1)-O(1)A	86.06(10)	N(4)B-Cd(2)-O(4)C	88.90(12)
N(1)A-Cd(1)-O(1)A	89.80(12)	N(4)-Cd(2)-O(4)C	83.83(11)
O(2)A-Cd(1)-O(1)A	53.52(10)	O(3)C-Cd(2)-O(4)C	52.01(11)
O(2)-Cd(1)-O(1)A	132.50(12)	O(3)D-Cd(2)-O(4)C	139.52(12)
O(1)-Cd(1)-O(1)A	172.98(18)	O(4)D-Cd(2)-O(4)C	167.90(17)
Complex 4			
Cd(1)-O(2)A	2.271(3)	Cd(1)-N(1)A	2.294(4)
Cd(1)-O(2)	2.271(3)	Cd(1)-O(1)	2.613(5)
Cd(1)-N(1)	2.294(4)	Cd(1)-O(1)A	2.613(5)
O(2)A-Cd(1)-O(2)	109.8(2)	N(1)-Cd(1)-O(1)	145.40(14)
O(2)A-Cd(1)-N(1)	120.05(14)	N(1)A-Cd(1)-O(1)	78.39(14)
O(2)-Cd(1)-N(1)	104.42(14)	O(2)A-Cd(1)-O(1)A	52.21(12)
O(2)A-Cd(1)-N(1)A	104.42(14)	O(2)-Cd(1)-O(1)A	93.67(14)
O(2)-Cd(1)-N(1)A	120.05(14)	N(1)-Cd(1)-O(1)A	78.39(14)
N(1)-Cd(1)-N(1)A	98.6(2)	N(1)A-Cd(1)-O(1)A	145.40(14)
O(2)A-Cd(1)-O(1)	93.67(14)	O(1)-Cd(1)-O(1)A	123.0(2)
O(2)-Cd(1)-O(1)	52.21(12)		
Complex 5			
Cd(1)-N(1)	2.301(2)	Cd(1)-O(1)	2.414(2)
Cd(1)-N(3)	2.350(2)	Cd(1)-O(2)	2.449(2)
Cd(1)-O(3)A	2.357(2)	Cd(1)-O(4)A	2.511(2)
Cd(1)-N(4)	2.369(2)		
N(1)-Cd(1)-N(3)	165.32(9)	N(3)-Cd(1)-O(2)	99.73(9)
N(1)-Cd(1)-O(3)A	95.42(8)	O(3)A-Cd(1)-O(2)	82.91(8)
N(3)-Cd(1)-O(3)A	88.52(8)	N(4)-Cd(1)-O(2)	132.29(9)
N(1)-Cd(1)-N(4)	98.86(9)	O(1)-Cd(1)-O(2)	52.80(8)
N(3)-Cd(1)-N(4)	69.66(8)	N(1)-Cd(1)-O(4)A	84.93(8)
O(3)A-Cd(1)-N(4)	140.03(8)	N(3)-Cd(1)-O(4)A	86.10(8)
N(1)-Cd(1)-O(1)	85.84(9)	O(3)A-Cd(1)-O(4)A	53.47(8)
N(3)-Cd(1)-O(1)	101.23(9)	N(4)-Cd(1)-O(4)A	90.83(9)
O(3)A-Cd(1)-O(1)	135.55(8)	O(1)-Cd(1)-O(4)A	167.86(9)

N(4)-Cd(1)-O(1)	82.81(8)	O(2)-Cd(1)-O(4)A	135.98(9)	
N(1)-Cd(1)-O(2)	94.79(9)			
Complex 6				
Zn(1)-O(1)A	1.996(3)	Zn(1)-N(1)	2.022(3)	
Zn(1)-O(1)	1.996(3)	Zn(1)-N(1)A	2.022(3)	
O(1)A-Zn(1)-O(1)	93.8(2)	O(1)A-Zn(1)-N(1)A	124.62(13)	
O(1)A-Zn(1)-N(1)	104.93(12)	O(1)-Zn(1)-N(1)A	104.93(12)	
O(1)-Zn(1)-N(1)	124.62(13)	N(1)-Zn(1)-N(1)A	105.63(14)	

<sup>*a*</sup> Symmetry codes for **1**: A: -x+3,-y+1,-z+1; for **2**: A: -x+2,-y,-z+1; for **3**: A: -x+1,y,-z+1; B: -x+1,y,-z+2; C: -x+3/2,y+3/2,-z+2; D: x-1/2,y+3/2,z; for **4**: A: -x+1,y,-z+1/2; for **5**: A: x,-y+1/2,z-1/2; for **6**: A: -x+2,-y+1/2,z.