Electronic Supplementary Information for

Alcohol-solvothermal syntheses, crystal structures and photocatalytic properties of tin selenides with polyselenide ligands

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Table S1. Selected Bond Lengths (Å) and Angles (deg) for **1**

Sn(1)–Se(1)	2.9069(17)	Sn(1)–Se(2)	2.5409(19)
Sn(1)–Se(3)	2.6715(17)	Sn(1)–Se(4)	2.5340(17)
Sn(1)–Se(5)	2.5465(18)	Sn(2)–Se(1)	2.7203(17)
Sn(2)–Se(3)#1	2.5287(16)	Sn(2)–Se(5)	2.5732(16)
Sn(2)–Se(6)	2.7229(19)	Sn(2)–Se(7)	2.5529(17)
Sn(3)–Se(1)	2.7648(17)	Sn(3)–Se(4)	2.5565(17)
Sn(3)–Se(7)	2.5480(18)	Sn(3)–Se(8)	2.5243(19)
Sn(3)–Se(8)#2	2.7014(18)	Se(2)#1–Se(6)	2.331(2)
Mn(1)–N(1)	2.266(13)	Mn(1)–N(2)	2.240(13)
Mn(1)–N(3)	2.254(13)	Mn(1)–N(4)	2.261(11)
Mn(1)–N(5)	2.303(14)	Mn(1)–N(6)	2.275(13)
Se(1)–Sn(1)–Se(2)	81.40(5)	Se(1)–Sn(1)–Se(3)	175.08(5)
Se(1)–Sn(1)–Se(4)	87.87(5)	Se(1)–Sn(1)–Se(5)	83.25(5)
Se(2)–Sn(1)–Se(3)	103.32(6)	Se(2)–Sn(1)–Se(4)	122.11(7)
Se(2)–Sn(1)–Se(5)	114.21(6)	Se(3)–Sn(1)–Se(4)	88.42(5)
Se(3)–Sn(1)–Se(5)	95.90(6)	Se(4)–Sn(1)–Se(5)	120.70(6)
Se(1)–Sn(2)–Se(3)#1	99.42(6)	Se(1)–Sn(2)–Se(5)	86.62(5)
Se(1)–Sn(2)–Se(6)	165.77(5)	Se(1)–Sn(2)–Se(7)	88.66(6)
Se(3)#1–Sn(2)–Se(5)	120.01(6)	Se(3)#1–Sn(2)–Se(6)	91.70(6)
Se(3)#1–Sn(2)–Se(7)	112.66(6)	Se(5)–Sn(2)–Se(6)	80.11(5)
Se(5)–Sn(2)–Se(7)	127.19(6)	Se(6)–Sn(2)–Se(7)	95.26(7)
Se(1)–Sn(3)–Se(4)	90.58(5)	Se(1)–Sn(3)–Se(7)	87.79(6)
Se(1)–Sn(3)–Se(8)	90.50(6)	Se(1)–Sn(3)–Se(8)#2	176.91(6)
Se(4)–Sn(3)–Se(7)	111.38(7)	Se(4)–Sn(3)–Se(8)	119.19(7)
Se(4)–Sn(3)–Se(8)#2	91.87(6)	Se(7)–Sn(3)–Se(8)	129.41(7)

Se(7)–Sn(3)–Se(8)#2	89.57(6)	Se(8)–Sn(3)–Se(8)#2	89.94(6)
Sn(1)–Se(1)–Sn(2)	83.19(5)	Sn(1)–Se(1)–Sn(3)	83.63(5)
Sn(2)–Se(1)–Sn(3)	84.70(5)	Sn(1)–Se(3)–Sn(2)#3	98.44(6)
Sn(1)–Se(4)–Sn(3)	96.00(6)	Sn(1)–Se(5)–Sn(2)	93.80(5)
Sn(2)–Se(7)–Sn(3)	92.84(6)	Sn(3)–Se(8)–Sn(3)#2	90.06(6)
Se(1)–Se(2)–Sn(6)#3	104.73(7)	Se(2)#1–Se(6)–Sn(2)	101.50(7)
N(1)–Mn(1)–N(2)	77.0(5)	N(1)–Mn(1)–N(3)	168.2(5)
N(1)–Mn(1)–N(4)	95.8(5)	N(1)–Mn(1)–N(5)	92.7(6)
N(1)–Mn(1)–N(6)	94.1(5)	N(2)–Mn(1)–N(3)	94.9(5)
N(2)–Mn(1)–N(4)	100.4(5)	N(2)–Mn(1)–N(5)	164.7(5)
N(2)–Mn(1)–N(6)	93.9(5)	N(3)–Mn(1)–N(4)	77.1(5)
N(3)–Mn(1)–N(5)	96.8(6)	N(3)–Mn(1)–N(6)	95.0(5)
N(4)–Mn(1)–N(5)	91.8(5)	N(4)–Mn(1)–N(6)	164.2(5)
N(5)–Mn(1)–N(6)	75.4(5)		

Symmetry transformations used to generate equivalent atoms: #1 –x+1/2, y+1/2, –z+1/2; #2 –x+1, –y+2, –z; #3 –x+1/2, y–1/2, –z+1/2.

Table S2. Selected Bond Lengths (Å) and Angles (deg) for **2**

Sn(1)–Se(1)	2.765(8)	Sn(1)–Se(2)	2.559(8)
Sn(1)–Se(3)	2.546(8)	Sn(1)–Se(4)	2.687(9)
Sn(1)–Se(4)#1	2.524(9)	Sn(2)–Se(1)	2.911(8)
Sn(2)–Se(2)	2.540(8)	Sn(2)–Se(5)	2.555(8)
Sn(2)–Se(6)#2	2.663(7)	Sn(2)–Se(8)#2	2.523(8)
Sn(3)–Se(1)	2.714(7)	Sn(3)–Se(3)	2.561(8)
Sn(3)–Se(5)	2.587(7)	Sn(3)–Se(6)	2.541(7)
Sn(3)–Se(7)	2.717(8)	Se(7)–Se(8)	2.324(10)
Fe(1)–N(1)	2.233(19)	Fe(1)–N(2)	2.257(19)
Fe(1)–N(3)	2.230(19)	Fe(1)–N(4)	2.224(19)
Fe(1)–N(5)	2.272(2)	Fe(1)–N(6)	2.212(2)
Se(1)–Sn(1)–Se(2)	90.6(2)	Se(1)–Sn(1)–Se(3)	87.9(2)
Se(1)–Sn(1)–Se(4)	176.9(3)	Se(1)–Sn(1)–Se(4)#1	91.2(3)
Se(2)–Sn(1)–Se(3)	111.7(3)	Se(2)–Sn(1)–Se(4)	91.6(3)
Se(2)–Sn(1)–Se(4) #1	119.0(3)	Se(3)–Sn(1)–Se(4)	89.4(3)
Se(3)–Sn(1)–Se(4)#1	129.2(3)	Se(4)–Sn(1)–Se(4)#1	89.6(3)
Se(1)–Sn(2)–Se(2)	87.7(2)	Se(1)–Sn(2)–Se(5)	83.0(2)
Se(1)–Sn(2)–Se(6)#2	174.5(2)	Se(1)–Sn(2)–Se(8)#2	81.7(2)
Se(2)–Sn(2)–Se(5)	121.0(3)	Se(2)–Sn(2)–Se(6)#2	88.0(3)
Se(2)–Sn(2)–Se(8)#2	122.3(3)	Se(5)–Sn(2)–Se(6)#2	96.3(3)
Se(5)–Sn(2)–Se(8)#2	113.7(3)	Se(8)#2–Sn(2)–Se(6)#2	103.5(2)
Se(1)–Sn(3)–Se(3)	88.7(2)	Se(1)–Sn(3)–Se(5)	86.4(2)
Se(1)–Sn(3)–Se(6)	99.7(3)	Se(1)–Sn(3)–Se(7)	165.6(3)
Se(3)–Sn(3)–Se(5)	127.9(3)	Se(3)–Sn(3)–Se(6)	112.4(3)
Se(3)–Sn(3)–Se(7)	95.1(3)	Se(5)–Sn(3)–Se(6)	119.6(3)

Se(5)–Sn(3)–Se(7)	80.3(2)	Se(6)–Sn(3)–Se(7)	91.7(3)
Sn(1)–Se(1)–Sn(2)	83.7(2)	Sn(1)–Se(1)–Sn(3)	84.7(2)
Sn(2)–Se(1)–Sn(3)	83.5(2)	Sn(1)–Se(2)–Sn(2)	96.0(3)
Sn(1)–Se(3)–Sn(3)	92.6(2)	Sn(1)–Se(4)–Sn(4)#1	90.4(3)
Sn(2)–Se(5)–Sn(3)	93.6(2)	Sn(3)–Se(6)–Sn(2)#3	98.3(2)
Se(7)–Se(8)–Sn(2)#3	105.2(3)	Se(7)–Se(8)–Sn(3)	101.5(3)
N(1)–Fe(1)–N(2)	79.4(15)	N(1)–Fe(1)–N(3)	97.3(17)
N(1)–Fe(1)–N(4)	99.0(18)	N(1)–Fe(1)–N(5)	165(2)
N(1)–Fe(1)–N(6)	92.1(17)	N(2)–Fe(1)–N(3)	173.1(18)
N(2)–Fe(1)–N(4)	94.2(14)	N(2)–Fe(1)–N(5)	90(2)
N(2)–Fe(1)–N(6)	95(3)	N(3)–Fe(1)–N(4)	80.2(15)
N(3)–Fe(1)–N(5)	95(3)	N(3)–Fe(1)–N(6)	91(3)
N(4)–Fe(1)–N(5)	93(2)	N(4)–Fe(1)–N(6)	167(2)
N(5)–Fe(1)–N(6)	78.0(17)		

Symmetry transformations used to generate equivalent atoms: #1 –x+1, –y+1, –z; #2 –x+2, y+1/2, –z+1/2; #3 –x+2, y–1/2, –z+1/2.

Table S3. Selected Bond Lengths (Å) and Angles (deg) for **3**

Sn(1)–Se(1)	2.910(2)	Sn(1)–Se(2)	2.543(2)
Sn(1)–Se(3)	2.668(2)	Sn(1)–Se(4)	2.532(2)
Sn(1)–Se(5)	2.552(2)	Sn(2)–Se(1)	2.7173(19)
Sn(2)–Se(3)	2.526(2)	Sn(2)–Se(5)	2.578(2)
Sn(2)–Se(6)	2.715(2)	Sn(2)–Se(7)	2.549(2)
Sn(3)–Se(1)	2.761(2)	Sn(3)–Se(4)	2.557(2)
Sn(3)–Se(7)	2.550(2)	Sn(3)–Se(8)	2.521(2)
Sn(3)–Se(8)#2	2.703(2)	Se(2)–Se(6)#3	2.330(3)
Zn(1)–N(1)	2.244(15)	Zn(1)–N(2)	2.208(15)
Zn(1)–N(3)	2.247(16)	Zn(1)–N(4)	2.176(14)
Zn(1)–N(5)	2.198(15)	Zn(1)–N(6)	2.167(15)
Se(1)–Sn(1)–Se(2)	81.37(6)	Se(1)–Sn(1)–Se(3)	174.91(7)
Se(1)–Sn(1)–Se(4)	87.87(7)	Se(1)–Sn(1)–Se(5)	83.11(6)
Se(2)–Sn(1)–Se(3)	103.51(7)	Se(2)–Sn(1)–Se(4)	122.37(8)
Se(2)–Sn(1)–Se(5)	113.65(8)	Se(3)–Sn(1)–Se(4)	88.24(7)
Se(3)–Sn(1)–Se(5)	96.09(7)	Se(4)–Sn(1)–Se(5)	120.95(8)
Se(1)–Sn(2)–Se(3)#1	99.34(7)	Se(1)–Sn(2)–Se(5)	86.58(6)
Se(1)–Sn(2)–Se(6)	165.63(7)	Se(1)–Sn(2)–Se(7)	88.87(7)
Se(3)#1–Sn(2)–Se(5)	119.75(7)	Se(3)#1–Sn(2)–Se(6)	91.94(7)
Se(3)#1–Sn(2)–Se(7)	112.62(8)	Se(5)–Sn(2)–Se(6)	80.06(6)
Se(5)–Sn(2)–Se(7)	127.48(8)	Se(6)–Sn(2)–Se(7)	95.02(8)
Se(1)–Sn(3)–Se(4)	90.68(7)	Se(1)–Sn(3)–Se(7)	87.90(7)
Se(1)–Sn(3)–Se(8)	90.59(7)	Se(1)–Sn(3)–Se(8)#2	177.06(7)
Se(4)–Sn(3)–Se(7)	111.40(8)	Se(4)–Sn(3)–Se(8)	119.15(8)
Se(4)–Sn(3)–Se(8)#2	91.58(7)	Se(7)–Sn(3)–Se(8)	129.44(9)

Se(7)–Sn(3)–Se(8)#2	89.52(7)	Se(8)–Sn(3)–Se(8)#2	89.95(7)
Sn(1)–Se(1)–Sn(2)	83.23(6)	Sn(1)–Se(1)–Sn(3)	83.57(6)
Sn(2)–Se(1)–Sn(3)	84.60(6)	Sn(1)–Se(3)–Sn(2)#3	98.42(7)
Sn(1)–Se(4)–Sn(3)	95.94(7)	Sn(1)–Se(5)–Sn(2)	93.60(6)
Sn(2)–Se(7)–Sn(3)	92.64(7)	Sn(3)–Se(8)–Sn(3)#2	90.05(7)
Se(6)#3–Se(2)–Sn(1)	104.46(8)	Se(2)#1–Se(6)–Sn(2)	101.54(8)
N(1)–Zn(1)–N(2)	79.0(6)	N(1)–Zn(1)–N(3)	92.8(6)
N(1)–Zn(1)–N(4)	168.0(7)	N(1)–Zn(1)–N(5)	95.0(6)
N(1)–Zn(1)–N(6)	91.0(6)	N(2)–Zn(1)–N(3)	92.1(6)
N(2)–Zn(1)–N(4)	92.7(6)	N(2)–Zn(1)–N(5)	94.2(6)
N(2)–Zn(1)–N(6)	167.2(6)	N(3)–Zn(1)–N(4)	78.8(6)
N(3)–Zn(1)–N(5)	170.7(6)	N(3)–Zn(1)–N(6)	96.4(6)
N(4)–Zn(1)–N(5)	94.2(6)	N(4)–Zn(1)–N(6)	98.3(5)
N(5)–Zn(1)–N(6)	78.6(6)		

Symmetry transformations used to generate equivalent atoms: #1 –x+3/2, y–1/2, –z+1/2; #2 –x+2, –y, –z; #3 –x+3/2, y+1/2, –z+1/2.

Table S4. Selected Bond Lengths (Å) and Angles (deg) for **4**

Sn(1)–Se(1)	2.524(6)	Sn(1)–Se(2)	2.586(6)
Sn(1)–Se(3)	2.563(5)	Sn(1)–Se(4)	2.439(5)
Sn(2)–Se(1)	2.881(10)	Sn(2)–Se(2)	2.561(5)
Sn(2)–Se(5)	2.576(5)	Sn(2)–Se(6)#1	2.587(7)
Sn(2)–Se(8A)#1	2.627(9)	Sn(2)–Se(8B)#1	2.577(12)
Sn(3)–Se(1)	3.172(9)	Sn(3)–Se(3)	2.544(5)
Sn(3)–Se(5)	2.537(5)	Sn(3)–Se(6)	2.543(6)
Sn(3)–Se(7)	2.514(8)	Sn(4)–Se(8A)	2.597(10)
Se(7)–Se(8B)	2.387(15)	Se(8A)–Se(8B)	1.288(14)
Ni(1)–N(1)	2.15(4)	Ni(1)–N(2)	2.11(3)
Ni(1)–N(3)	2.18(4)	Ni(1)–N(4)	2.16(3)
Ni(1)–N(5)	2.15(4)	Ni(1)–N(6)	2.12(3)
Se(1)–Sn(1)–Se(2)	95.2(3)	Se(1)–Sn(1)–Se(3)	100.8(3)
Se(1)–Sn(1)–Se(4)	112.5(2)	Se(2)–Sn(1)–Se(3)	105.60(18)
Se(2)–Sn(1)–Se(4)	123.2(2)	Se(3)–Sn(1)–Se(4)	115.6(2)
Se(1)–Sn(2)–Se(2)	87.63(19)	Se(1)–Sn(2)–Se(5)	87.8(2)
Se(1)–Sn(2)–Se(6)#1	172.5(2)	Se(1)–Sn(2)–Se(8A)#1	92.5(3)
Se(1)–Sn(2)–Se(8B)#1	64.1(3)	Se(2)–Sn(2)–Se(5)	111.24(18)
Se(2)–Sn(2)–Se(6)#1	97.69(19)	Se(2)–Sn(2)–Se(8A)#1	130.3(3)
Se(2)–Sn(2)–Se(8B)#1	120.9(3)	Se(5)–Sn(2)–Se(6)#1	95.2(2)

Se(5)–Sn(2)–Se(8B)#1	117.7(3)	Se(1)–Sn(3)–Se(3)	85.87(16)
Se(1)–Sn(3)–Se(5)	82.4(2)	Se(1)–Sn(3)–Se(6)	167.7(2)
Se(1)–Sn(3)–Se(7)	58.9(3)	Se(1)–Sn(3)–Se(8A)	91.4(3)
Se(3)–Sn(3)–Se(5)	112.12(18)	Se(3)–Sn(3)–Se(6)	106.3(2)
Se(3)–Sn(3)–Se(7)	114.3(3)	Se(3)–Sn(3)–Se(8A)	115.8(3)
Se(5)–Sn(3)–Se(6)	94.70(17)	Se(5)–Sn(3)–Se(7)	114.9(3)
Se(5)–Sn(3)–Se(8A)	131.1(3)	Se(6)–Sn(3)–Se(7)	112.5(3)
Se(6)–Sn(3)–Se(8A)	81.4(3)	Se(7)–Sn(3)–Se(8A)	33.1(3)
Sn(1)–Se(1)–Sn(2)	83.9(2)	Sn(1)–Se(1)–Sn(3)	79.4(2)
Sn(2)–Se(1)–Sn(3)	81.69(16)	Sn(1)–Se(2)–Sn(2)	89.52(18)
Sn(1)–Se(3)–Sn(3)	91.93(16)	Sn(2)–Se(5)–Sn(3)	101.71(16)
Sn(2)#2–Se(6)–Sn(3)	94.3(2)	Sn(3)–Se(8A)–Sn(2)#2	92.1(3)
N(1)–Ni(1)–N(2)	84.0(14)	N(1)–Ni(1)–N(3)	94.4(15)
N(1)–Ni(1)–N(4)	89.3(14)	N(1)–Ni(1)–N(5)	89.4(15)
N(1)–Ni(1)–N(6)	170.4(15)	N(2)–Ni(1)–N(3)	177.6(16)
N(2)–Ni(1)–N(4)	93.7(14)	N(2)–Ni(1)–N(5)	92(2)
N(2)–Ni(1)–N(6)	88.1(14)	N(3)–Ni(1)–N(4)	84.6(13)
N(3)–Ni(1)–N(5)	89.8(19)	N(3)–Ni(1)–N(6)	93.7(15)
N(4)–Ni(1)–N(5)	174.1(18)	N(4)–Ni(1)–N(6)	96.6(11)
N(5)–Ni(1)–N(6)	85.5(12)		

Symmetry transformations used to generate equivalent atoms: #1) –x+1/2, y, z+1/2; #2) –x+1/2, y, z–1/2.

Table S5. Selected Bond Lengths (Å) and Angles (deg) for **5**

Sn(1)–Se(1)	2.703(6)	Sn(1)–Se(4)	2.717(6)
Sn(1)–Se(5)	2.721(6)	Sn(1)–Se(8)	2.708(6)
Sn(1)–Se(9)	2.741(6)	Sn(1)–Se(12)	2.736(7)
Se(1)–Se(2)	2.315(9)	Se(2)–Se(3)	2.378(10)
Se(3)–Se(4)	2.349(9)	Se(5)–Se(6)	2.326(8)
Se(6)–Se(7)	2.310(11)	Se(7)–Se(8)	2.333(9)
Se(9)–Se(10)	2.336(9)	Se(10)–Se(11)	2.346(9)
Se(11)–Se(12)	2.352(9)	Mn(1)–N(1)	2.302(18)
Mn(1)–N(2)	2.308(16)	Mn(1)–N(3)	2.284(19)
Mn(1)–N(4)	2.276(17)	Mn(1)–N(5)	2.316(18)
Mn(1)–N(6)	2.300(17)		
Se(1)–Sn(1)–Se(4)	95.8(2)	Se(1)–Sn(1)–Se(5)	94.3(2)
Se(1)–Sn(1)–Se(8)	88.45(19)	Se(1)–Sn(1)–Se(9)	86.1(2)
Se(1)–Sn(1)–Se(12)	178.7(2)	Se(4)–Sn(1)–Se(5)	86.5(2)
Se(4)–Sn(1)–Se(8)	175.0(2)	Se(4)–Sn(1)–Se(9)	92.5(2)

Se(4)–Sn(1)–Se(12)	82.9(2)	Se(5)–Sn(1)–Se(8)	95.8(2)
Se(5)–Sn(1)–Se(9)	178.9(2)	Se(5)–Sn(1)–Se(12)	85.5(2)
Se(8)–Sn(1)–Se(9)	85.2(2)	Se(8)–Sn(1)–Se(12)	92.8(2)
Se(9)–Sn(1)–Se(12)	94.1(2)	Se(1)–Se(2)–Sn(1)	100.7(3)
Se(3)–Se(4)–Sn(1)	102.3(3)	Se(5)–Se(6)–Sn(1)	103.1(3)
Se(7)–Se(8)–Sn(1)	100.5(3)	Se(9)–Se(10)–Sn(1)	101.7(3)
Se(11)–Se(12)–Sn(1)	102.0(3)	Se(1)–Se(2)–Se(3)	98.6(4)
Se(2)–Se(3)–Se(4)	99.1(3)	Se(5)–Se(6)–Se(7)	100.2(3)
Se(6)–Se(7)–Se(8)	101.7(3)	Se(9)–Se(10)–Se(11)	98.0(3)
Se(10)–Se(11)–Se(12)	98.7(3)	N(1)–Mn(1)–N(2)	75.8(11)
N(1)–Mn(1)–N(3)	93.6(14)	N(1)–Mn(1)–N(4)	94.3(13)
N(1)–Mn(1)–N(5)	93.9(12)	N(1)–Mn(1)–N(6)	165.7(13)
N(2)–Mn(1)–N(3)	94.3(12)	N(2)–Mn(1)–N(4)	168.1(12)
N(2)–Mn(1)–N(5)	94.0(13)	N(2)–Mn(1)–N(6)	93.2(11)
N(3)–Mn(1)–N(4)	79.5(12)	N(3)–Mn(1)–N(5)	169.9(13)
N(3)–Mn(1)–N(6)	96.2(12)	N(4)–Mn(1)–N(5)	93.3(14)
N(4)–Mn(1)–N(6)	97.6(12)	N(5)–Mn(1)–N(6)	77.7(6)
Se(8)-Sn(1)-Se(1)-Se(2)	-152.3(3)	Se(4)-Sn(1)-Se(1)-Se(2)	25.1(3)
Se(5)-Sn(1)-Se(1)-Se(2)	112.0(3)	Se(12)-Sn(1)-Se(1)-Se(2)	32(10)
Se(9)-Sn(1)-Se(1)-Se(2)	-67.0(3)	Sn(1)-Se(1)-Se(2)-Se(3)	-55.7(4)
Se(1)-Se(2)-Se(3)-Se(4)	67.6(4)	Se(2)-Se(3)-Se(4)-Sn(1)	-47.1(4)
Se(1)-Sn(1)-Se(4)-Se(3)	13.6(3)	Se(8)-Sn(1)-Se(4)-Se(3)	162(2)
Se(5)-Sn(1)-Se(4)-Se(3)	-80.3(3)	Se(12)-Sn(1)-Se(4)-Se(3)	-166.2(3)
Se(9)-Sn(1)-Se(4)-Se(3)	100.0(3)	Se(1)-Sn(1)-Se(5)-Se(6)	103.3(3)
Se(8)-Sn(1)-Se(5)-Se(6)	14.4(3)	Se(4)-Sn(1)-Se(5)-Se(6)	-161.2(3)
Se(12)-Sn(1)-Se(5)-Se(6)	-78.0(3)	Se(9)-Sn(1)-Se(5)-Se(6)	-144(13)
Sn(1)-Se(5)-Se(6)-Se(7)	-46.2(4)	Se(5)-Se(6)-Se(7)-Se(8)	64.9(4)
Se(6)-Se(7)-Se(8)-Sn(1)	-52.2(4)	Se(1)-Sn(1)-Se(8)-Se(7)	-72.7(3)
Se(4)-Sn(1)-Se(8)-Se(7)	139(2)	Se(5)-Sn(1)-Se(8)-Se(7)	21.4(3)
Se(12)-Sn(1)-Se(8)-Se(7)	107.2(3)	Se(9)-Sn(1)-Se(8)-Se(7)	-159.0(3)
Se(1)-Sn(1)-Se(9)-Se(10)	-159.6(3)	Se(8)-Sn(1)-Se(9)-Se(10)	-70.9(3)
Se(4)-Sn(1)-Se(9)-Se(10)	104.7(3)	Se(5)-Sn(1)-Se(9)-Se(10)	87(13)
Se(12)-Sn(1)-Se(9)-Se(10)	21.6(3)	Sn(1)-Se(9)-Se(10)-Se(11)	-54.4(3)
Se(9)-Se(10)-Se(11)-Se(12)	69.0(3)	Se(10)-Se(11)-Se(12)-Sn(1)	-51.6(3)
Se(1)-Sn(1)-Se(12)-Se(11)	-82(10)	Se(8)-Sn(1)-Se(12)-Se(11)	102.9(3)
Se(4)-Sn(1)-Se(12)-Se(11)	-74.5(3)	Se(5)-Sn(1)-Se(12)-Se(11)	-161.5(3)
Se(9)-Sn(1)-Se(12)-Se(11)	17.5(3)		

Table S6. Selected Bond Lengths (Å) and Angles (deg) for **6**

Sn(1)–Se(1)	2.972(13)	Sn(1)–Se(2)	2.255(11)
Sn(1)–Se(4)	2.678(10)	Sn(1)–Se(5)	2.727(10)
Sn(1)–Se(8)	2.981(12)	Sn(1)–Se(9)	2.601(11)
Sn(1)–Se(12)	2.760(10)	Se(2)–Se(3)	2.356(15)
Se(3)–Se(4)	2.478(14)	Se(5)–Se(6)	2.451(14)

Se(6)–Se(7)	2.417(16)	Se(7)–Se(8)	2.286(12)
Se(9)–Se(10)	2.367(14)	Se(10)–Se(11)	2.314(17)
Se(11)–Se(12)	2.214(14)	Fe(1)–N(1)	2.202(19)
Fe(1)–N(2)	2.293(19)	Fe(1)–N(3)	2.208(19)
Fe(1)–N(4)	2.337(16)	Fe(1)–N(5)	2.221(17)
Fe(1)–N(6)	2.317(19)		
Se(1)–Sn(1)–Se(4)	89.4(4)	Se(1)–Sn(1)–Se(5)	93.6(3)
Se(1)–Sn(1)–Se(8)	179.2(3)	Se(1)–Sn(1)–Se(9)	89.4(3)
Se(1)–Sn(1)–Se(12)	84.6(4)	Se(4)–Sn(1)–Se(5)	102.1(3)
Se(4)–Sn(1)–Se(8)	90.6(3)	Se(4)–Sn(1)–Se(9)	178.8(4)
Se(4)–Sn(1)–Se(12)	74.9(3)	Se(5)–Sn(1)–Se(8)	87.2(3)
Se(5)–Sn(1)–Se(9)	77.9(3)	Se(5)–Sn(1)–Se(12)	176.4(4)
Se(8)–Sn(1)–Se(9)	90.6(4)	Se(8)–Sn(1)–Se(12)	94.7(3)
Se(9)–Sn(1)–Se(12)	105.1(3)	Se(1)–Se(2)–Sn(1)	104.9(5)
Se(3)–Se(4)–Sn(1)	106.3(4)	Se(5)–Se(6)–Sn(1)	110.5(4)
Se(7)–Se(8)–Sn(1)	109.4(5)	Se(9)–Se(10)–Sn(1)	93.9(5)
Se(11)–Se(12)–Sn(1)	89.4(5)	Se(1)–Se(2)–Se(3)	98.8(5)
Se(2)–Se(3)–Se(4)	98.2(5)	Se(5)–Se(6)–Se(7)	101.6(6)
Se(6)–Se(7)–Se(8)	98.4(5)	Se(9)–Se(10)–Se(11)	97.9(6)
Se(10)–Se(11)–Se(12)	104.6(6)	N(1)–Fe(1)–N(2)	79.7(8)
N(1)–Fe(1)–N(3)	148.9(19)	N(1)–Fe(1)–N(4)	82.9(17)
N(1)–Fe(1)–N(5)	84.6(17)	N(1)–Fe(1)–N(6)	108.6(18)
N(2)–Fe(1)–N(3)	82.9(19)	N(2)–Fe(1)–N(4)	81.2(18)
N(2)–Fe(1)–N(5)	162.9(17)	N(2)–Fe(1)–N(6)	101.0(10)
N(3)–Fe(1)–N(4)	69.1(10)	N(3)–Fe(1)–N(5)	114.2(18)
N(3)–Fe(1)–N(6)	99.8(12)	N(4)–Fe(1)–N(5)	103.6(16)
N(4)–Fe(1)–N(6)	168.5(13)	N(5)–Fe(1)–N(6)	77.6(7)
Se(9)-Sn(1)-Se(1)-Se(2)	159.9(5)	Se(4)-Sn(1)-Se(1)-Se(2)	-20.0(5)
Se(5)-Sn(1)-Se(1)-Se(2)	82.1(5)	Se(12)-Sn(1)-Se(1)-Se(2)	-94.9(5)
Se(8)-Sn(1)-Se(1)-Se(2)	-110(27)	Sn(1)-Se(1)-Se(2)-Se(3)	53.0(6)
Se(1)-Se(2)-Se(3)-Se(4)	-65.8(6)	Se(2)-Se(3)-Se(4)-Sn(1)	51.9(5)
Se(9)-Sn(1)-Se(4)-Se(3)	-21(18)	Se(5)-Sn(1)-Se(4)-Se(3)	-112.1(5)
Se(12)-Sn(1)-Se(4)-Se(3)	65.9(5)	Se(1)-Sn(1)-Se(4)-Se(3)	-18.6(5)
Se(8)-Sn(1)-Se(4)-Se(3)	160.6(4)	Se(9)-Sn(1)-Se(5)-Se(6)	77.8(5)
Se(4)-Sn(1)-Se(5)-Se(6)	-103.4(5)	Se(12)-Sn(1)-Se(5)-Se(6)	-135(6)
Se(1)-Sn(1)-Se(5)-Se(6)	166.4(5)	Se(8)-Sn(1)-Se(5)-Se(6)	-13.4(5)
Sn(1)-Se(5)-Se(6)-Se(7)	44.3(6)	Se(5)-Se(6)-Se(7)-Se(8)	-57.3(7)
Se(6)-Se(7)-Se(8)-Sn(1)	50.0(7)	Se(9)-Sn(1)-Se(8)-Se(7)	-100.6(6)
Se(4)-Sn(1)-Se(8)-Se(7)	79.4(6)	Se(5)-Sn(1)-Se(8)-Se(7)	-22.7(6)
Se(12)-Sn(1)-Se(8)-Se(7)	154.3(5)	Se(1)-Sn(1)-Se(8)-Se(7)	170(27)
Se(4)-Sn(1)-Se(9)-Se(10)	69(18)	Se(5)-Sn(1)-Se(9)-Se(10)	159.7(5)
Se(12)-Sn(1)-Se(9)-Se(10)	-18.3(6)	Se(1)-Sn(1)-Se(9)-Se(10)	65.9(5)
Se(8)-Sn(1)-Se(9)-Se(10)	-113.3(5)	Sn(1)-Se(9)-Se(10)-Se(11)	49.2(6)
Se(9)-Se(10)-Se(11)-Se(12)	-77.5(7)	Se(10)-Se(11)-Se(12)-Sn(1)	55.0(6)

Se(9)-Sn(1)-Se(12)-Se(11)	-20.5(6)	Se(4)-Sn(1)-Se(12)-Se(11)	160.7(5)
Se(5)-Sn(1)-Se(12)-Se(11)	-167(6)	Se(1)-Sn(1)-Se(12)-Se(11)	-108.4(5)
Se(8)-Sn(1)-Se(12)-Se(11)	71.4(5)		

Table S7. Selected Bond Lengths (Å) and Angles (deg) for **7**

Sn(1)–Se(1)	2.725(7)	Sn(1)–Se(4)	2.707(7)
Sn(1)–Se(5)	2.717(7)	Sn(1)–Se(8)	2.720(7)
Sn(1)–Se(9)	2.680(8)	Sn(1)–Se(12)	2.675(7)
Se(1)–Se(2)	2.329(10)	Se(2)–Se(3)	2.336(12)
Se(3)–Se(4)	2.345(10)	Se(5)–Se(6)	2.311(11)
Se(6)–Se(7)	2.319(12)	Se(7)–Se(8)	2.323(10)
Se(9)–Se(10)	2.314(11)	Se(10)–Se(11)	2.322(13)
Se(11)–Se(12)	2.311(10)	Zn(1)–N(1)	2.173(19)
Zn(1)–N(2)	2.171(3)	Zn(1)–N(3)	2.222(3)
Zn(1)–N(4)	2.252(4)	Zn(1)–N(5)	2.191(5)
Zn(1)–N(6)	2.171(2)		
Se(1)–Sn(1)–Se(4)	95.4(2)	Se(1)–Sn(1)–Se(5)	178.3(3)
Se(1)–Sn(1)–Se(8)	84.9(2)	Se(1)–Sn(1)–Se(9)	89.2(2)
Se(1)–Sn(1)–Se(12)	93.8(2)	Se(4)–Sn(1)–Se(5)	83.3(2)
Se(4)–Sn(1)–Se(8)	91.7(2)	Se(4)–Sn(1)–Se(9)	174.5(3)
Se(4)–Sn(1)–Se(12)	85.7(2)	Se(5)–Sn(1)–Se(8)	94.1(2)
Se(5)–Sn(1)–Se(9)	92.2(3)	Se(5)–Sn(1)–Se(12)	87.2(2)
Se(8)–Sn(1)–Se(9)	85.6(2)	Se(8)–Sn(1)–Se(12)	177.0(3)
Se(9)–Sn(1)–Se(12)	97.1(2)	Se(1)–Se(2)–Sn(1)	99.8(3)
Se(3)–Se(4)–Sn(1)	102.3(3)	Se(5)–Se(6)–Sn(1)	102.1(3)
Se(7)–Se(8)–Sn(1)	100.8(3)	Se(9)–Se(10)–Sn(1)	99.9(3)
Se(11)–Se(12)–Sn(1)	102.5(3)	Se(1)–Se(2)–Se(3)	98.1(4)
Se(2)–Se(3)–Se(4)	99.9(3)	Se(5)–Se(6)–Se(7)	98.8(4)
Se(6)–Se(7)–Se(8)	97.9(4)	Se(9)–Se(10)–Se(11)	101.0(4)
Se(10)–Se(11)–Se(12)	100.7(4)	N(1)–Zn(1)–N(2)	75.5(18)
N(1)–Zn(1)–N(3)	168.6(12)	N(1)–Zn(1)–N(4)	96.1(12)
N(1)–Zn(1)–N(5)	89.4(13)	N(1)–Zn(1)–N(6)	98.6(16)
N(2)–Zn(1)–N(3)	95.9(19)	N(2)–Zn(1)–N(4)	95.7(16)
N(2)–Zn(1)–N(5)	88.8(16)	N(2)–Zn(1)–N(6)	169(2)
N(3)–Zn(1)–N(4)	77.0(14)	N(3)–Zn(1)–N(5)	98.0(15)
N(3)–Zn(1)–N(6)	91.0(16)	N(4)–Zn(1)–N(5)	173.6(13)
Se(12)-Sn(1)-Se(1)-Se(2)	-112.4(3)	Se(9)-Sn(1)-Se(1)-Se(2)	150.5(3)
Se(4)-Sn(1)-Se(1)-Se(2)	-26.4(3)	Se(5)-Sn(1)-Se(1)-Se(2)	11(8)
Se(8)-Sn(1)-Se(1)-Se(2)	64.9(3)	Sn(1)-Se(1)-Se(2)-Se(3)	56.8(4)
Se(1)-Se(2)-Se(3)-Se(4)	-68.2(4)	Se(2)-Se(3)-Se(4)-Sn(1)	46.9(4)
Se(12)-Sn(1)-Se(4)-Se(3)	81.5(3)	Se(9)-Sn(1)-Se(4)-Se(3)	-158(2)
Se(5)-Sn(1)-Se(4)-Se(3)	169.1(4)	Se(8)-Sn(1)-Se(4)-Se(3)	-96.9(3)
Se(1)-Sn(1)-Se(4)-Se(3)	-11.9(4)	Se(12)-Sn(1)-Se(5)-Se(6)	160.6(4)
Se(9)-Sn(1)-Se(5)-Se(6)	-102.4(4)	Se(4)-Sn(1)-Se(5)-Se(6)	74.6(4)

Se(8)-Sn(1)-Se(5)-Se(6)	-16.7(4)	Se(1)-Sn(1)-Se(5)-Se(6)	37(8)
Sn(1)-Se(5)-Se(6)-Se(7)	51.3(4)	Se(5)-Se(6)-Se(7)-Se(8)	-69.9(4)
Se(6)-Se(7)-Se(8)-Sn(1)	55.4(4)	Se(12)-Sn(1)-Se(8)-Se(7)	-138(4)
Se(9)-Sn(1)-Se(8)-Se(7)	69.1(3)	Se(4)-Sn(1)-Se(8)-Se(7)	-106.1(3)
Se(5)-Sn(1)-Se(8)-Se(7)	-22.7(4)	Se(1)-Sn(1)-Se(8)-Se(7)	158.7(3)
Se(12)-Sn(1)-Se(9)-Se(10)	-23.0(4)	Se(4)-Sn(1)-Se(9)-Se(10)	-144(2)
Se(5)-Sn(1)-Se(9)-Se(10)	-110.4(3)	Se(8)-Sn(1)-Se(9)-Se(10)	155.7(3)
Se(1)-Sn(1)-Se(9)-Se(10)	70.7(3)	Sn(1)-Se(9)-Se(10)-Se(11)	52.5(4)
Se(9)-Se(10)-Se(11)-Se(12)	-64.9(5)	Se(10)-Se(11)-Se(12)-Sn(1)	45.2(4)
Se(9)-Sn(1)-Se(12)-Se(11)	-13.1(4)	Se(4)-Sn(1)-Se(12)-Se(11)	162.1(4)
Se(5)-Sn(1)-Se(12)-Se(11)	78.7(4)	Se(8)-Sn(1)-Se(12)-Se(11)	-166(4)
Se(1)-Sn(1)-Se(12)-Se(11)	-102.8(4)		

Table S8. Selected Bond Lengths (Å) and Angles (deg) for **8**

Sn(1)–Se(1)	2.670(3)	Sn(1)–Se(2)	2.313(5)
Sn(1)–Se(4)	2.686(3)	Sn(1)–Se(5)	2.712(3)
Sn(1)–Se(8)	2.675(3)	Sn(1)–Se(9)	2.718(3)
Sn(1)–Se(12)	2.729(3)	Se(2)–Se(3)	2.323(5)
Se(3)–Se(4)	2.311(5)	Se(5)–Se(6)	2.313(4)
Se(6)–Se(7)	2.330(4)	Se(7)–Se(8)	2.323(4)
Se(9)–Se(10)	2.333(4)	Se(10)–Se(11)	2.329(4)
Se(11)–Se(12)	2.325(4)	Ni(1)–N(1)	2.149(15)
Ni(1)–N(2)	2.133(2)	Ni(1)–N(3)	2.085(17)
Ni(1)–N(4)	2.162(2)	Ni(1)–N(5)	2.101(2)
Ni(1)–N(6)	2.146(18)		
Se(1)–Sn(1)–Se(4)	96.78(10)	Se(1)–Sn(1)–Se(5)	88.69(9)
Se(1)–Sn(1)–Se(8)	175.15(11)	Se(1)–Sn(1)–Se(9)	92.36(10)
Se(1)–Sn(1)–Se(12)	85.67(10)	Se(4)–Sn(1)–Se(5)	93.25(9)
Se(4)–Sn(1)–Se(8)	85.40(10)	Se(4)–Sn(1)–Se(9)	86.81(9)
Se(4)–Sn(1)–Se(12)	177.33(11)	Se(5)–Sn(1)–Se(8)	95.52(9)
Se(5)–Sn(1)–Se(9)	178.93(11)	Se(5)–Sn(1)–Se(12)	85.71(9)
Se(8)–Sn(1)–Se(9)	83.41(10)	Se(8)–Sn(1)–Se(12)	92.25(11)
Se(9)–Sn(1)–Se(12)	94.18(9)	Se(1)–Se(2)–Sn(1)	100.04(14)
Se(3)–Se(4)–Sn(1)	102.42(13)	Se(5)–Se(6)–Sn(1)	99.22(12)
Se(7)–Se(8)–Sn(1)	103.36(13)	Se(9)–Se(10)–Sn(1)	102.21(12)
Se(11)–Se(12)–Sn(1)	100.59(12)	Se(1)–Se(2)–Se(3)	100.47(17)
Se(2)–Se(3)–Se(4)	100.32(15)	Se(5)–Se(6)–Se(7)	98.90(14)
Se(6)–Se(7)–Se(8)	99.82(14)	Se(9)–Se(10)–Se(11)	98.41(15)
Se(10)–Se(11)–Se(12)	97.89(14)	N(1)–Ni(1)–N(2)	82.2(7)
N(1)–Ni(1)–N(3)	92.4(6)	N(1)–Ni(1)–N(4)	91.4(7)
N(1)–Ni(1)–N(5)	92.2(7)	N(1)–Ni(1)–N(6)	172.5(7)
N(2)–Ni(1)–N(3)	91.8(8)	N(2)–Ni(1)–N(4)	170.8(8)
N(2)–Ni(1)–N(5)	92.8(8)	N(2)–Ni(1)–N(6)	93.0(8)
N(3)–Ni(1)–N(4)	81.8(8)	N(3)–Ni(1)–N(5)	173.9(8)

N(3)–Ni(1)–N(6)	93.6(6)	N(4)–Ni(1)–N(5)	94.1(8)
N(4)–Ni(1)–N(6)	94.0(8)	N(5)–Ni(1)–N(6)	82.2(7)
Se(8)-Sn(1)-Se(1)-Se(2)	-140.0(11)	Se(4)-Sn(1)-Se(1)-Se(2)	-23.54(14)
Se(5)-Sn(1)-Se(1)-Se(2)	69.58(14)	Se(9)-Sn(1)-Se(1)-Se(2)	-110.61(14)
Se(12)-Sn(1)-Se(1)-Se(2)	155.38(14)	Sn(1)-Se(1)-Se(2)-Se(3)	53.43(17)
Se(1)-Se(2)-Se(3)-Se(4)	-65.6(2)	Se(2)-Se(3)-Se(4)-Sn(1)	45.62(18)
Se(1)-Sn(1)-Se(4)-Se(3)	-13.09(15)	Se(8)-Sn(1)-Se(4)-Se(3)	162.56(15)
Se(5)-Sn(1)-Se(4)-Se(3)	-102.16(15)	Se(9)-Sn(1)-Se(4)-Se(3)	78.92(15)
Se(12)-Sn(1)-Se(4)-Se(3)	-169.3(19)	Se(1)-Sn(1)-Se(5)-Se(6)	150.11(12)
Se(8)-Sn(1)-Se(5)-Se(6)	-27.49(13)	Se(4)-Sn(1)-Se(5)-Se(6)	-113.17(12)
Se(9)-Sn(1)-Se(5)-Se(6)	-20(5)	Se(12)-Sn(1)-Se(5)-Se(6)	64.36(13)
Sn(1)-Se(5)-Se(6)-Se(7)	57.05(14)	Se(5)-Se(6)-Se(7)-Se(8)	-67.11(17)
Se(6)-Se(7)-Se(8)-Sn(1)	44.83(17)	Se(1)-Sn(1)-Se(8)-Se(7)	-160.6(10)
Se(4)-Sn(1)-Se(8)-Se(7)	82.56(14)	Se(5)-Sn(1)-Se(8)-Se(7)	-10.27(14)
Se(9)-Sn(1)-Se(8)-Se(7)	169.87(14)	Se(12)-Sn(1)-Se(8)-Se(7)	-96.18(14)
Se(1)-Sn(1)-Se(9)-Se(10)	-101.91(14)	Se(8)-Sn(1)-Se(9)-Se(10)	75.70(14)
Se(4)-Sn(1)-Se(9)-Se(10)	161.43(14)	Se(5)-Sn(1)-Se(9)-Se(10)	68(5)
Se(12)-Sn(1)-Se(9)-Se(10)	-16.09(15)	Sn(1)-Se(9)-Se(10)-Se(11)	50.84(15)
Se(9)-Se(10)-Se(11)-Se(12)	-69.96(17)	Se(10)-Se(11)-Se(12)-Sn(1)	56.10(16)
Se(1)-Sn(1)-Se(12)-Se(11)	68.68(14)	Se(8)-Sn(1)-Se(12)-Se(11)	-106.93(14)
Se(4)-Sn(1)-Se(12)-Se(11)	-135.0(19)	Se(5)-Sn(1)-Se(12)-Se(11)	157.69(14)
Se(9)-Sn(1)-Se(12)-Se(11)	-23.38(15)		

Table S9. Hydrogen Bond Lengths (Å) and Angles (deg) for **1**–**8**

D–H···A	d(H···A)	d(D···A)	<(DHA)
1			
N(1)–H(1A)···Se(3)#1	2.77	3.603(14)	154.3
N(2)–H(2A)···Se(7)#2	2.73	3.606(12)	164.6
N(2)–H(2B)···Se(6)#1	2.71	3.600(13)	173.3
N(3)–H(3A)···Se(8)	2.96	3.639(12)	133.7
N(3)–H(3B)···Se(2)	3.02	3.729(14)	137.0
N(4)–H(4B)···Se(5)#1	2.75	3.482(12)	139.5
2			
N(1)–H(1B)···Se(5)#1	0.90	2.75	3.44(4)
N(2)–H(2A)···Se(4)#2	0.90	2.86	3.60(4)
N(2)–H(2B)···Se(8)#3	0.90	2.93	3.66(4)
N(3)–H(3A)···Se(6)#4	0.90	2.84	3.64(4)
N(3)–H(3B)···Se(6)#5	0.90	3.06	3.94(4)
N(4)–H(4A)···Se(3)#2	0.90	2.65	3.54(5)
N(4)–H(4B)···Se(7)#1	0.90	2.72	3.62(4)
3			
N(4)–H(4A)···Se(7)#1	2.74	3.604(14)	160.5
N(4)–H(4B)···Se(6)#2	2.71	3.591(16)	168.1

N(5)–H(5A)···Se(8)#3	2.90	3.642(15)	141.0
N(5)–H(5B)···Se(2)#3	2.96	3.683(14)	138.6
N(6)–H(6A)···Se(8)#4	3.15	3.879(16)	139.4
N(6)–H(6B)···Se(5)#2	2.73	3.492(13)	142.9
4			
N(2)–H(2A)...Se(1)#1	2.97	3.78(4)	150.5
N(2)–H(2B)...Se(6)#2	3.03	3.90(4)	164.4
N(8)–H(8A)...Se(15)#3	2.94	3.82(3)	166.0
N(10)–H(10A)...Se(6)#2	2.46	3.28(4)	151.5
N(10)–H(10B)...Se(11)#4	2.90	3.76(4)	161.3
N(11)–H(11B)...Se(11)#4	2.79	3.65(3)	160.9
5			
N(1)–H(1A)···Se(9)#1	2.76	3.62(4)	160.5
N(2)–H(2A)···Se(12)	2.90	3.65(3)	141.8
N(3)–H(3A)···Se(12)	2.94	3.66(3)	138.2
N(4)–H(4A)···Se(8)#1	2.90	3.72(4)	152.3
N(4)–H(4B)···Se(1)#2	3.03	3.92(3)	172.0
N(5)–H(5A)···Se(1)#1	2.90	3.73(4)	153.1
N(6)–H(6A)···Se(4)	2.81	3.61(3)	149.2
6			
N(1)–H(1B)···Se(12)#1	2.65	3.50(3)	159.2
N(2)–H(2B)···Se(9)	2.98	3.79(5)	150.0
N(2)–H(2B)···Se(1)	2.93	3.54(4)	126.3
7			
N(1)–H(1A)···Se(8)#1	2.97	3.86(3)	168.7
N(1)–H(1B)···Se(8)	3.07	3.84(4)	144.7
N(2)–H(2B)···Se(4)#2	2.89	3.67(4)	146.4
N(3)–H(3B)···Se(12)#2	3.01	3.82(3)	150.1
N(4)–H(4A)···Se(1)#3	2.92	3.80(3)	168.0
N(4)–H(4B)···Se(9)	2.97	3.72(4)	142.3
N(5)–H(5A)···Se(8)#1	2.91	3.77(4)	160.8
N(5)–H(5B)···Se(5)#2	2.92	3.64(3)	138.0
N(6)–H(6A)···Se(5)#4	2.95	3.75(5)	148.9
N(6)–H(6B)···Se(8)	3.00	3.79(6)	147.6
8			
N(1)–H(1A)···Se(1)#1	2.90	3.708(17)	149.7
N(1)–H(1B)···Se(5)#2	2.90	3.799(17)	175.3
N(2)–H(2A)···Se(4)#3	2.98	3.774(18)	147.9
N(3)–H(3A)···Se(8)#3	3.00	3.777(15)	146.0
N(3)–H(3B)···Se(5)#2	2.97	3.786(15)	151.0
N(4)–H(4A)···Se(5)#1	2.94	3.722(19)	145.5
N(5)–H(5A)···Se(12)#1	2.88	3.69(2)	151.0
N(6)–H(6A)···Se(9)#3	2.76	3.565(19)	149.4

Symmetry transformations used to generate equivalent atoms: For **1**: #1) x+1, y, z; #2) –x+1, –y+2, –z. For **2**: #1) x–1, y, z; #2) –x+1, –y+1, –z; #3) –x+2, y+1/2, –z+1/2; #4) –x+1, y+1/2, –z+1/2; #5) x–1, –y+3/2, z–1/2. For **3**: #1) x, y+1, z+1; #2) –x+1, –y+1, –z+1; #3) –x+2, –y+1, –z+1; #4) x–1/2, –y+1/2, z+1/2. For **4**: #1) x–1, y+1, z; #2) –x+1, y+1/2, –z+2; #3) –x+1, y–1/2, –z+1; #4) x–1, y, z. For **5**: #1) x, y+1, z; #2) –x, –y+1, –z+2. For **6**: #1) x, y–1, z. For **7**: #1) –x+2, –y+1, –z+1; #2) x, y+1, z; #3) –x+2, –y+1, –z; #4) –x+1, –y+1, –z+1. For **8**: #1) –x+1, –y+2, –z+1; #2) x, y, z+1; #3) –x+1, –y+1, –z+1.

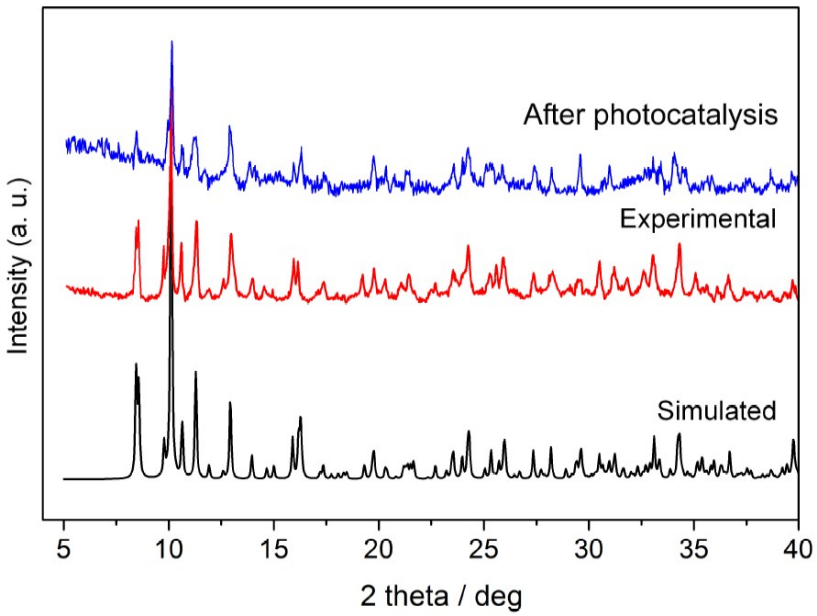


Fig. S1. Simulated and experimental powder XRD patterns of compound **1**, and experimental powder XRD pattern after photocatalysis for compound **1**.

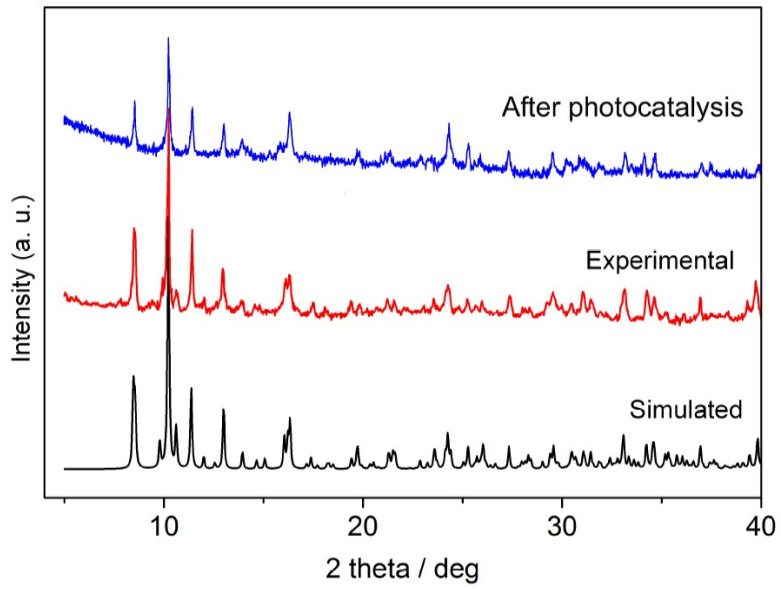


Fig. S2. Simulated and experimental powder XRD patterns of compound **2**, and experimental powder XRD pattern after photocatalysis for compound **2**.

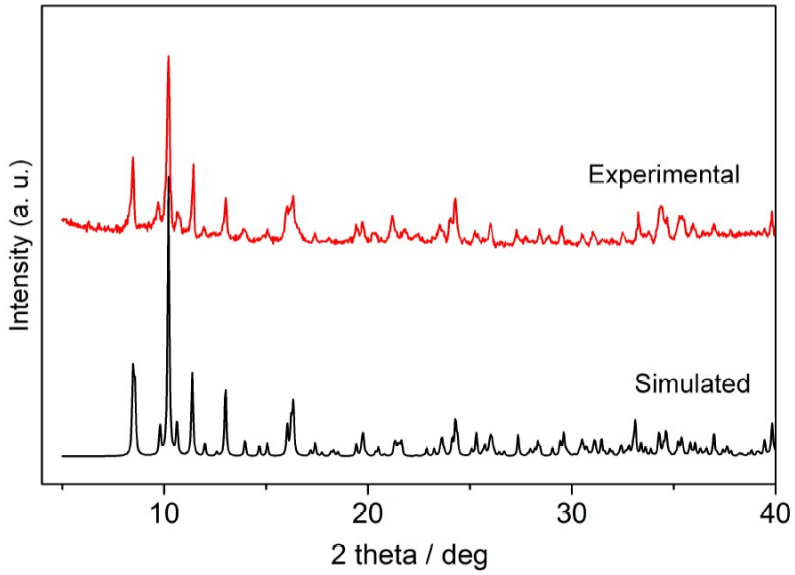


Fig. S3. Simulated and experimental powder XRD patterns of compound **3**.

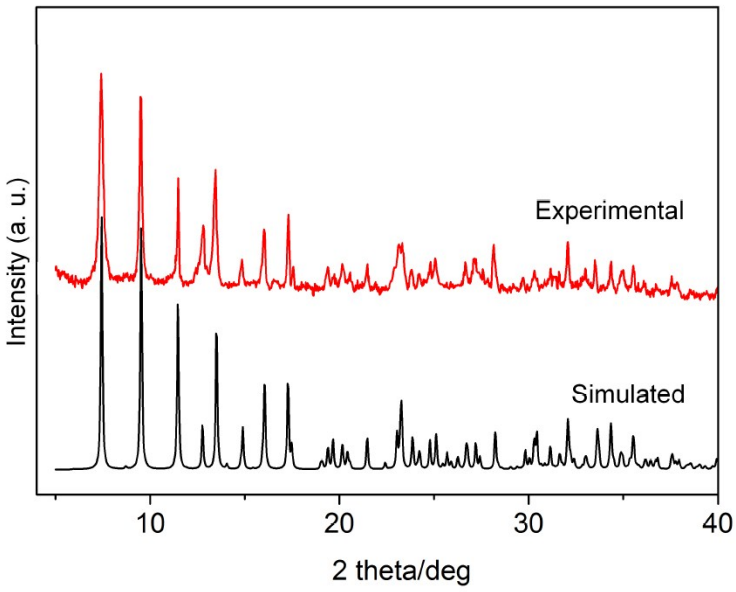


Fig. S4. Simulated and experimental powder XRD patterns of compound **4**.

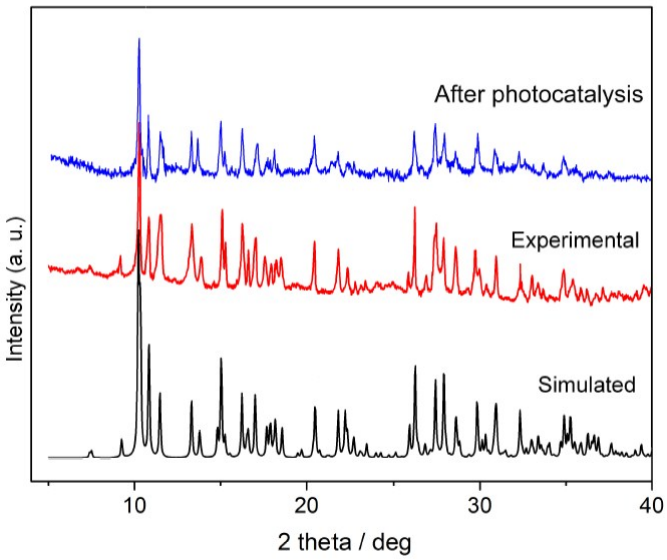


Fig. S5. Simulated and experimental powder XRD patterns of compound **5**, and experimental powder XRD pattern after photocatalysis for compound **5**.

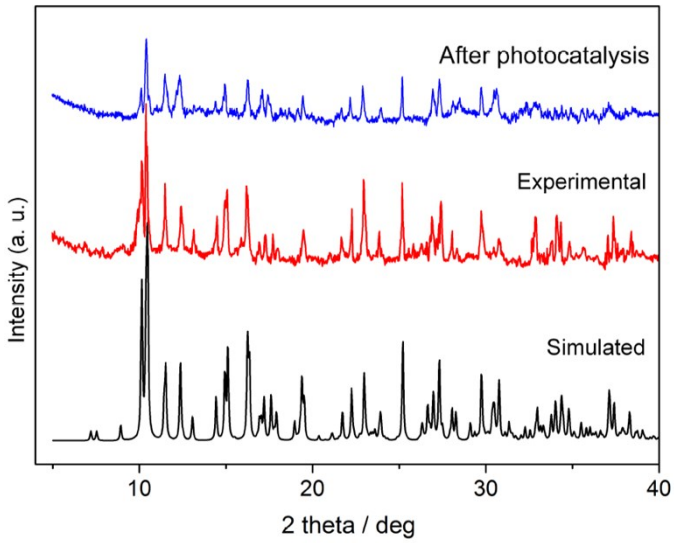


Fig. S6. Simulated and experimental powder XRD patterns of compound **6**, and experimental powder XRD pattern after photocatalysis for compound **6**.

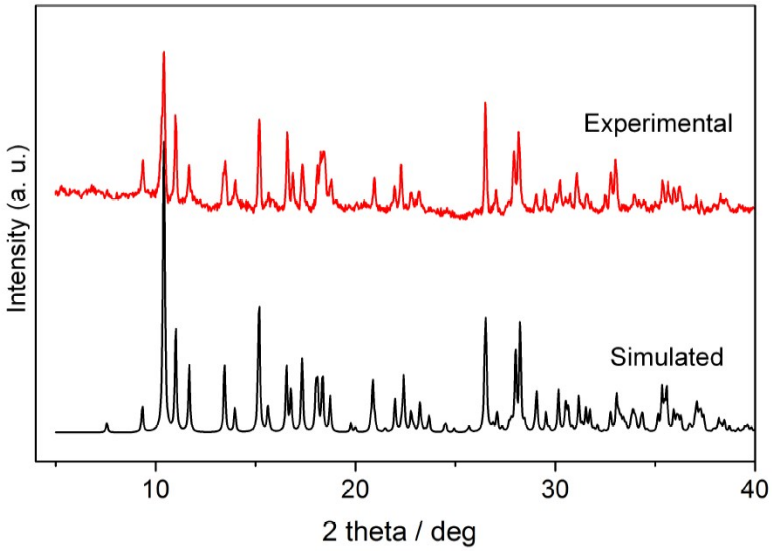


Fig. S7. Simulated and experimental powder XRD patterns of compound **8**.

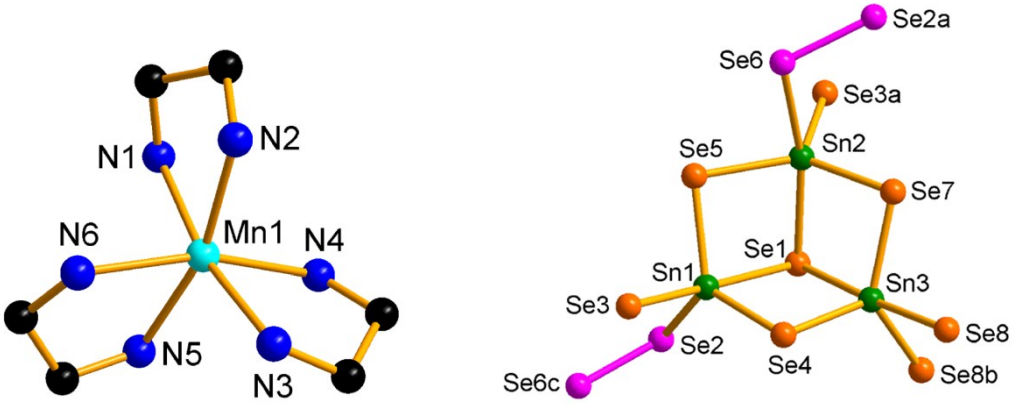


Fig. S8. Crystal structures of the $[Mn(en)_3]^{2+}$ cation and the asymmetric unit $Sn_3Se_6(Se_2)$ in **1** with the labeling scheme, showing the coordination environment of each Sn atom.

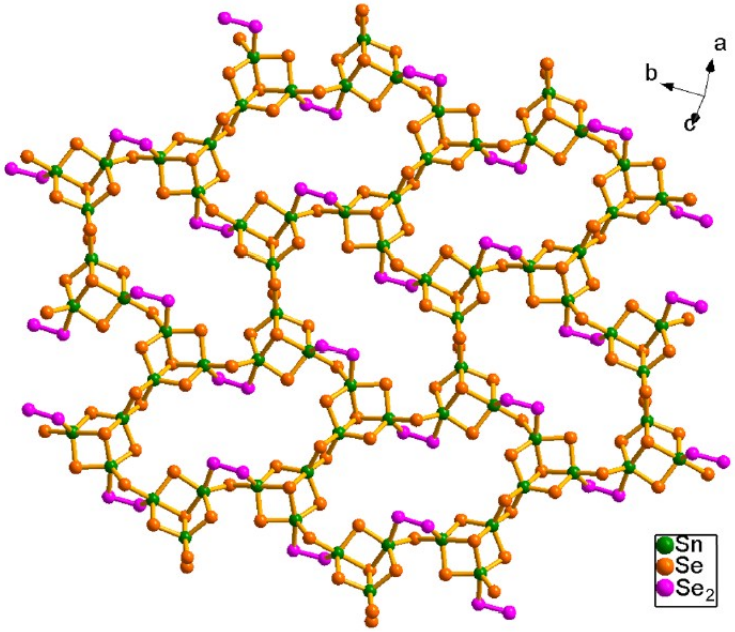


Fig. S9. A view of the two-dimensional honeycomb $[Sn_3Se_6(Se_2)]_n^{2n-}$ layer in **1**.

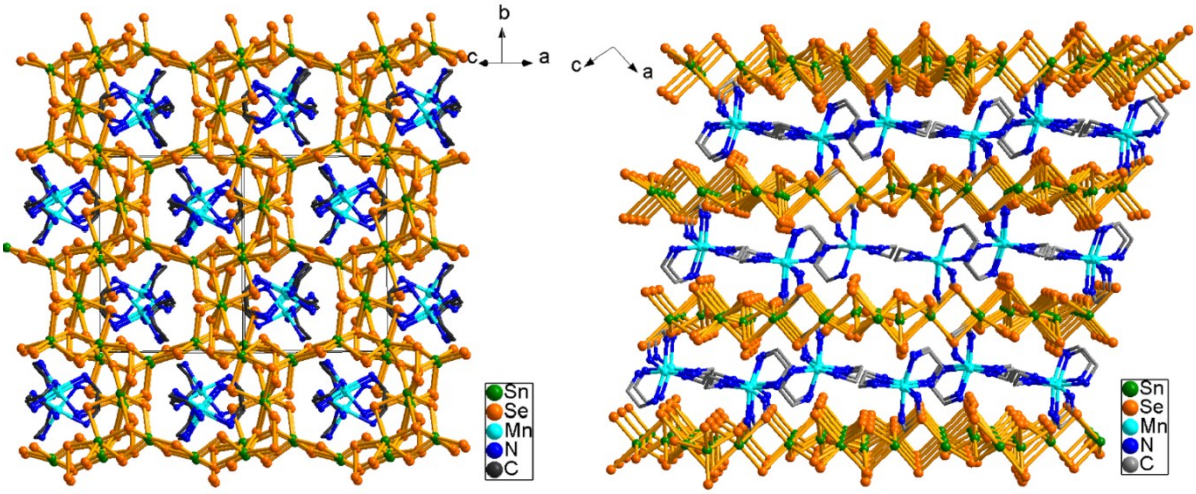


Fig. S10. Right: Packing diagram of **1** viewed perpendicular to the (111) plane, showing the $[Mn(en)_3]^{2+}$ cations stack in arrays in the nanochannels. Left: Packing diagram of **1** viewed along the *b* axis, showing the $[Mn(en)_3]^{2+}$ cations between the $[Sn_3Se_6(Se_2)]_n^{2n-}$ layers. Hydrogen atoms are omitted for clarity. Cyan octahedron: MnN_6.

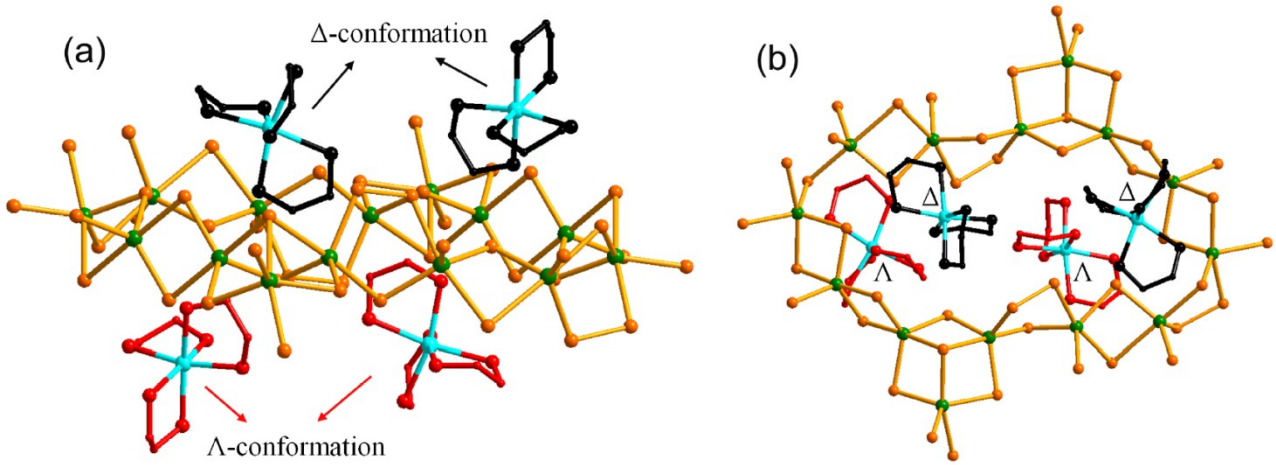


Fig. S11. Position of the $[Mn(en)_3]^{2+}$ ions viewed along the $[Sn_2Se_6(Se_2)^{2-}]_n$ layer (a) and viewed in the direction perpendicular to the $[Sn_2Se_6(Se_2)^{2-}]_n$ layer (b) in **1**. The $[Mn(en)_3]^{2+}$ ions in Δ-conformation are located up the $[Sn_2Se_6(Se_2)^{2-}]_n$ layer, while the $[Mn(en)_3]^{2+}$ ions in Λ-conformation are located down the $[Sn_2Se_6(Se_2)^{2-}]_n$ layer.

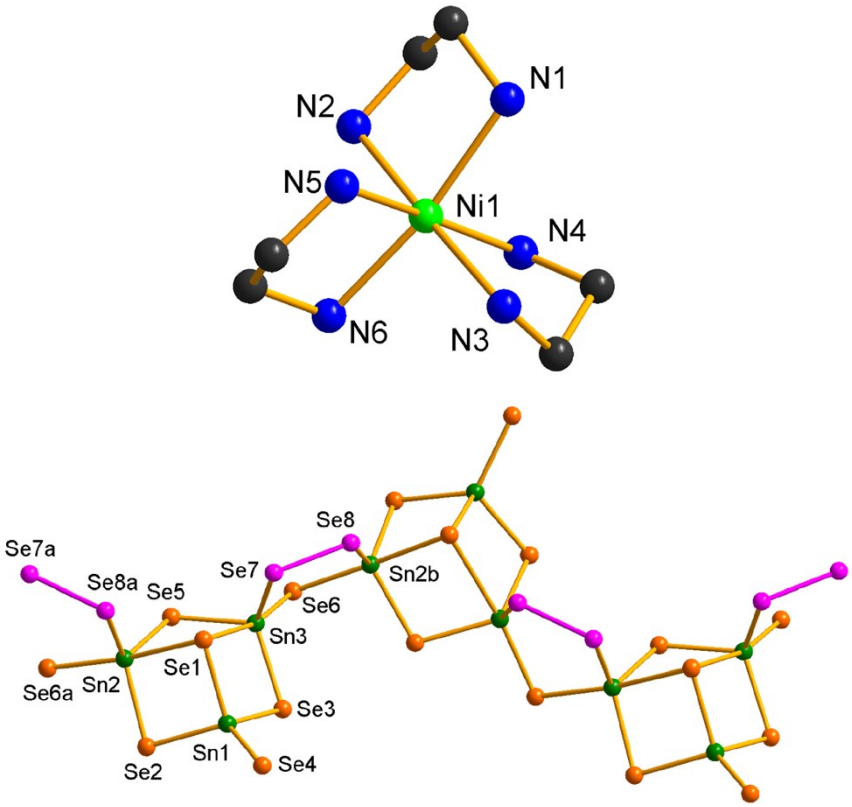


Fig. S12. Crystal structure of the $[Ni(en)_3]^{2+}$ cation (top), and asymmetric $Sn_3Se_{7.5}$ unit of **4** with the labeling scheme, showing the coordination environment of each Sn atom (bottom).

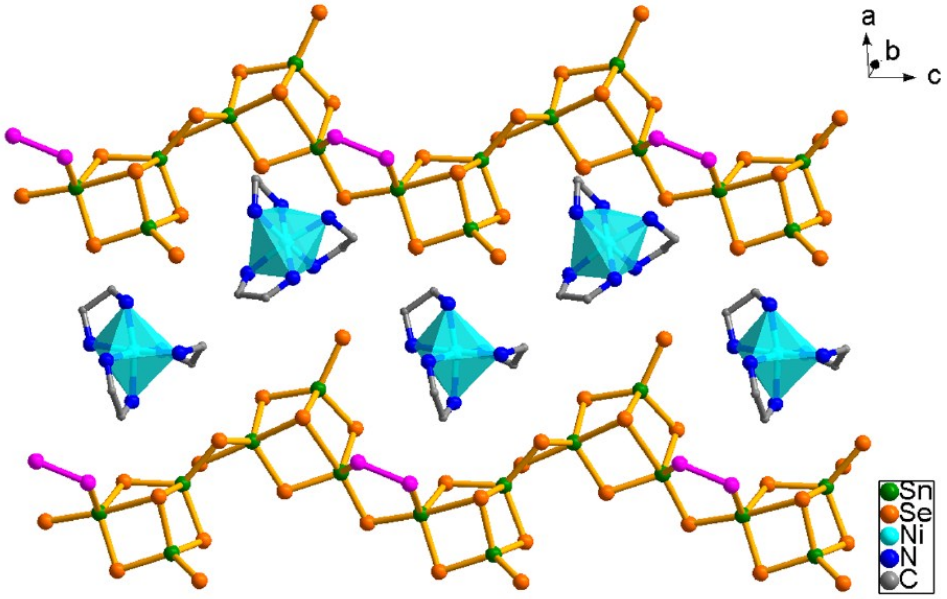


Fig. S13. Sectional packing of **3**, showing the $[Ni(en)_3]^{2+}$ cations stacking in arrays between the zigzag $[Sn_3Se_{7.5}]_n^{2n-}$ chains. Hydrogen atoms are omitted for clarity. NiN_6 is shown in cyan octahedron and Se_2 group is shown in purple.

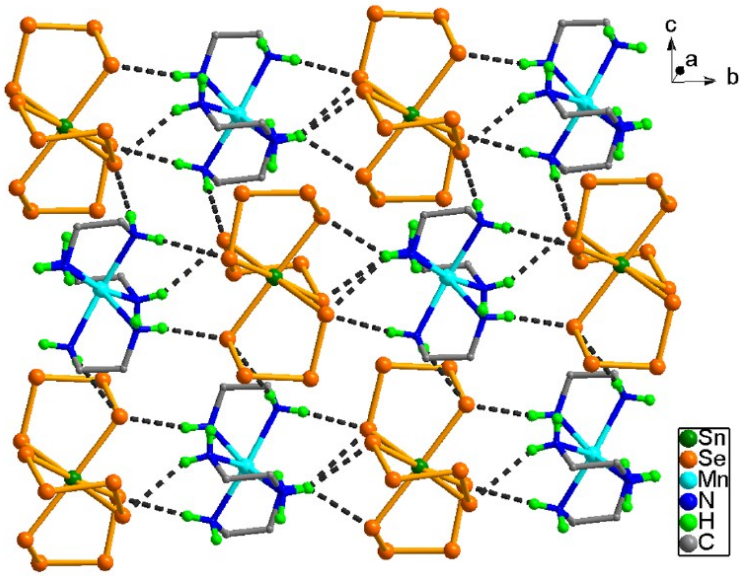


Fig. S14. A view of the layer formed by the $[Mn(en)_3]^{2+}$ and $[Sn(Se_4)_3]^{2-}$ moieties via N–H···Se hydrogen bonds.

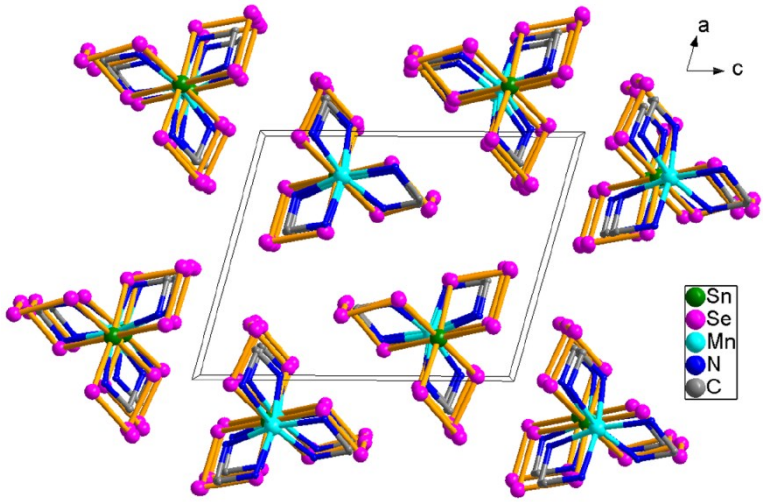


Fig. S15. Packing diagram of **5** viewed along the *b* axis; showing that $[Mn(en)_3]^{2+}$ and $[Sn(Se_4)_3]^{2-}$ are in the same conformation in one $\{[Mn(en)_3]^{2+}/[Sn(Se_4)_3]^{2-}\}_n$ array.

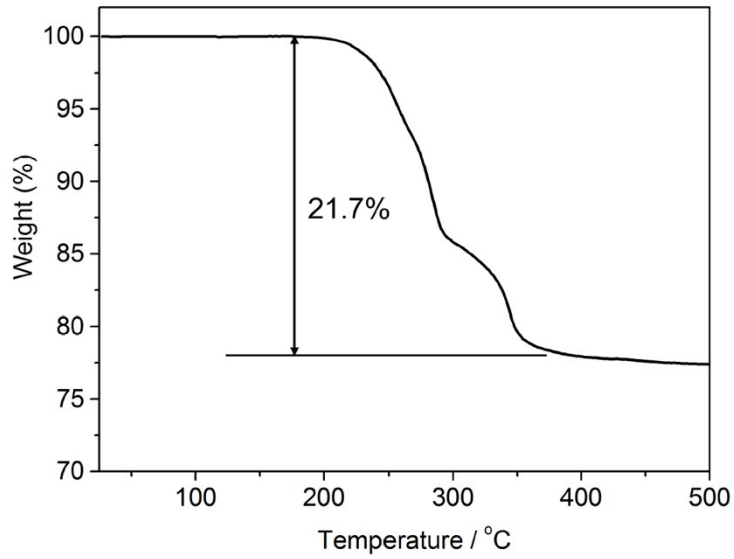


Fig. S16. TG curve for compound **1**.

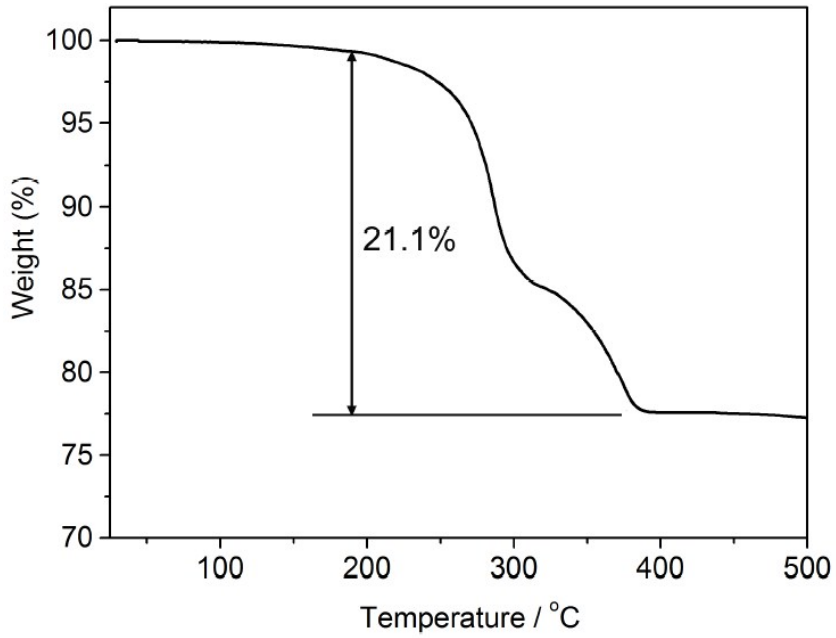


Fig. S17. TG curve for compound **2**.

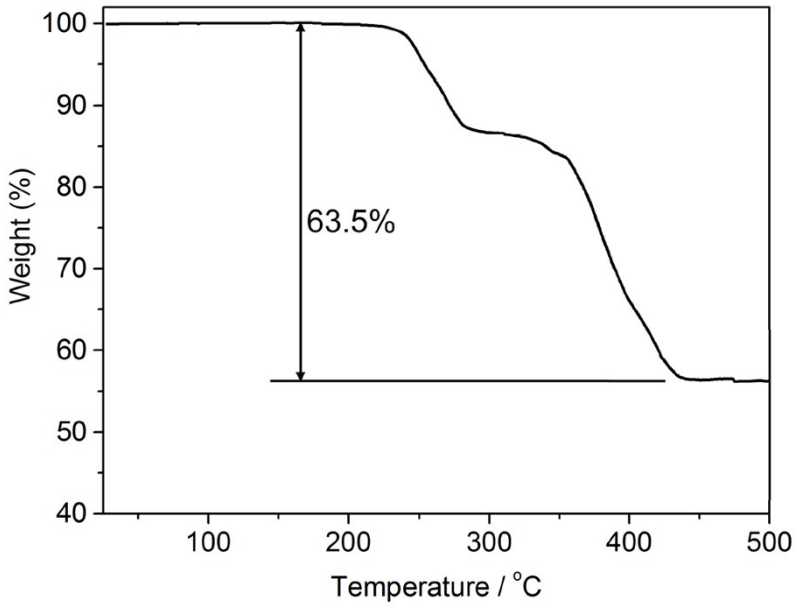


Fig. S18. TG curve for compound **5**.

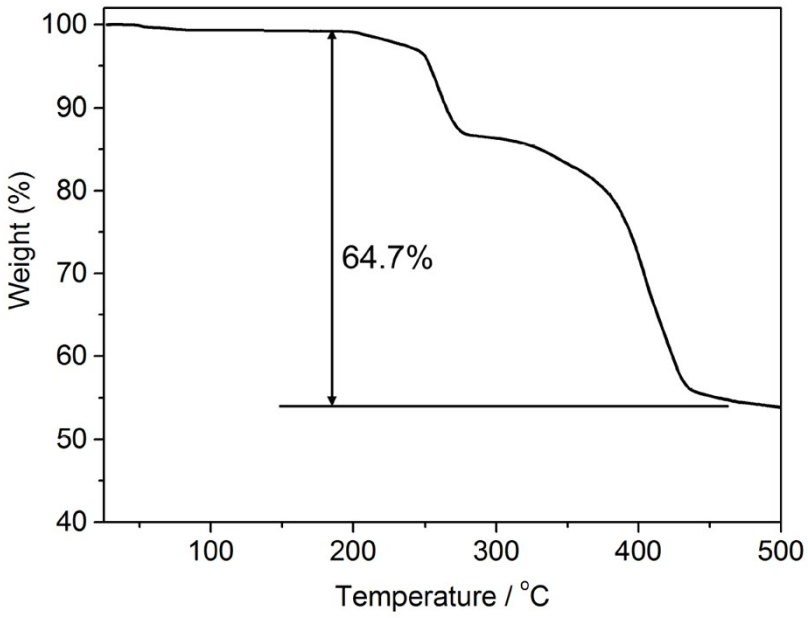


Fig. S19. TG curve for compound **6**.

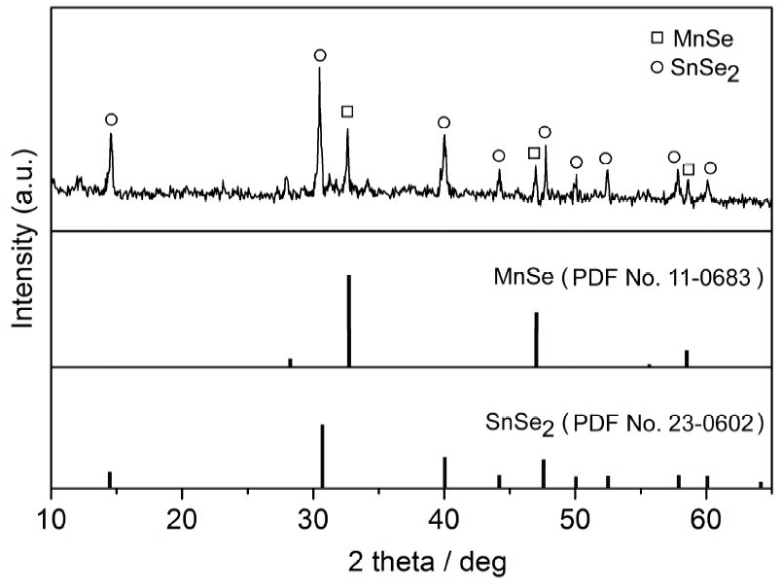


Fig. S20. The XRD patterns of the residue for the compound **1**. Literature stick patterns for $SnSe_2$ (PDF No. 23-0602) and MnSe (PDF No. 11-0683) are showed.

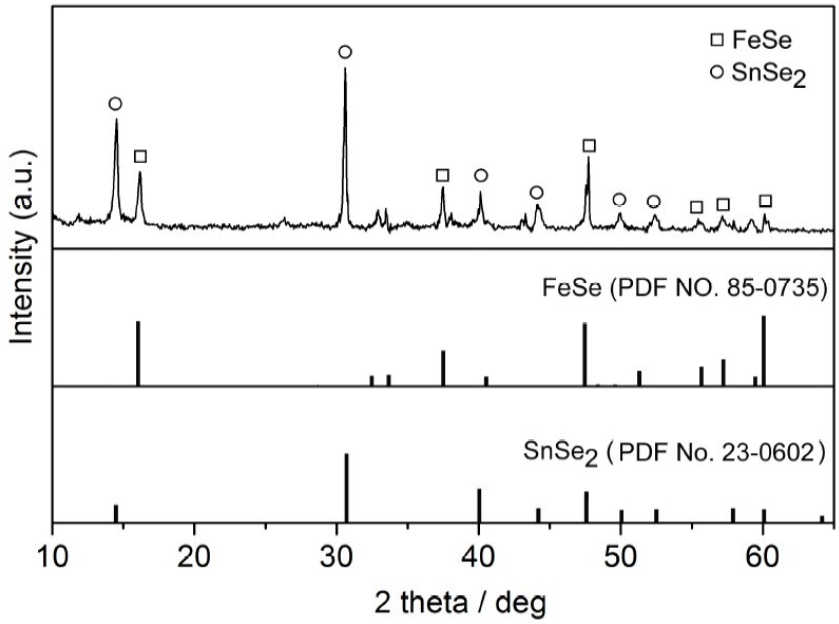


Fig. S21. The XRD patterns of the residue for the compound **2**. Literature stick patterns for $SnSe_2$ (PDF No. 23-0602) and FeSe (PDF No. 85-0735) are showed.

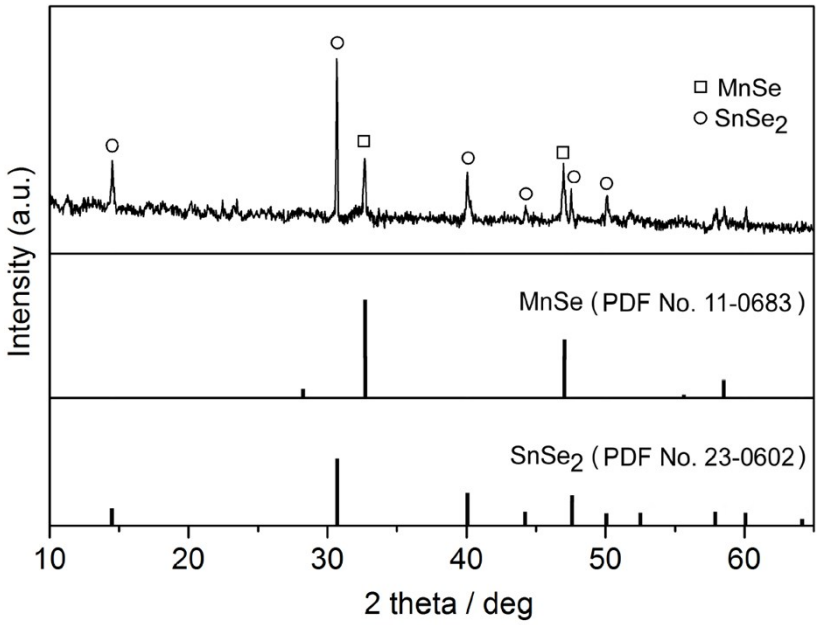


Fig. S22. The XRD patterns of the residue for the compound **5**. Literature stick patterns for $SnSe_2$ (PDF No. 23-0602), and MnSe (PDF NO. 11-0683) are showed.

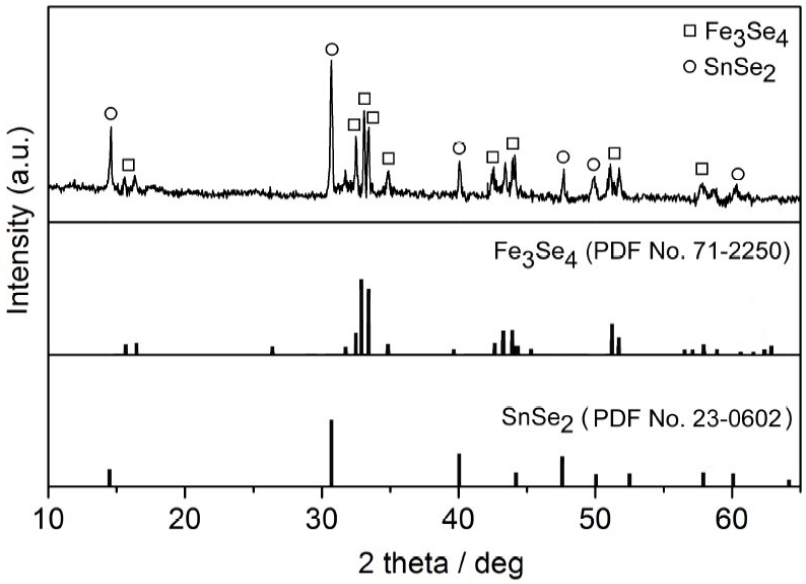


Fig. S23. The XRD patterns of the residue for the compound **6**. Literature stick patterns for $SnSe_2$ (PDF No. 23-0602) and Fe_3Se_4 (PDF No. 71-2250) are showed.

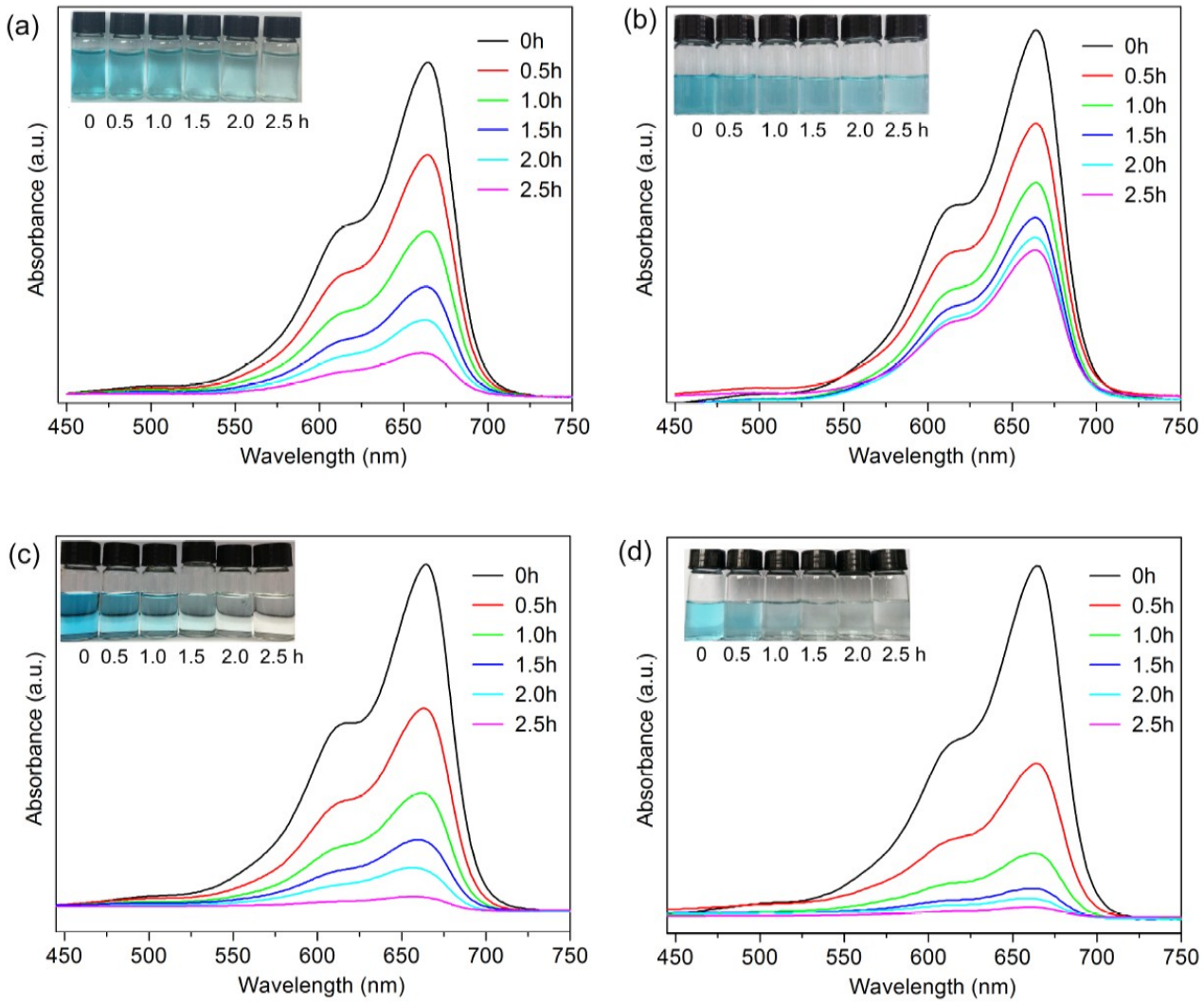
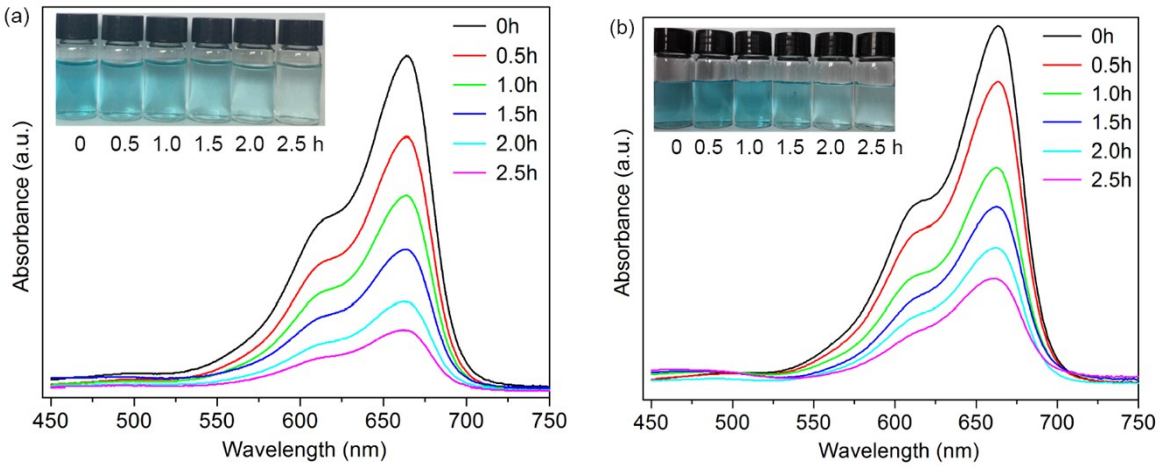


Fig. S24. Time dependent absorption spectra of MB solution with photodegradation catalyzed by **1** (a), **5** (b), **SM1** (c), and **SM5** (d).



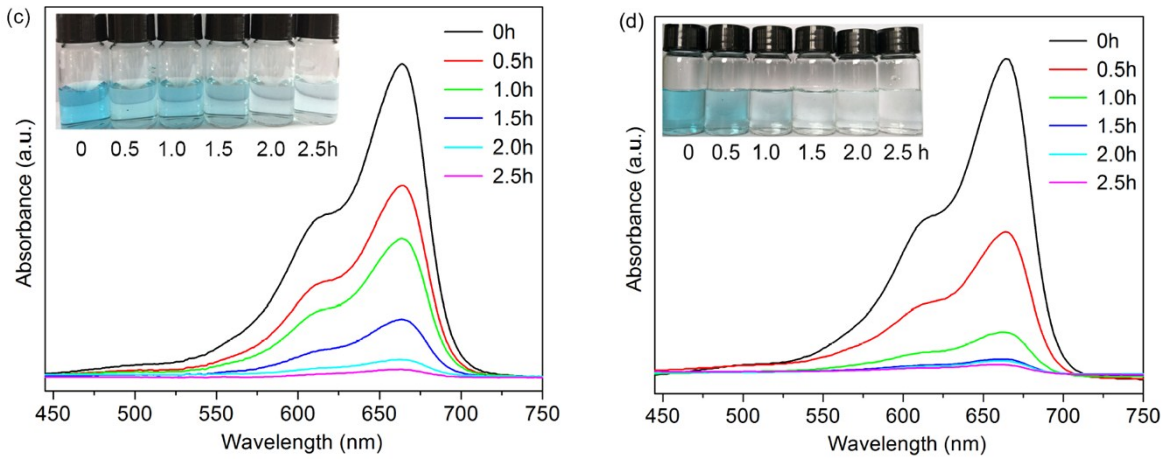


Fig. S25. Time dependent absorption spectra of MB solution with photodegradation catalyzed by **2** (a), **6** (b), **SF2** (c), and **SF6** (d).

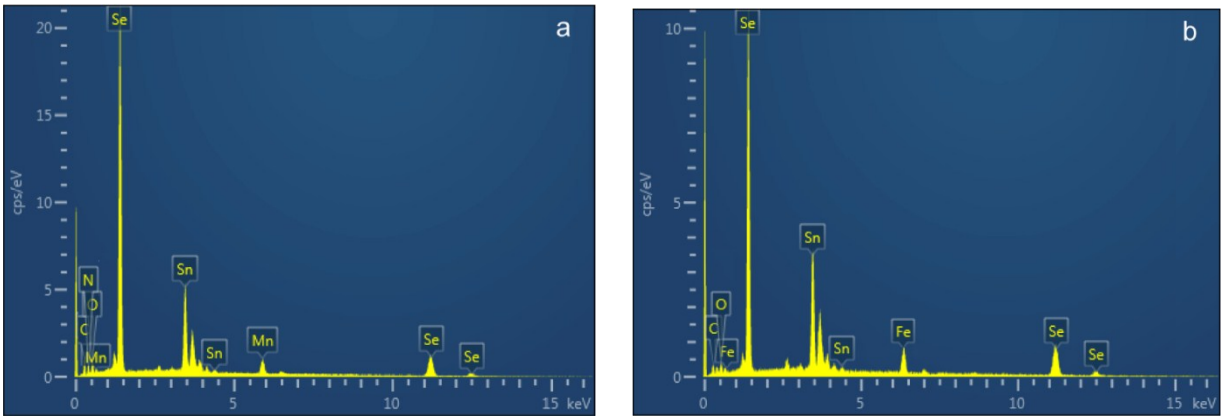


Fig. 26. The energy dispersive X-ray (EDX) spectra of the thermal decomposition residues **SM1** of compound **1** (a), and **SF2** of compound **2** (b).

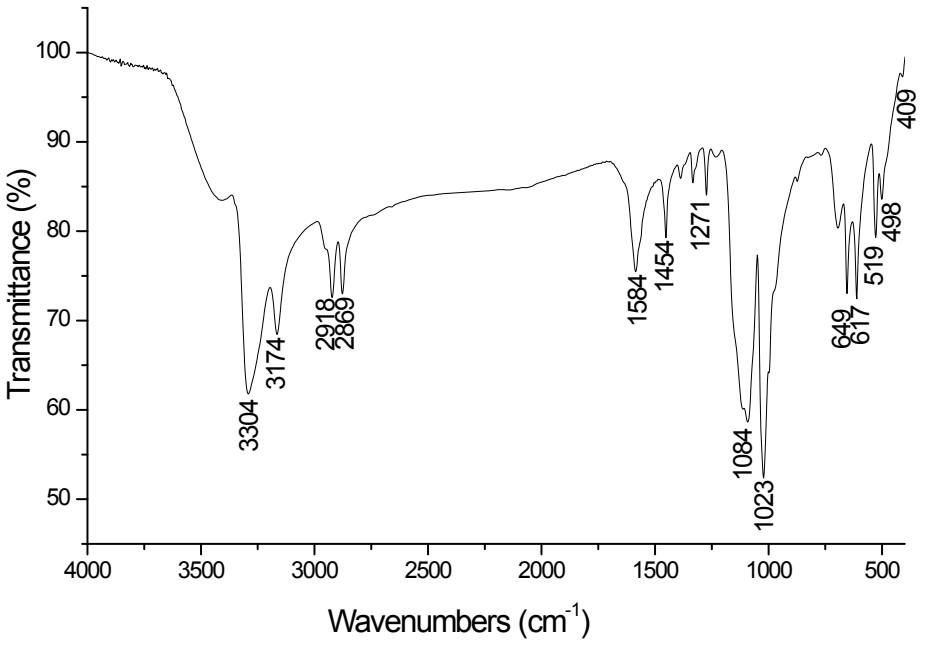


Fig. S27. IR spectrum of compound **1**.

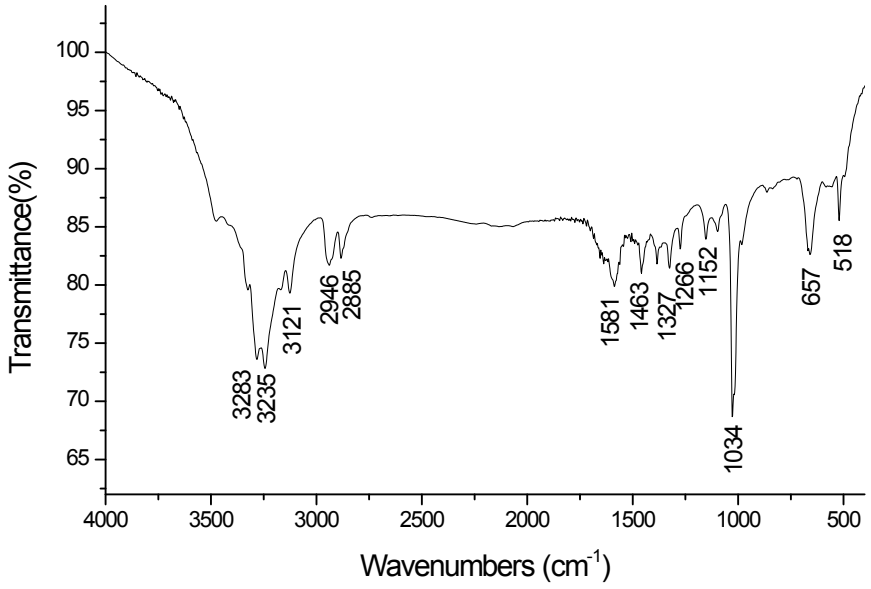


Fig. S28. IR spectrum of compound **2**.

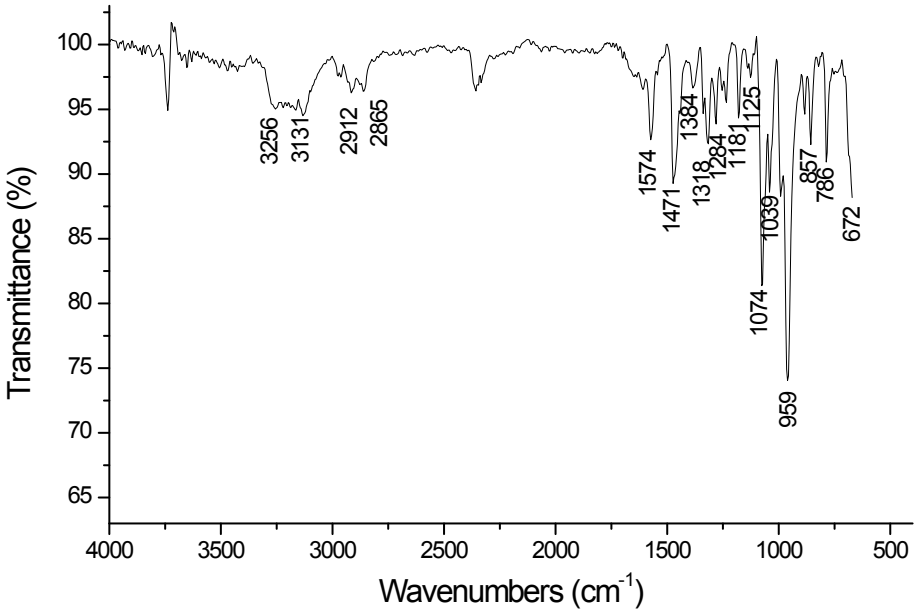


Fig. S29. IR spectrum of compound **3**.

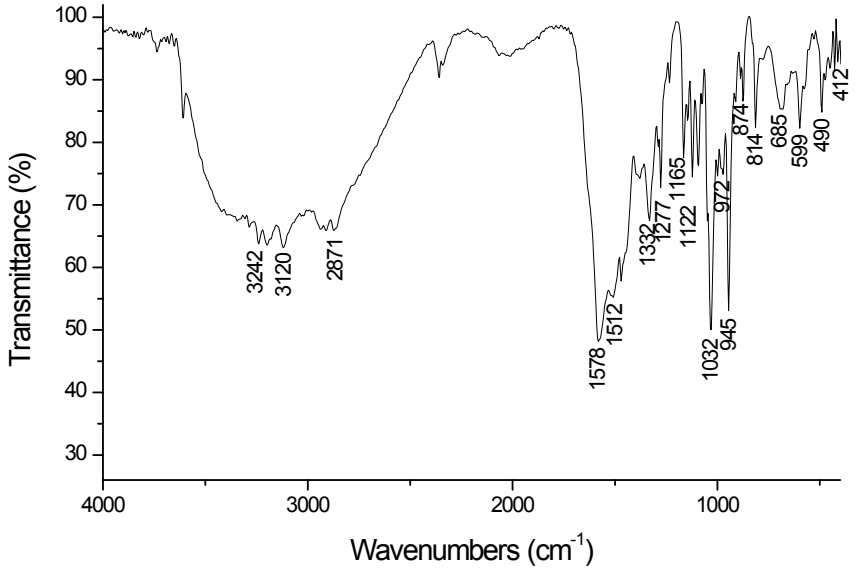


Fig. S30. IR spectrum of compound **4**.

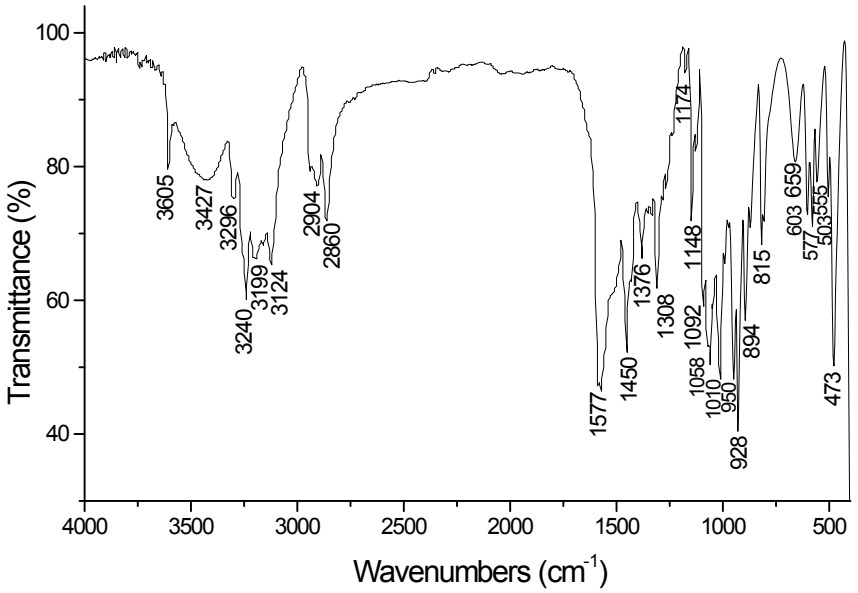


Fig. S31. IR spectrum of compound **5**.

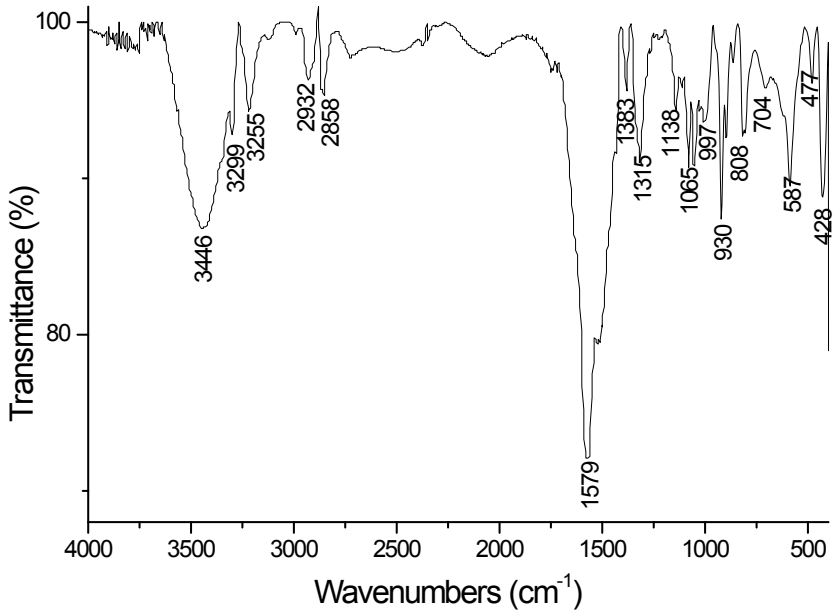


Fig. S32. IR spectrum of compound **6**.

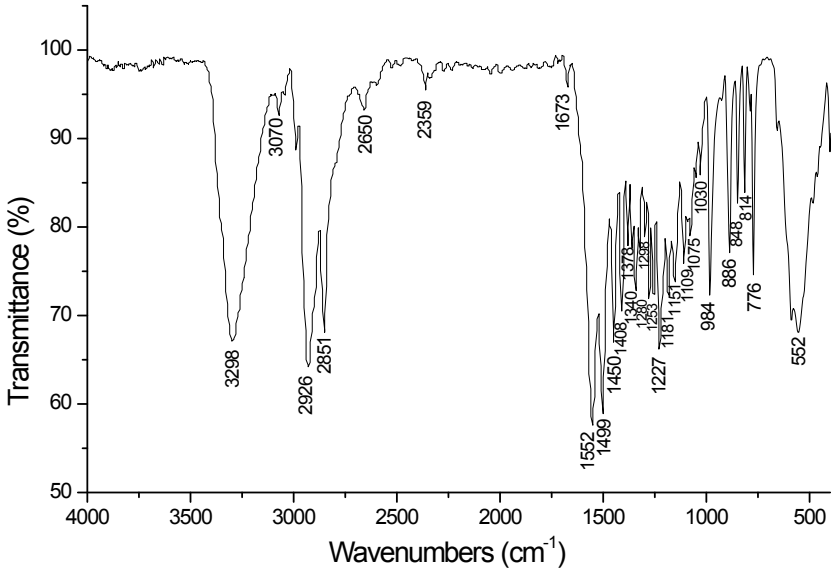


Fig. S33. IR spectrum of compound **7**.

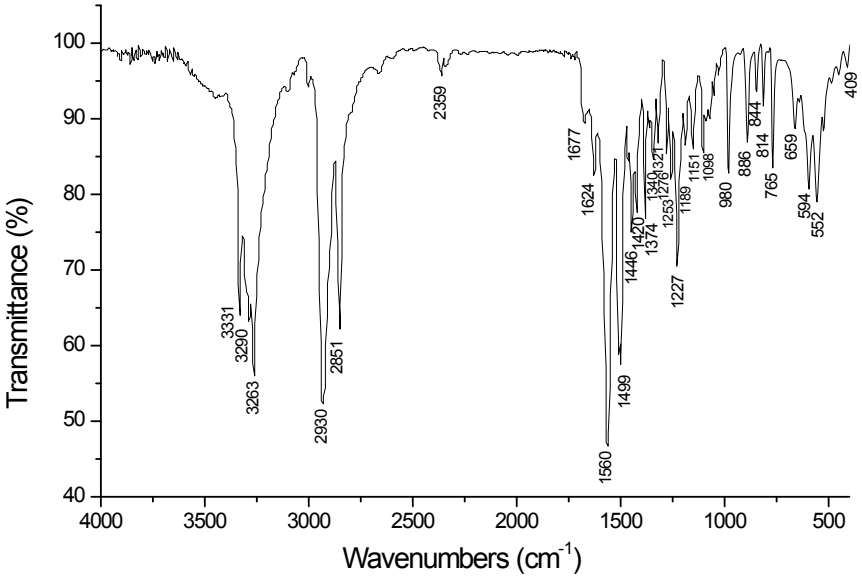


Fig. S34. IR spectrum of compound **8**.