

# Supplementary Information

Figure S1. TG/DTA data of 1.

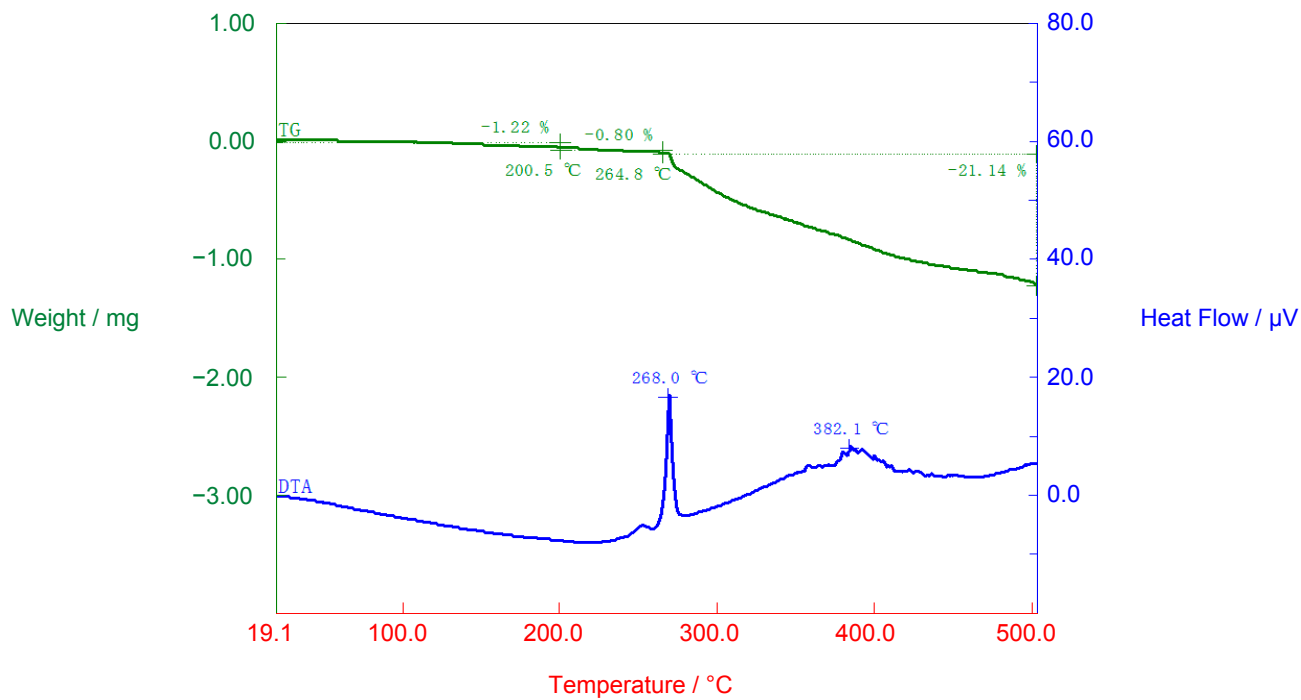


Figure S2. TG/DTA data of 2.

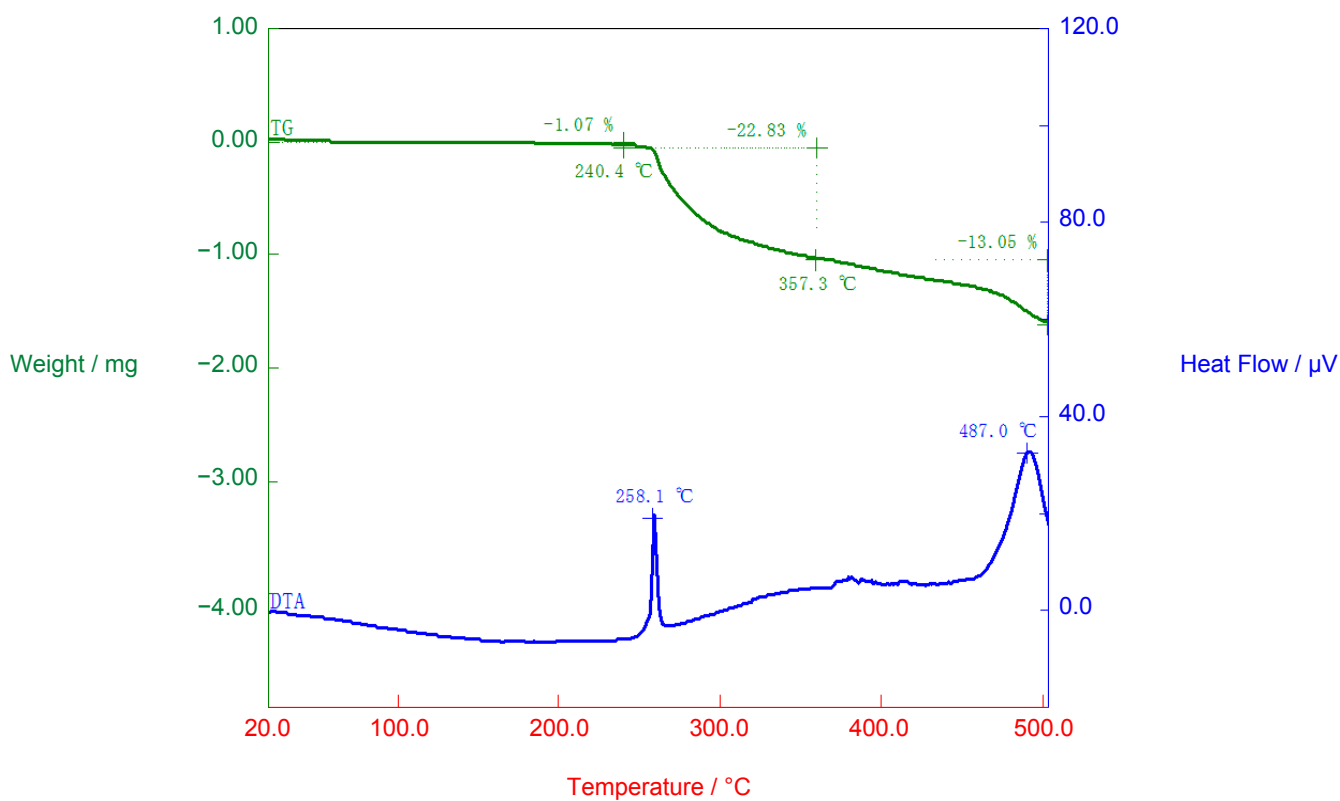


Figure S3. TG/DTA data of 3.

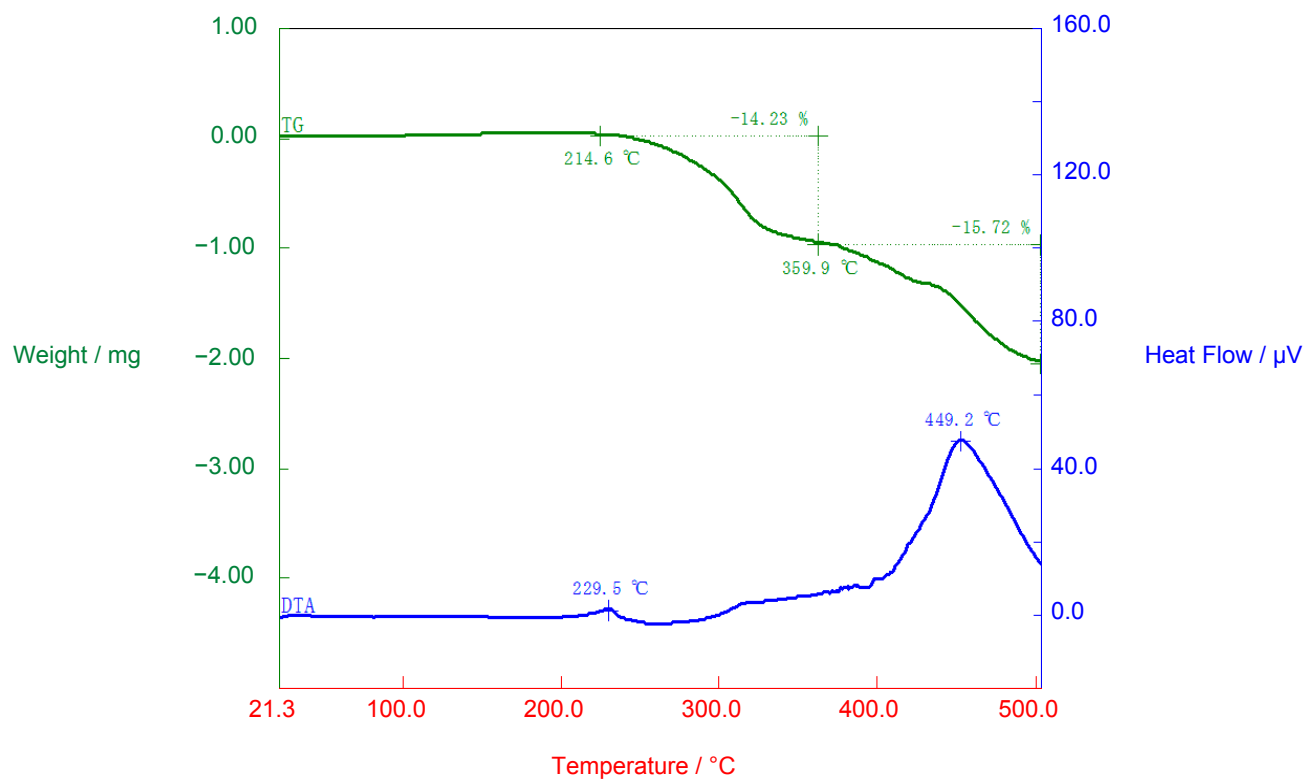
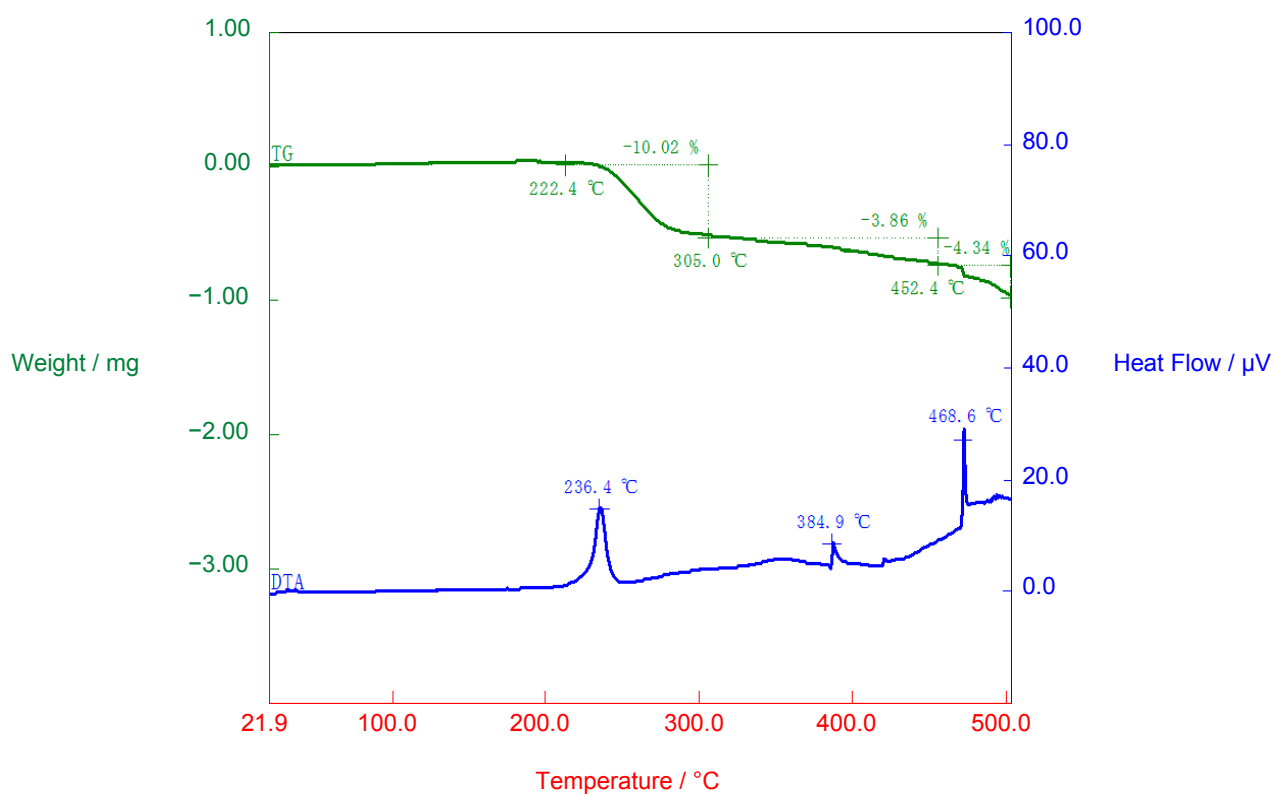
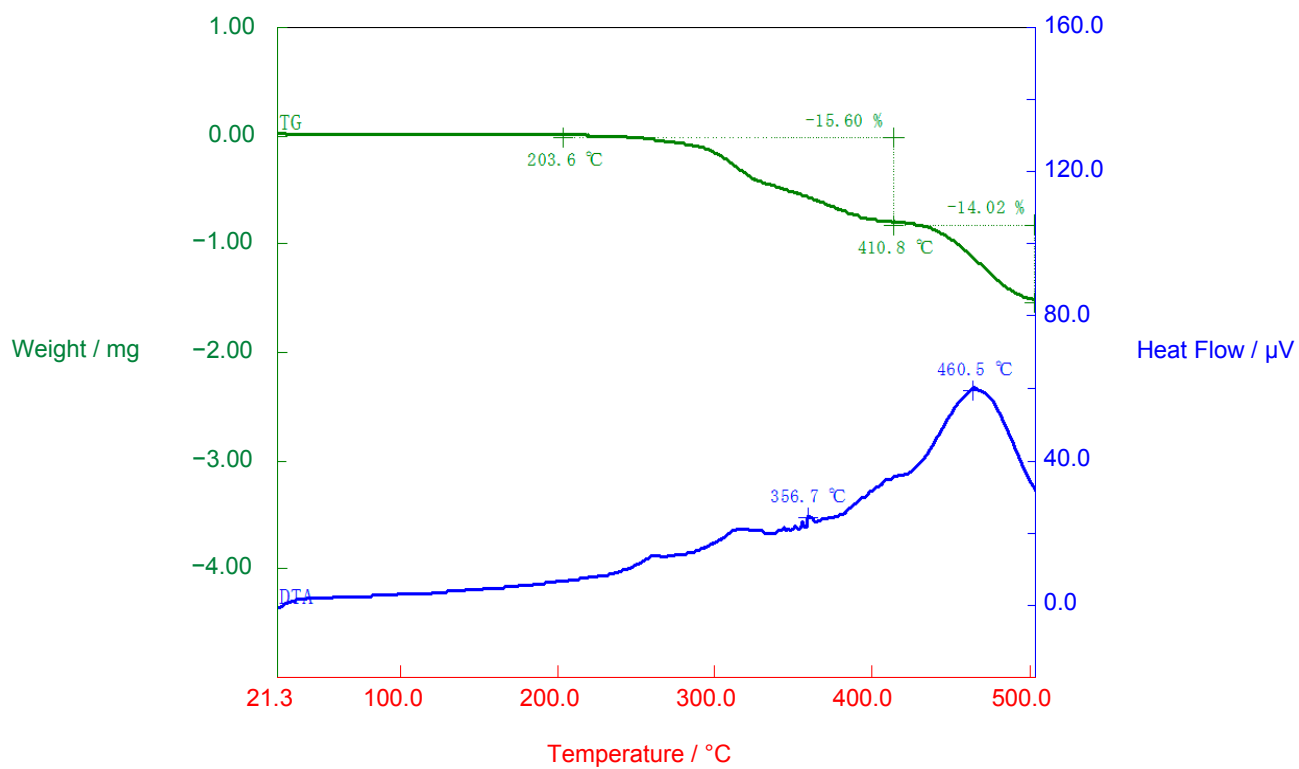
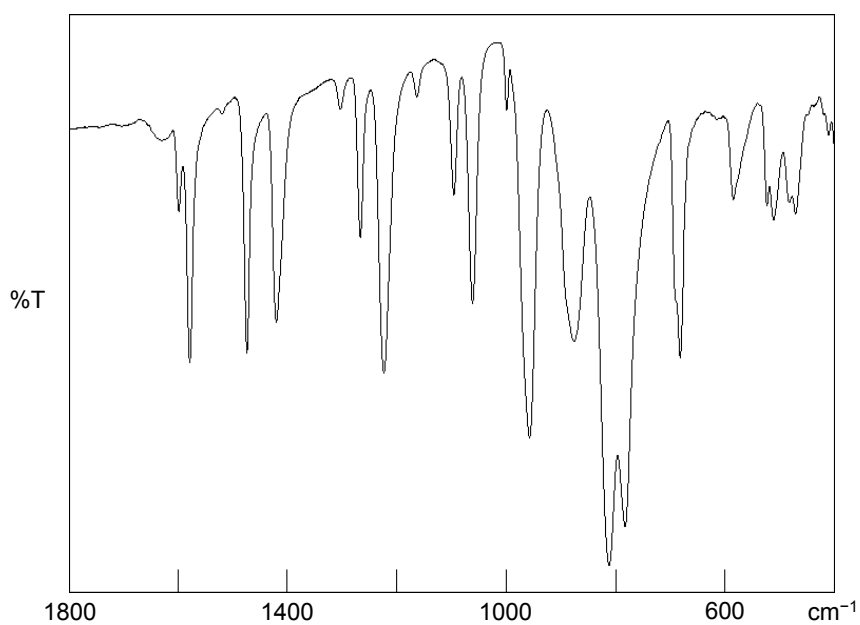
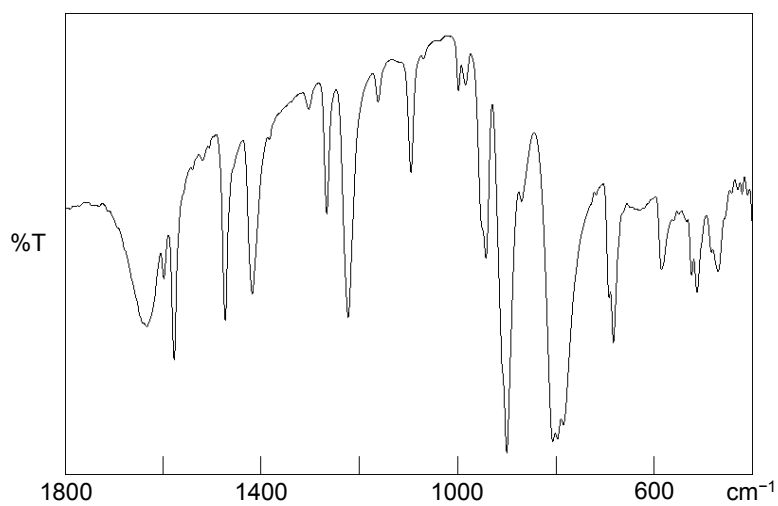
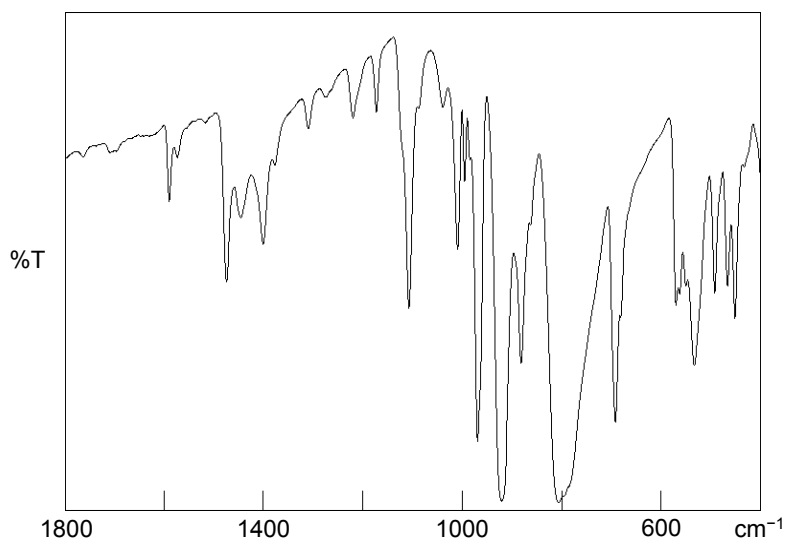
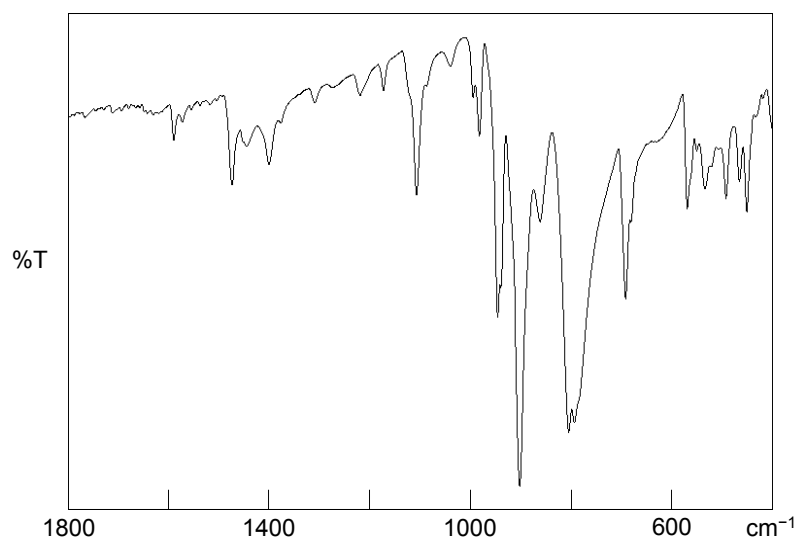
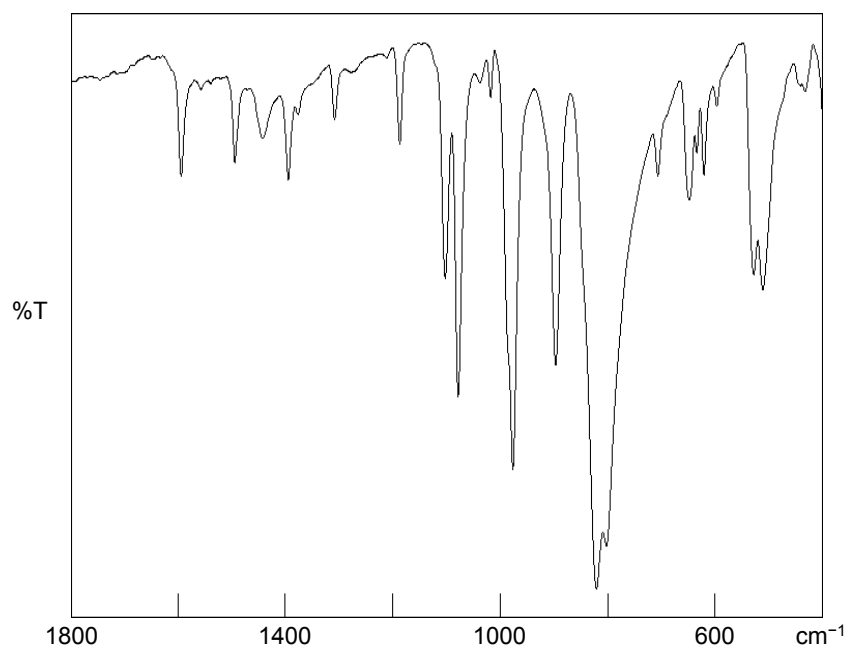
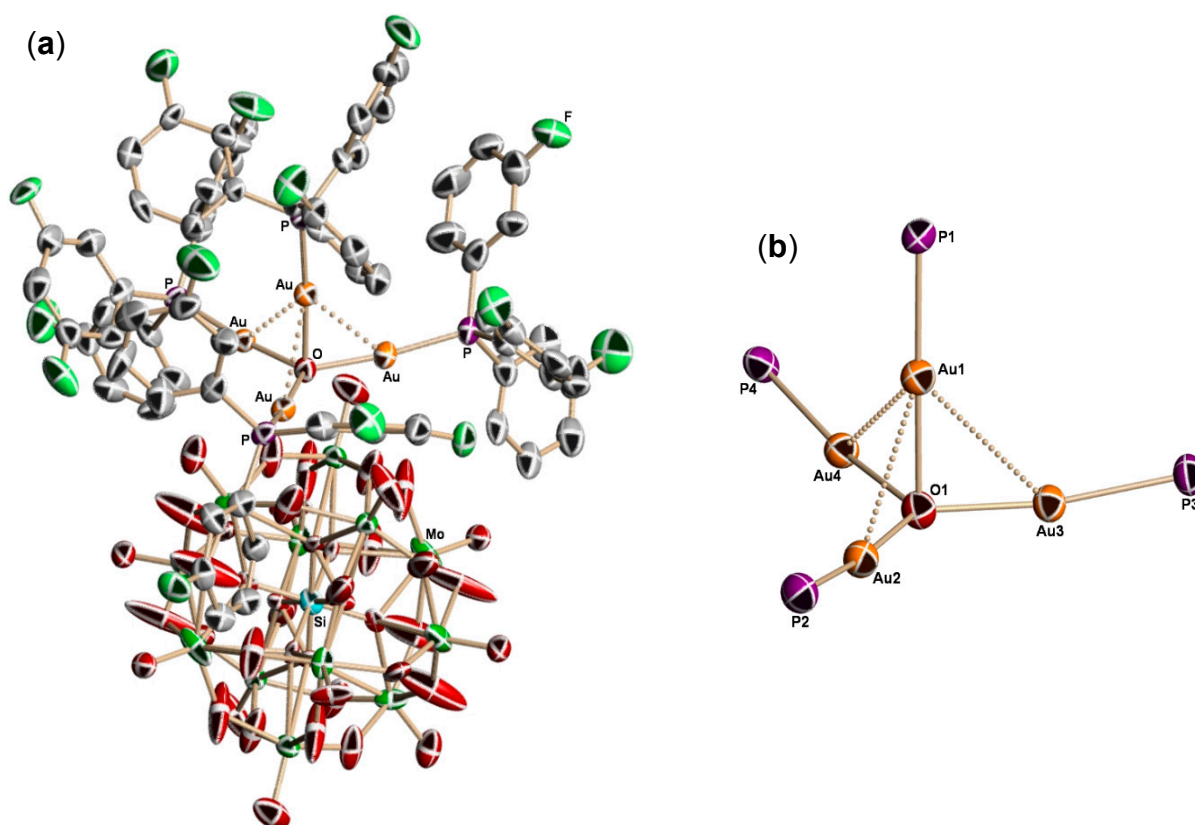


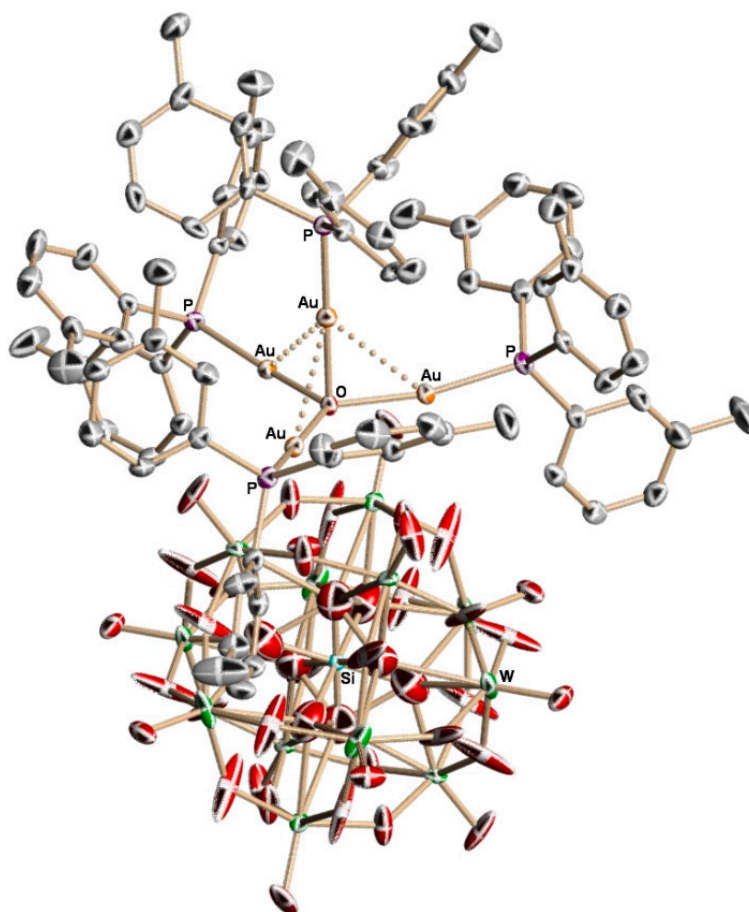
Figure S4. TG/DTA data of 4.



**Figure S5.** TG/DTA data of **5**.**Figure S6.** FT-IR spectrum of **1**.

**Figure S7.** FT-IR spectrum of **2**.**Figure S8.** FT-IR spectrum of **3**.**Figure S9.** FT-IR spectrum of **4**.

**Figure S10.** FT-IR spectrum of **5**.**Figure S11.** (a) Molecular structure of **2**. (b) The partial structure of the tetragold(I) cluster cation in **2**.

**Figure S12.** Molecular structure of **3**.**Table S1.** Bond lengths (Å) and angles (°) for **1**.

<b>Lengths</b>			
Au1–Au2	2.9513(7)	Au6–Au8	3.3454(7)
Au1–Au3	2.8978(7)	Au7–Au8	3.0273(8)
Au1–Au4	2.8582(7)	Au9–Au10	2.9293(8)
Au5–Au6	3.0032(7)	Au9–Au11	2.8719(8)
Au5–Au7	3.2921(7)	Au9–Au12	3.0815(7)
Au1–O1	2.138(8)	Au7–O4	2.081(9)
Au2–O1	2.071(8)	Au8–O4	2.100(9)
Au3–O1	2.095(8)	Au9–O2	2.117(7)
Au4–O1	2.078(8)	Au10–O2	2.084(8)
Au5–O3	2.098(8)	Au11–O2	2.093(8)
Au6–O3	2.065(8)	Au12–O2	2.072(9)
Au1–P1	2.211(3)	Au7–P7	2.212(4)
Au2–P2	2.206(4)	Au8–P8	2.218(3)
Au3–P3	2.213(3)	Au9–P9	2.215(3)
Au4–P4	2.202(3)	Au10–P10	2.204(3)
Au5–P5	2.206(3)	Au11–P11	2.210(4)
Au6–P6	2.220(3)	Au12–P12	2.219(3)

**Table S1.** *Cont.*

Angles			
Au1–O1–Au2	89.0(3)	Au7–O4–Au8	92.8(4)
Au1–O1–Au3	86.4(3)	Au9–O2–Au10	88.4(3)
Au1–O1–Au4	85.4(3)	Au9–O2–Au11	86.0(3)
Au2–O1–Au3	109.3(3)	Au9–O2–Au12	94.7(3)
Au2–O1–Au4	126.2(4)	Au10–O2–Au11	117.4(4)
Au3–O1–Au4	123.6(4)	Au10–O2–Au12	116.2(4)
Au5–O3–Au6	92.4(3)	Au11–O2–Au12	126.4(4)
O1–Au1–P1	176.2(2)	O4–Au7–P7	177.8(3)
O1–Au2–P2	172.1(2)	O4–Au8–P8	175.5(3)
O1–Au3–P3	172.4(2)	O2–Au9–P9	174.7(3)
O1–Au4–P4	170.7(2)	O2–Au10–P10	173.8(2)
O3–Au5–P5	172.7(2)	O2–Au11–P11	168.8(2)
O3–Au6–P6	178.2(2)	O2–Au12–P12	174.9(2)

**Table S2.** Bond lengths (Å) and angles (°) for **2**.

Lengths			
Au1–Au2	2.9899(10)	Au1–Au4	2.8930(10)
Au1–Au3	2.9414(10)		
Au1–O1	2.137(11)	Au3–O1	2.097(10)
Au2–O1	2.047(11)	Au4–O1	2.121(10)
Au1–P1	2.223(4)	Au3–P3	2.213(4)
Au2–P2	2.218(4)	Au4–P4	2.210(4)
Angles			
Au1–O1–Au2	91.2(4)	Au2–O1–Au3	123.5(5)
Au1–O1–Au3	88.0(4)	Au2–O1–Au4	116.1(5)
Au1–O1–Au4	85.6(4)	Au3–O1–Au4	120.2(5)
O1–Au1–P1	176.2(3)	O1–Au3–P3	172.7(3)
O1–Au2–P2	171.3(3)	O1–Au4–P4	168.4(3)

**Table S3.** Bond lengths (Å) and angles (°) for **3**.

Lengths			
Au1–Au2	2.9524(7)		
Au1–O1	2.124(13)	Au2–O1	2.0939(6)
Au1–P1	2.217(5)	Au2–P2	2.216(3)
Angles			
Au1–O1–Au2	88.8(4)	Au2–O1–Au2'	119.96(3)
O1–Au1–P1	180.0	O1–Au2–P2	169.3(3)

**Table S4.** Bond lengths (Å) and angles (°) for **4**.

<b>Lengths</b>			
Au1–Au2	2.9499(3)		
Au1–O1	2.106(6)	Au2–O1	2.0905(2)
Au1–P1	2.213(2)	Au2–P2	2.2132(14)
<b>Angles</b>			
Au1–O1–Au2	89.31(17)	Au2–O1–Au2'	119.985(8)
O1–Au1–P1	180.0	O1–Au2–P2	168.44(15)

**Table S5.** Bond lengths (Å) and angles (°) for **5**.

<b>Lengths</b>			
Au1–Au2	3.308(2)	Au4–Au5	3.034(2)
Au1–Au3	3.112(2)	Au5–Au7	3.199(2)
Au1–Au4	3.064(2)	Au6–Au7	3.078(2)
Au3–Au4	3.111(2)		
Au1–O1	2.04(2)	Au5–O2	2.00(2)
Au2–O1	1.99(2)	Au6–O2	2.01(2)
Au3–O1	2.16(3)	Au7–O2	2.06(2)
Au4–O1	2.15(2)		
Au1–P1	2.221(11)	Au5–P5	2.171(13)
Au2–P2	2.233(11)	Au6–P6	2.221(10)
Au3–P3	2.190(13)	Au7–P7	2.211(9)
Au4–P4	2.211(9)		
<b>Angles</b>			
Au1–O1–Au2	110.1(11)	Au3–O1–Au4	92.4(9)
Au1–O1–Au3	95.4(10)	Au5–O2–Au6	127.9(12)
Au1–O1–Au4	93.9(10)	Au5–O2–Au7	104.0(11)
Au2–O1–Au3	126.9(12)	Au6–O2–Au7	98.2(10)
Au2–O1–Au4	129.4(13)		
O1–Au1–P1	173.6(7)	O2–Au5–P5	178.0(7)
O1–Au2–P2	171.5(8)	O2–Au6–P6	175.7(7)
O1–Au3–P3	174.3(7)	O2–Au7–P7	172.0(7)
O1–Au4–P4	163.2(7)		