Electronic Supplementary Information

Europium complexes: choice of efficient synthetic routes from RM1 thermodynamic quantities as figures of merit

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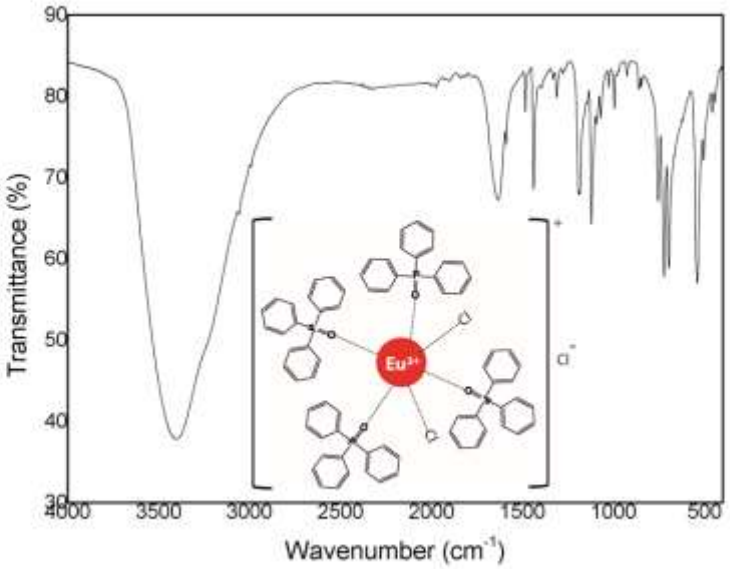
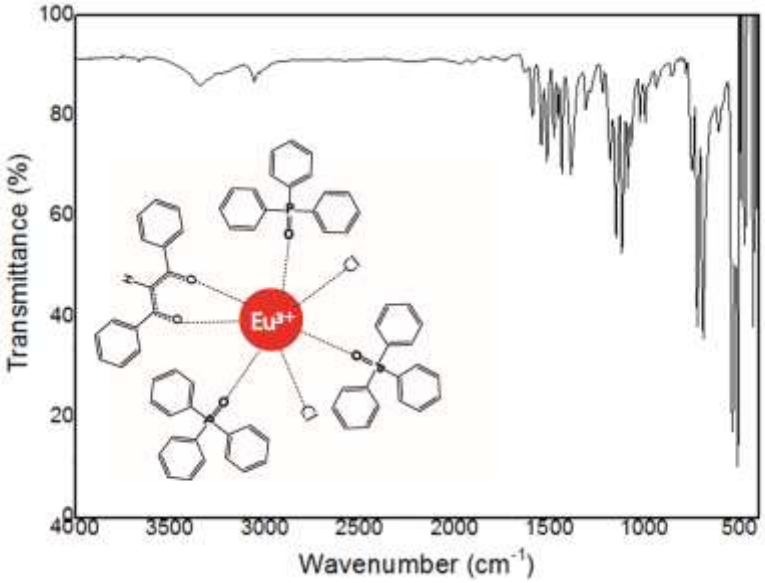


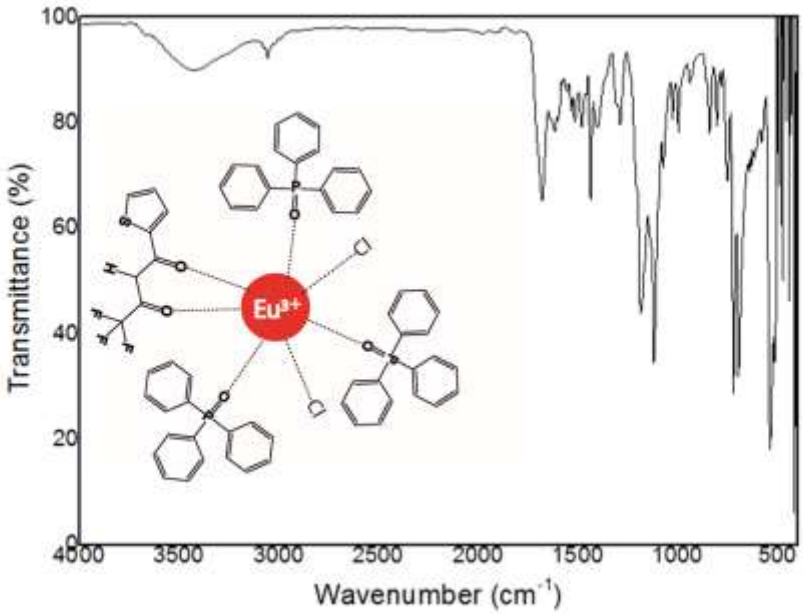
$[EuCl_3(TPPO)_4].3H_2O$ (KBr disk): υO-H 3461 cm^{-1}, υ=C–H 3090 cm^{-1} - 3015 cm^{-1}, and υP=O 1087 cm^{-1}.

Figure S1. Infrared spectrum of $[EuCl_2(TPPO)_4]Cl.3H_2O$.



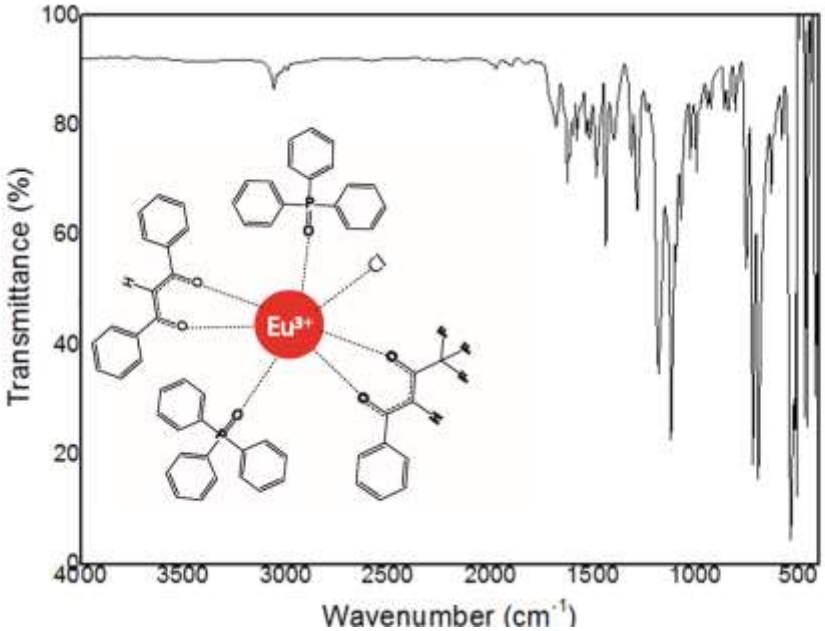
$[EuCl_2(DBM)(TPPO)_3]$ (KBr disk): υ=C–H 3062 cm^{-1}, υC=O 1594 cm^{-1}, υP=O 1148-1128 cm^{-1}.

Figure S2. Infrared spectrum of $[EuCl_2(DBM)(TPPO)_3]$.



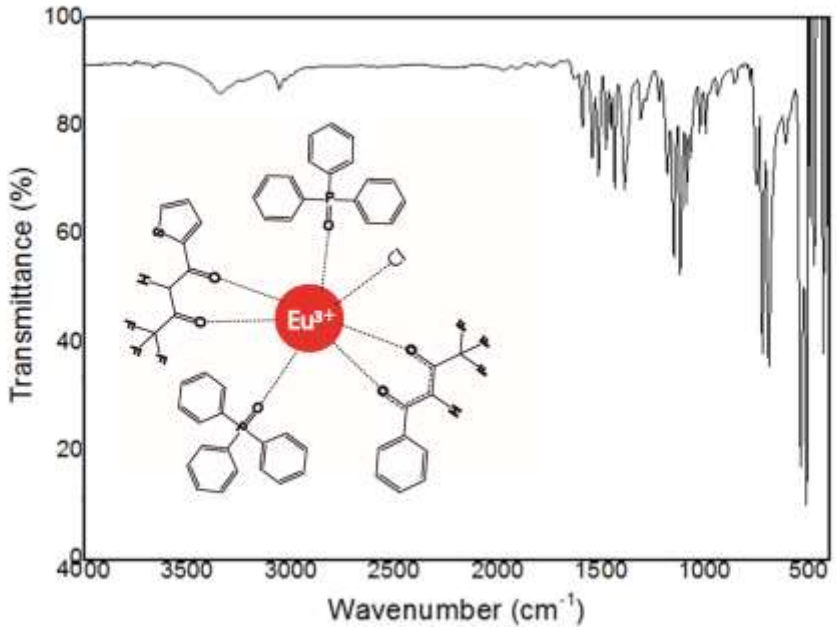
[$EuCl_2(TTA)(TPPO)_3$] (KBr disk): υ=C–H 3056 cm^{-1}, υC=O 1688 cm^{-1}, υP=O 1179-1115 cm^{-1}, υC-F 1287 cm^{-1}, and υS=C 1065 cm^{-1}.

Figure S3. Infrared spectrum of [$EuCl_2(TTA)(TPPO)_3$].



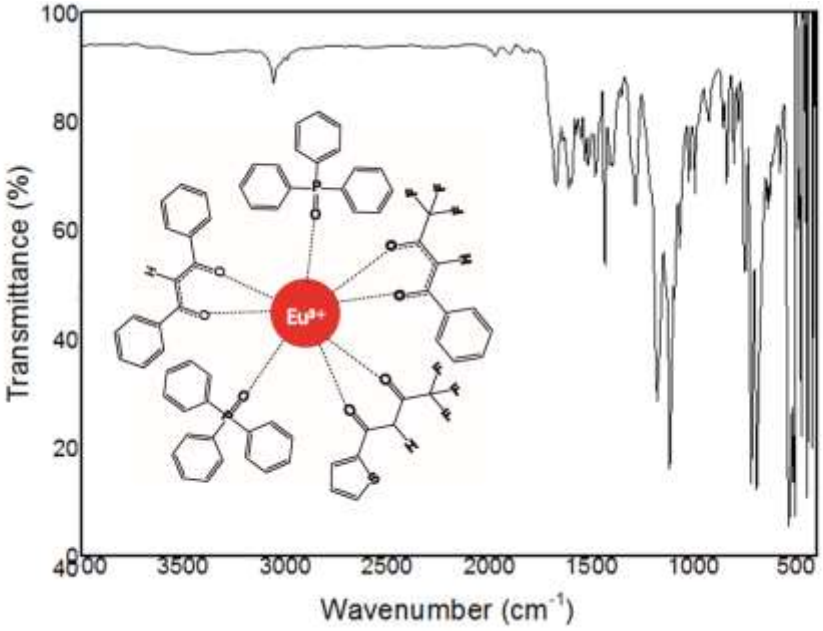
[$EuCl(DBM)(BTFA)(TPPO)_2$] (KBr disk): υ=C–H 3056 cm^{-1}, υC=O 1681 cm^{-1}, υP=O 1179-1116 cm^{-1}, and υC-F 1287 cm^{-1}.

Figure S4. Infrared spectrum of [$EuCl(DBM)(BTFA)(TPPO)_2$].



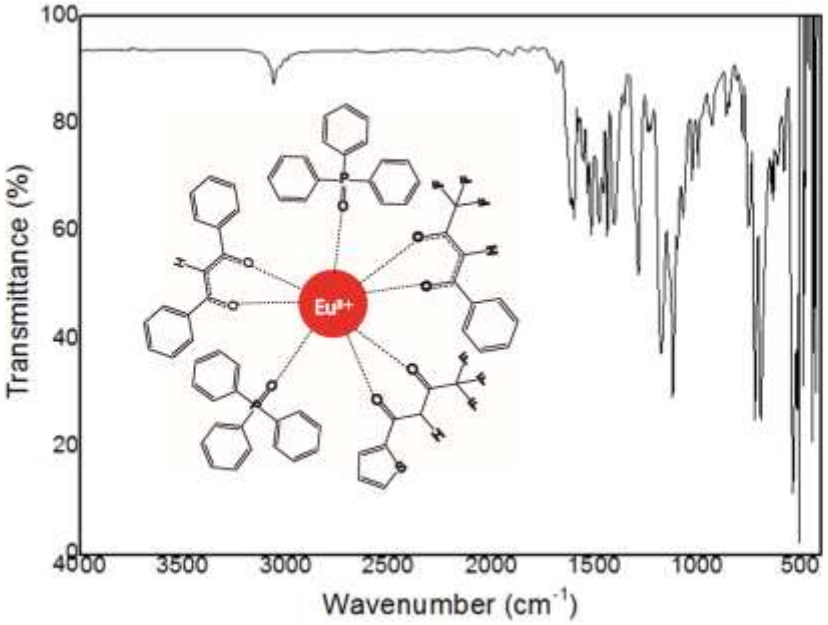
[EuCl(TTA)(BTFA)(TPPO)$_2$] (KBr disk): υ=C–H 3062 cm^{-1}, υC=O 1599 cm^{-1}, υP=O 1154-1116 cm^{-1}, υC-F 1185 cm^{-1}, and υS=C 1084 cm^{-1}.

Figure S5. Infrared spectrum of [EuCl(TTA)(BTFA)(TPPO)$_2$].



[Eu(DBM)(BTFA)(TTA)(TPPO)$_2$] (KBr disk): υ=C–H 3056 cm^{-1}, υC=O 1681 cm^{-1}, υP=O 1179-1116 cm^{-1}, υC-F 1294 cm^{-1}, and υS=C 1065 cm^{-1}.

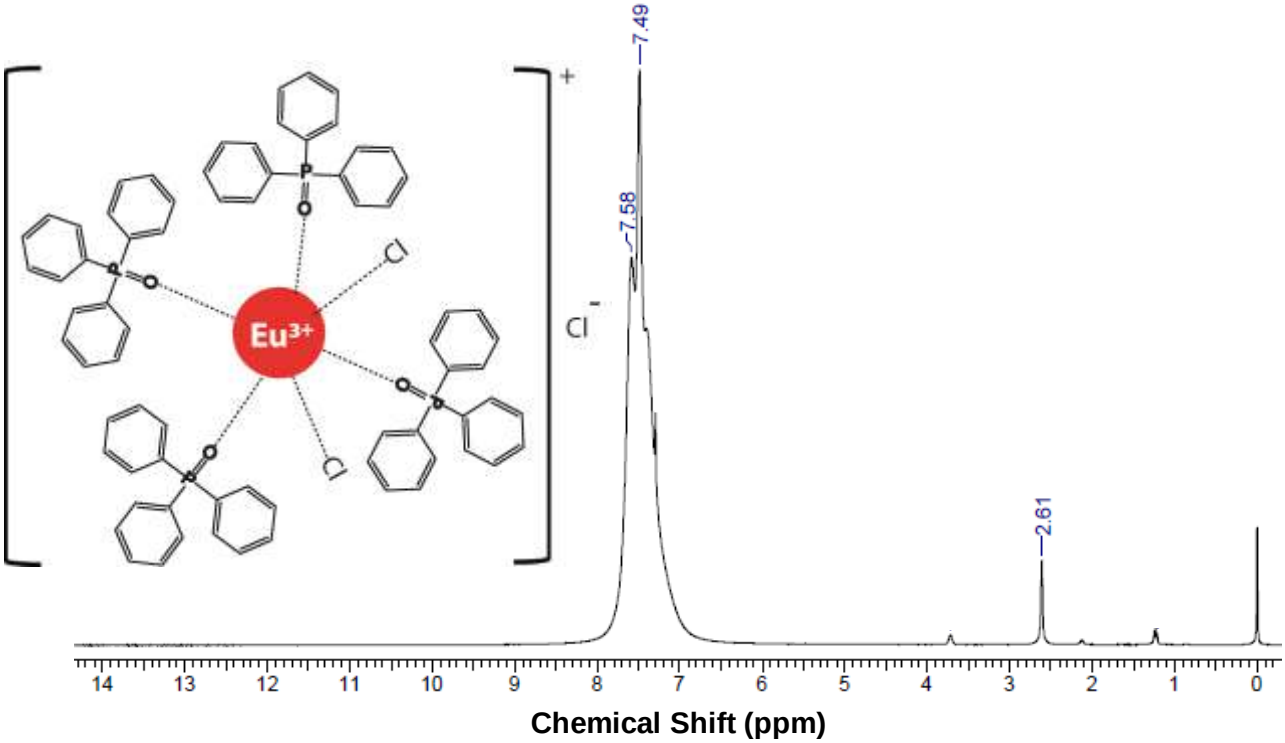
Figure S6. Infrared spectrum of [Eu(DBM)(BTFA)(TTA)(TPPO)$_2$] obtained via synthetic route 1.



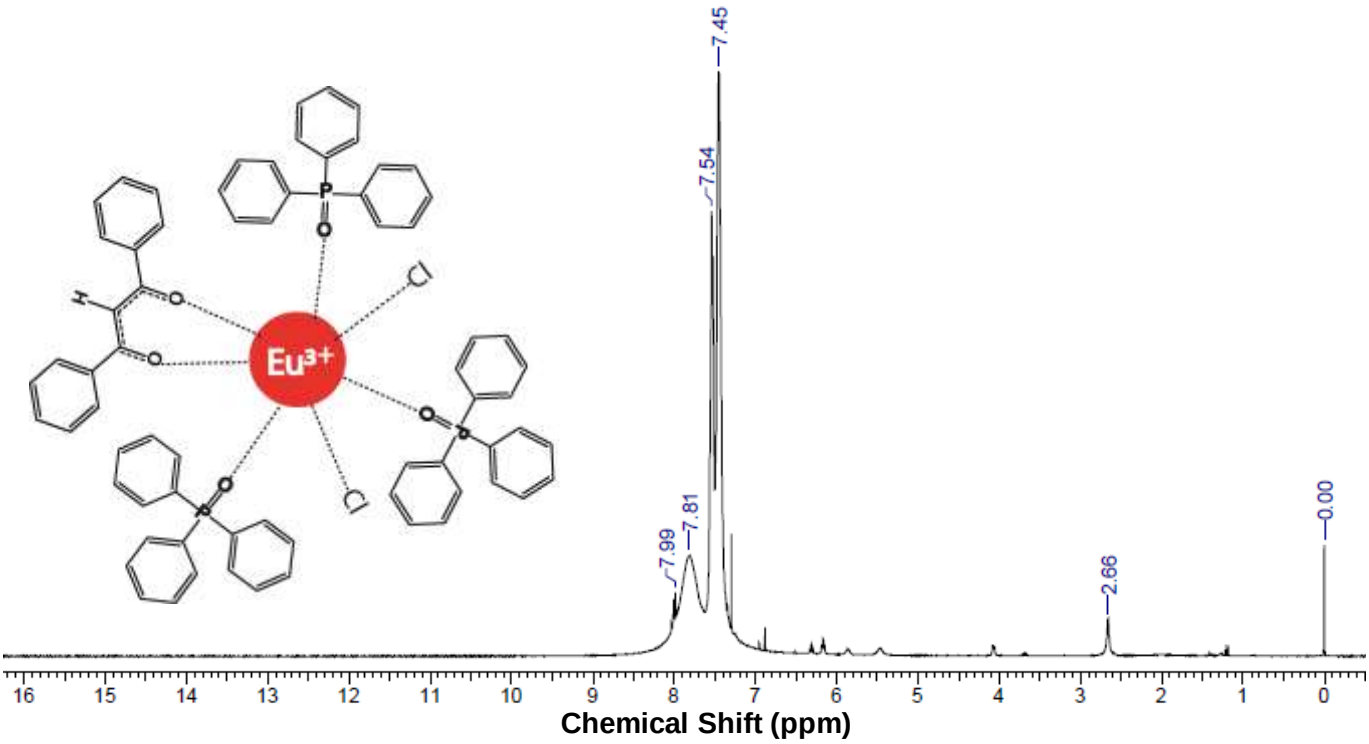
[Eu(DBM)(BTFA)(TTA)(TPPO)$_2$] (KBr disk): υ=C–H 3056 cm^{-1}; υC=O 1612-1593 cm^{-1}; υP=O 1166-1122 cm^{-1}; υC-F 1281 cm^{-1}; υS=C 1071 cm^{-1}.

Figure S7. Infrared spectrum of [Eu(DBM)(BTFA)(TTA)(TPPO)$_2$] obtained via synthetic route 6.

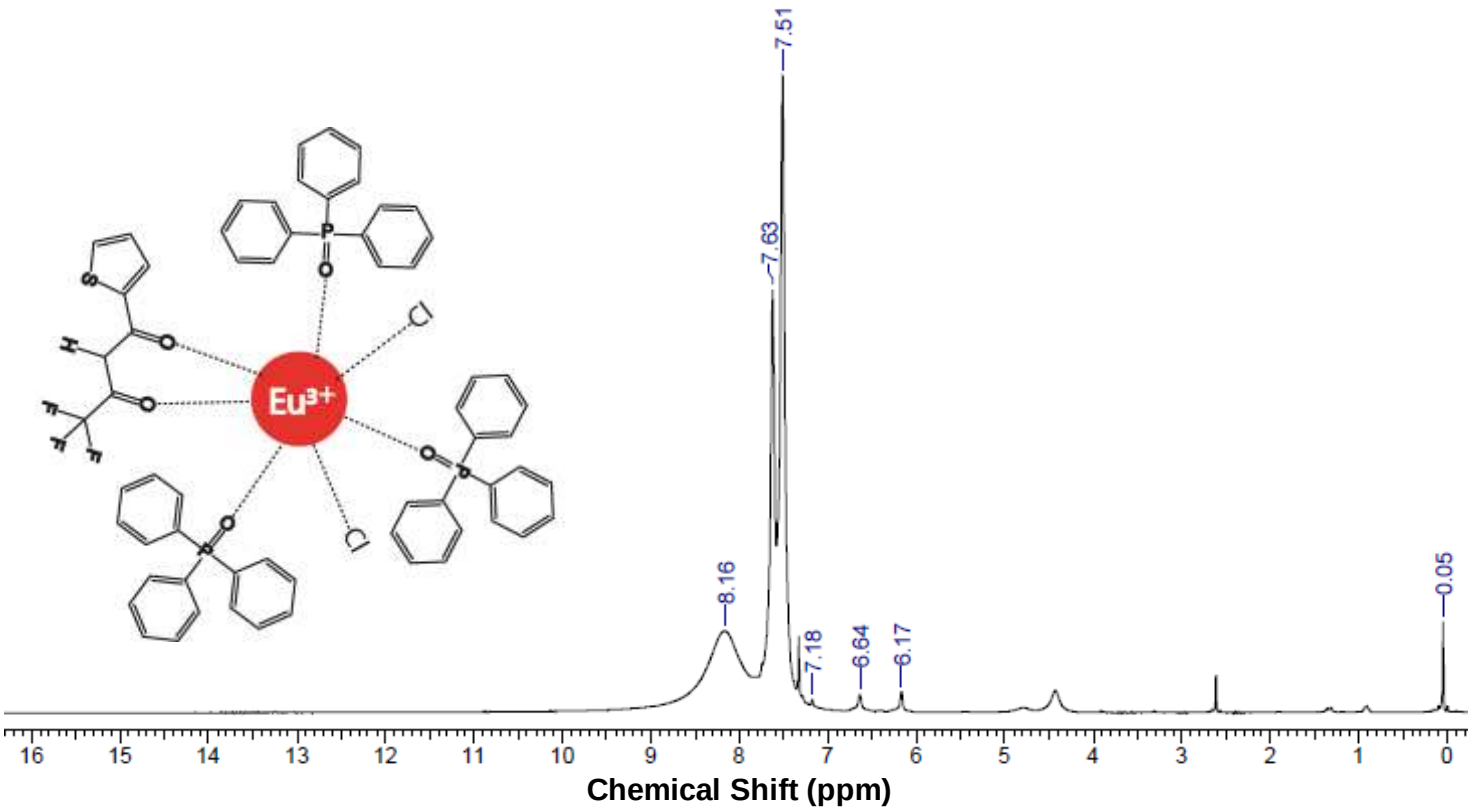
^{1}H NMR Spectra



^{1}H NMR (400 MHz, $CDCl_3$): δ7.60-7.31 ppm (m, Ar), and 2.61 ppm (s, OH).
Figure S8. ^{1}H NMR spectrum of $[EuCl_2(TPPO)_4]Cl.3H_2O$.

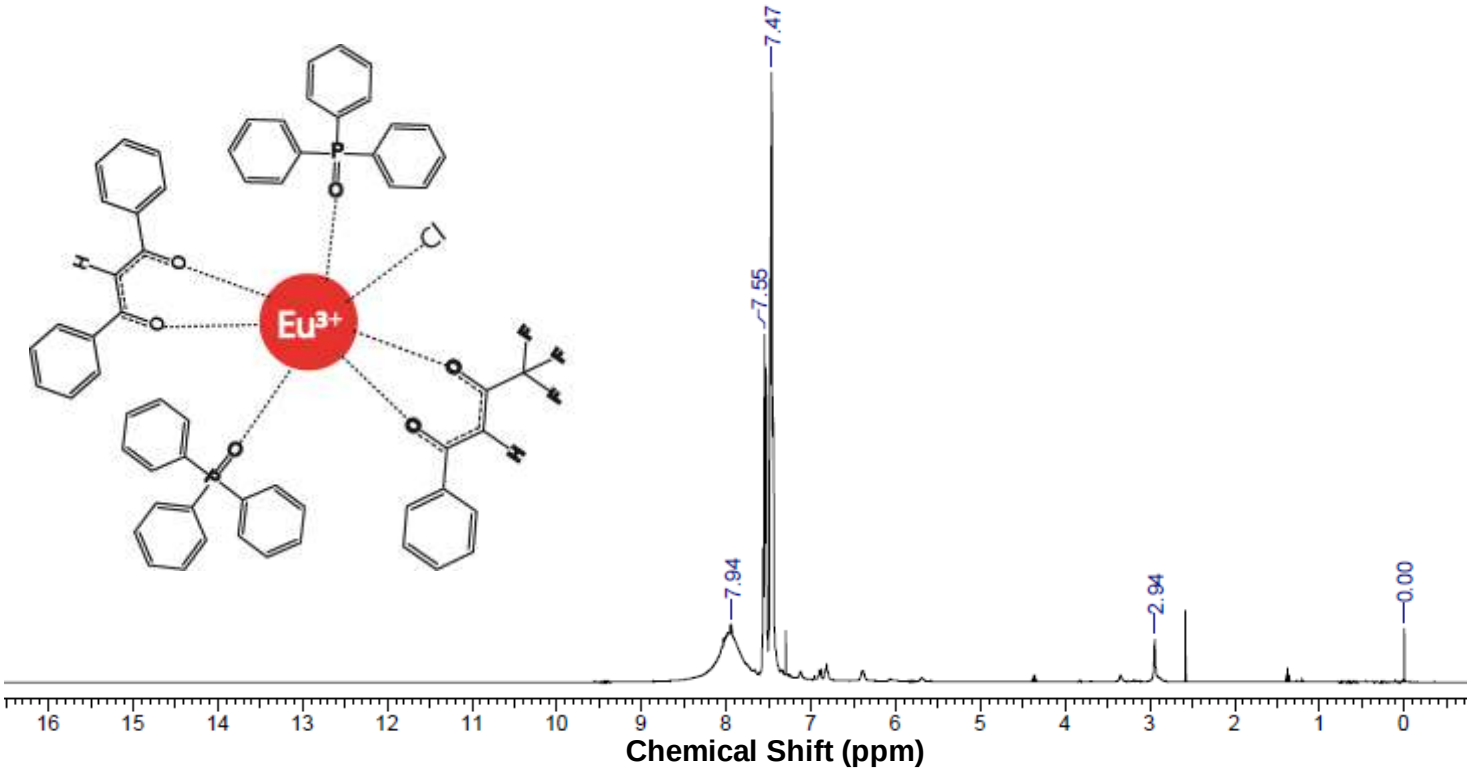


^{1}H NMR (400 MHz, $CDCl_3$): δ7.81 ppm (s, CH), and δ 7.56–7.36 ppm (m, Ar).
Figure S9. ^{1}H NMR spectrum of $[EuCl_2(DBM)(TPPO)_3]$.



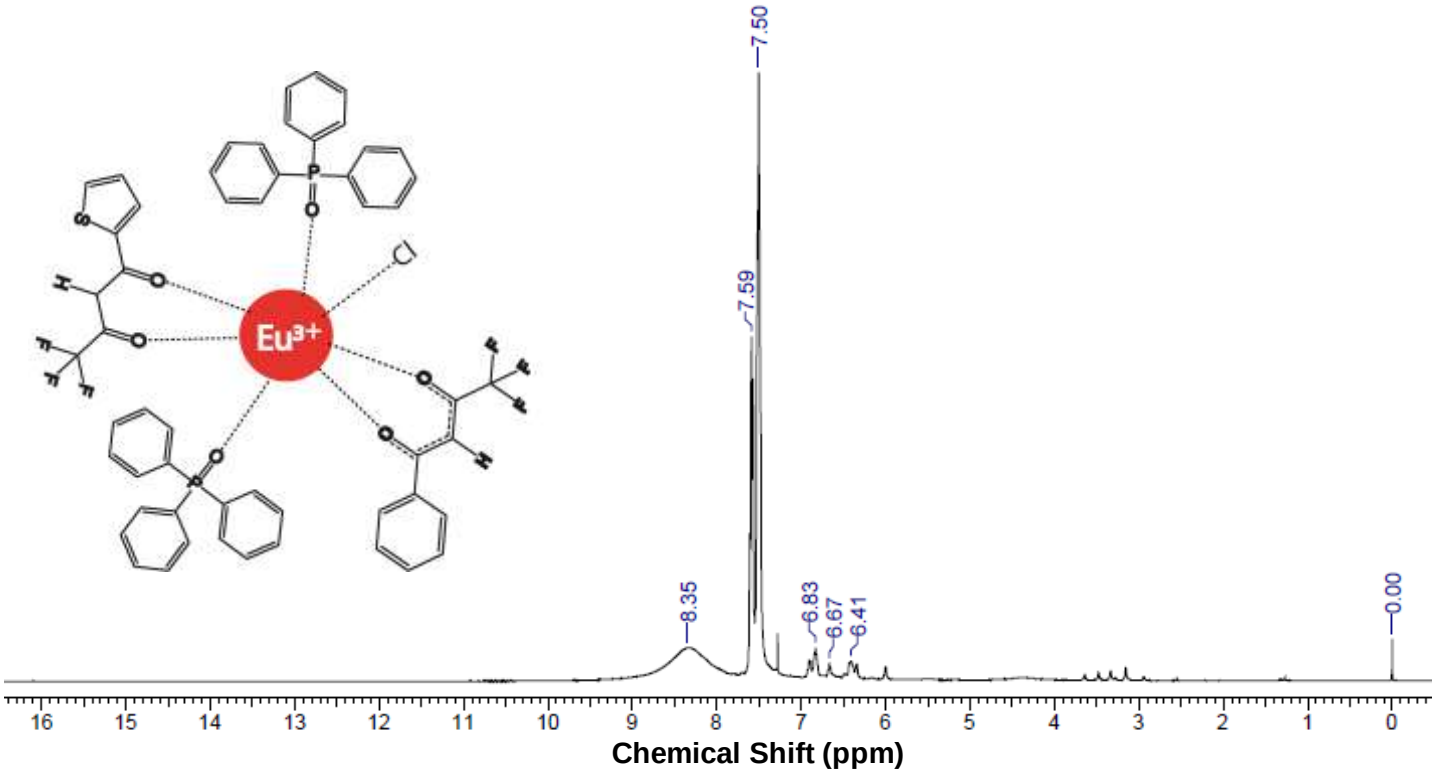
^{1}H NMR (400 MHz, $CDCl_3$): δ 8.16 ppm (s, CH), δ 7.65–6.14 ppm (m, Ar), and δ 7.21–6.14 ppm (m, Th).

Figure S10. ^{1}H NMR spectrum of $[EuCl_2(TTA)(TPPO)_3]$.



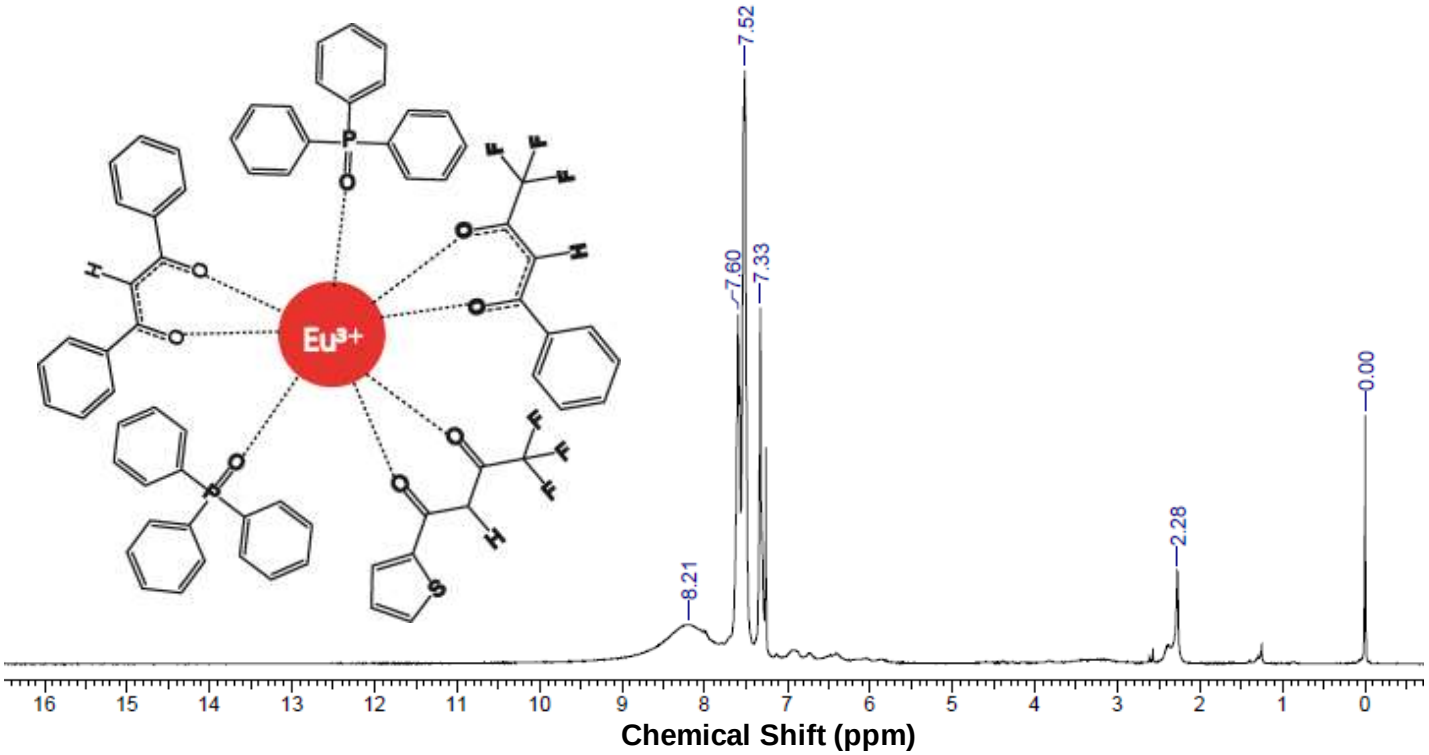
^{1}H NMR (400 MHz, $CDCl_3$): δ 7.94 ppm (s, CH) and δ 7.57–7.44 ppm (m, Ar).

Figure S11. ^{1}H NMR spectrum of $[EuCl(DBM)(BTFA)(TPPO)_2]$.



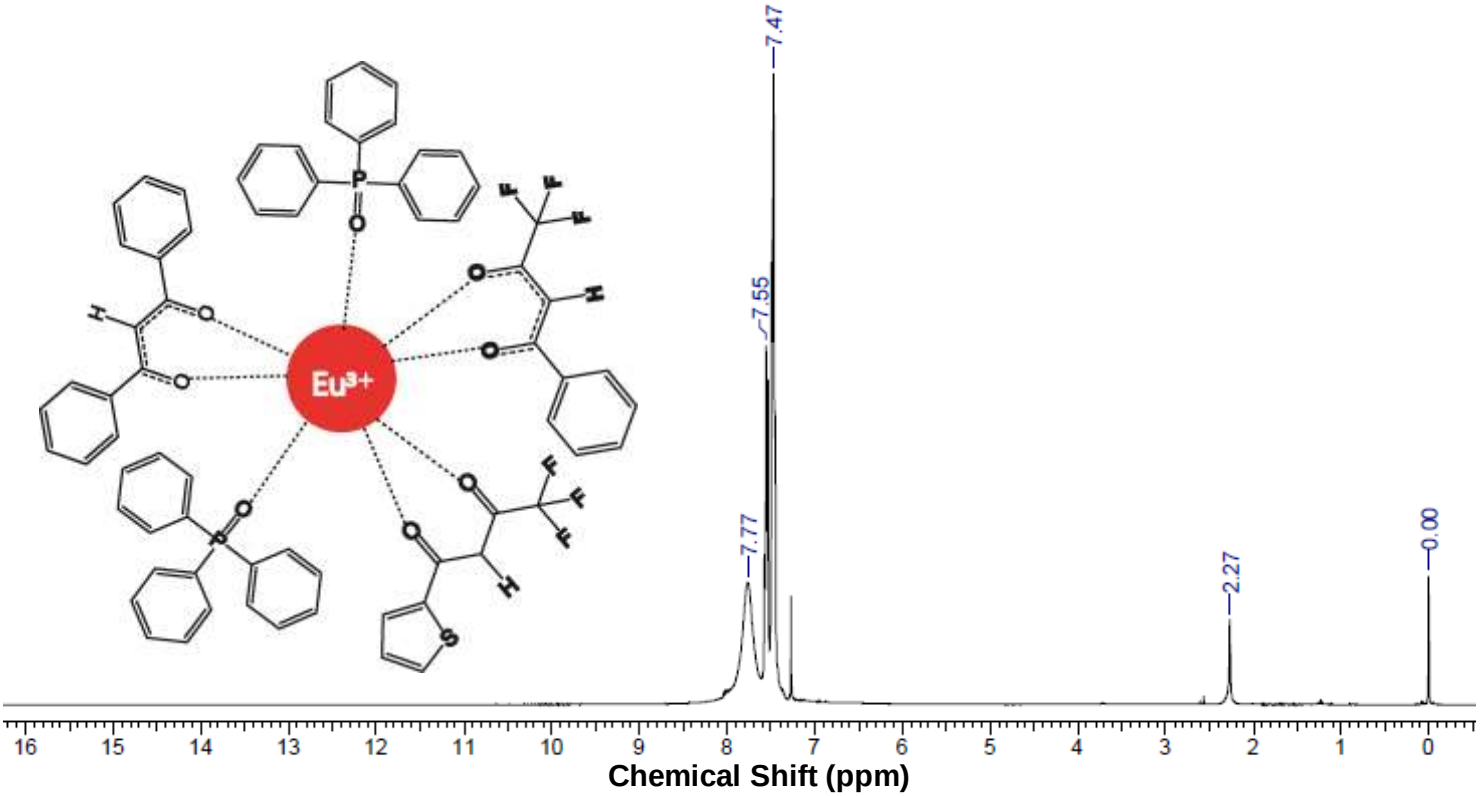
^{1}H NMR (400 MHz, $CDCl_3$): δ 8.35 ppm (s, CH), δ 7.62 – 6.39 ppm (m, Ar), δ 6.87–6.38 ppm (m, Th).

Figure S12. ^{1}H NMR spectrum of $[EuCl(TTA)(BTFA)(TPPO)_2]$.



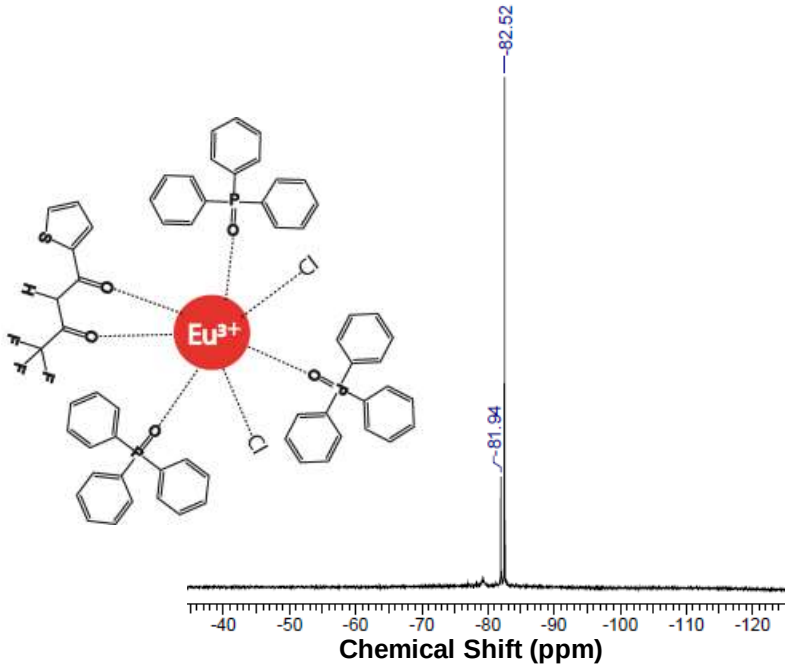
^{1}H NMR (400 MHz, $CDCl_3$): δ 8.21 ppm, and (s, CH), δ 7.63–7.29 ppm (m, Ar).

Figure S13. ^{1}H NMR spectrum of $[Eu(DBM)(BTFA)(TTA)(TPPO)_2]$ obtained via synthetic route 1.

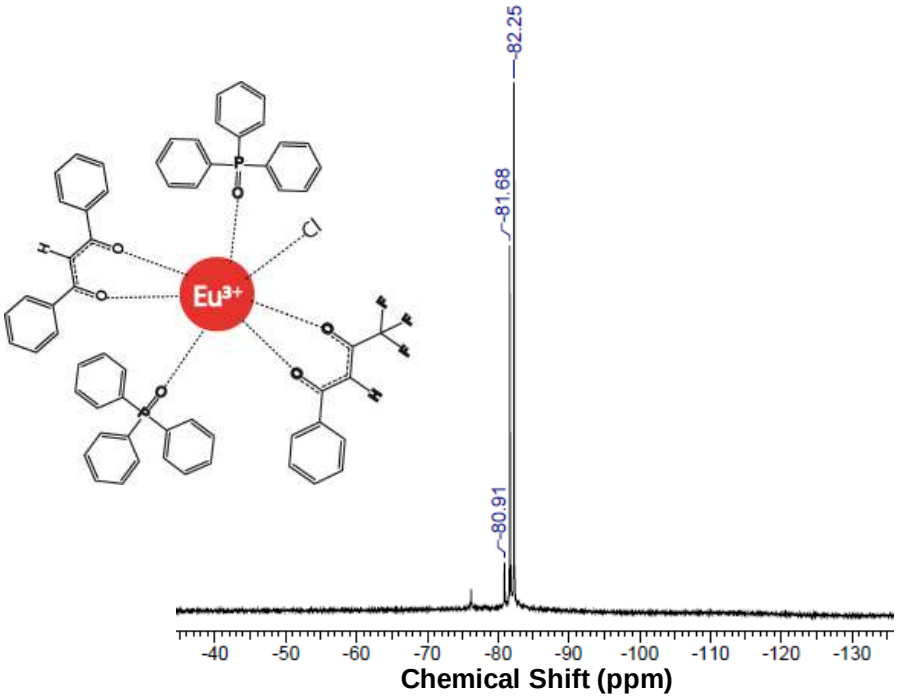


^{1}H NMR (400 MHz, $CDCl_3$): δ 7.77 ppm (s, CH), and δ 7.57–7.45 ppm (m, Ar).
Figure S14. ^{1}H NMR spectrum of [Eu(DBM)(BTFA)(TTA)$(TPPO)_2$] obtained via synthetic route 6**.**

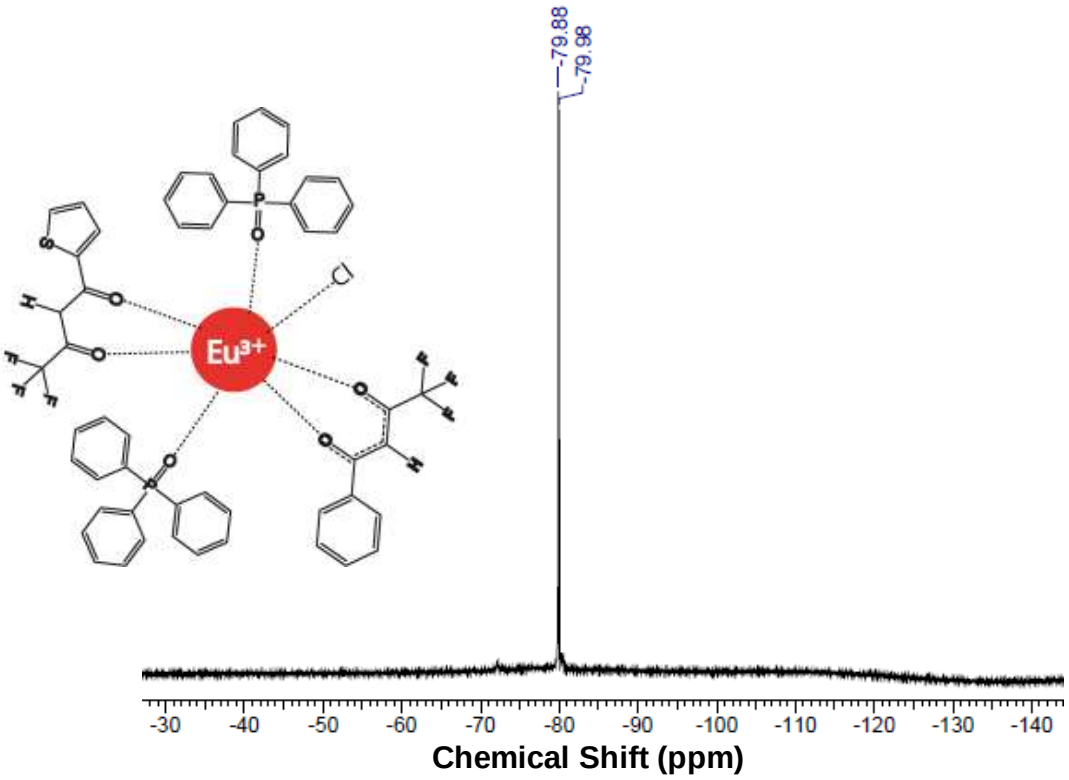
^{19}F NMR Spectra



^{19}F NMR (376 MHz, $CDCl_3$): δ –82 ppm, and δ –83 ppm.
Figure S15. ^{19}F NMR spectrum of [$EuCl_2(TTA)(TPPO)_3$].

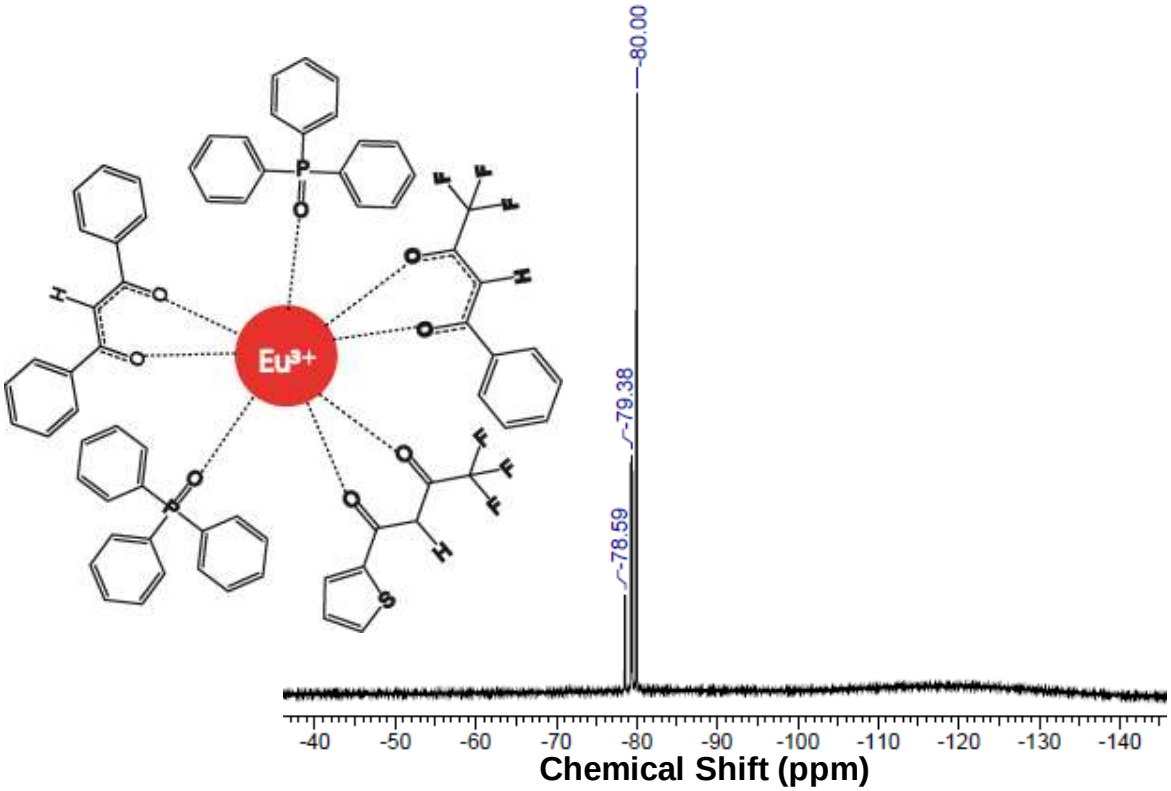


^{19}F NMR (376 MHz, $CDCl_3$): δ –81 ppm; and δ –82 ppm.
Figure S16. ^{19}F NMR spectrum of [$EuCl(DBM)(BTFA)(TPPO)_2$].



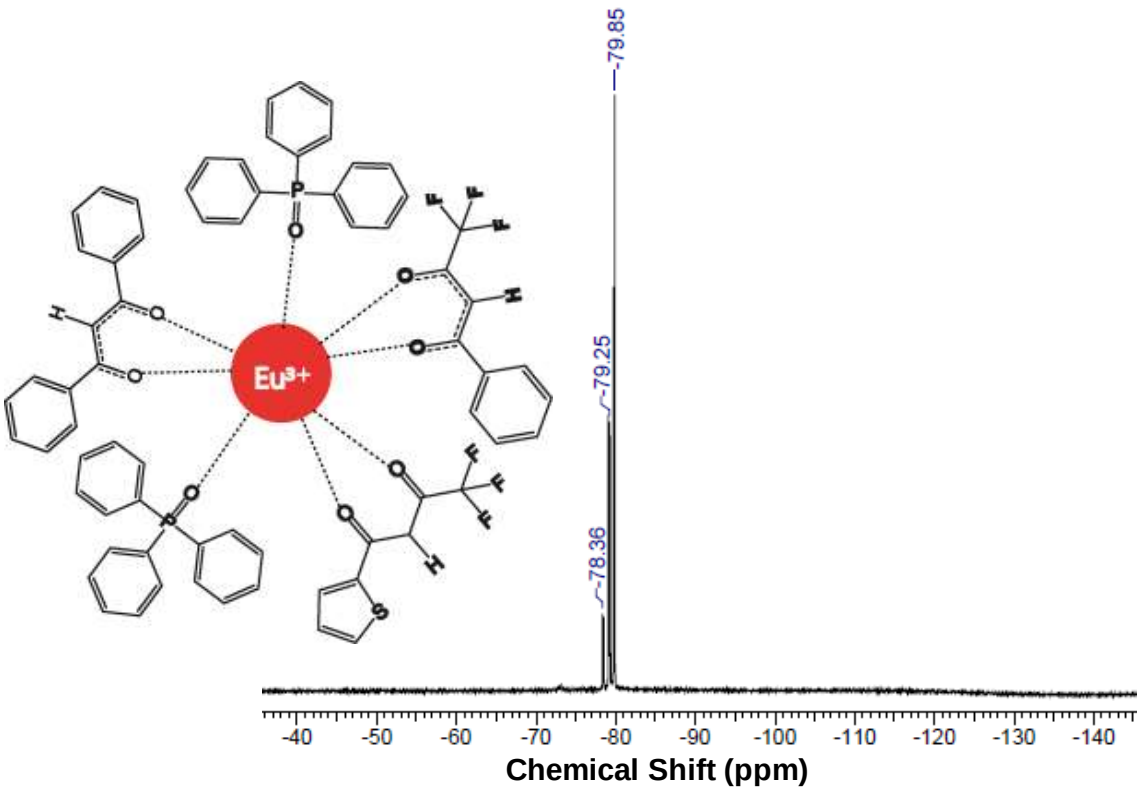
^{19}F NMR (376 MHz, $CDCl_3$): δ −80 ppm.

Figure S17. ^{19}F NMR spectrum of [EuCl(TTA)(BTFA)$(TPPO)_2$].



^{19}F NMR (376 MHz, $CDCl_3$): δ −79 ppm, and δ −80 ppm.

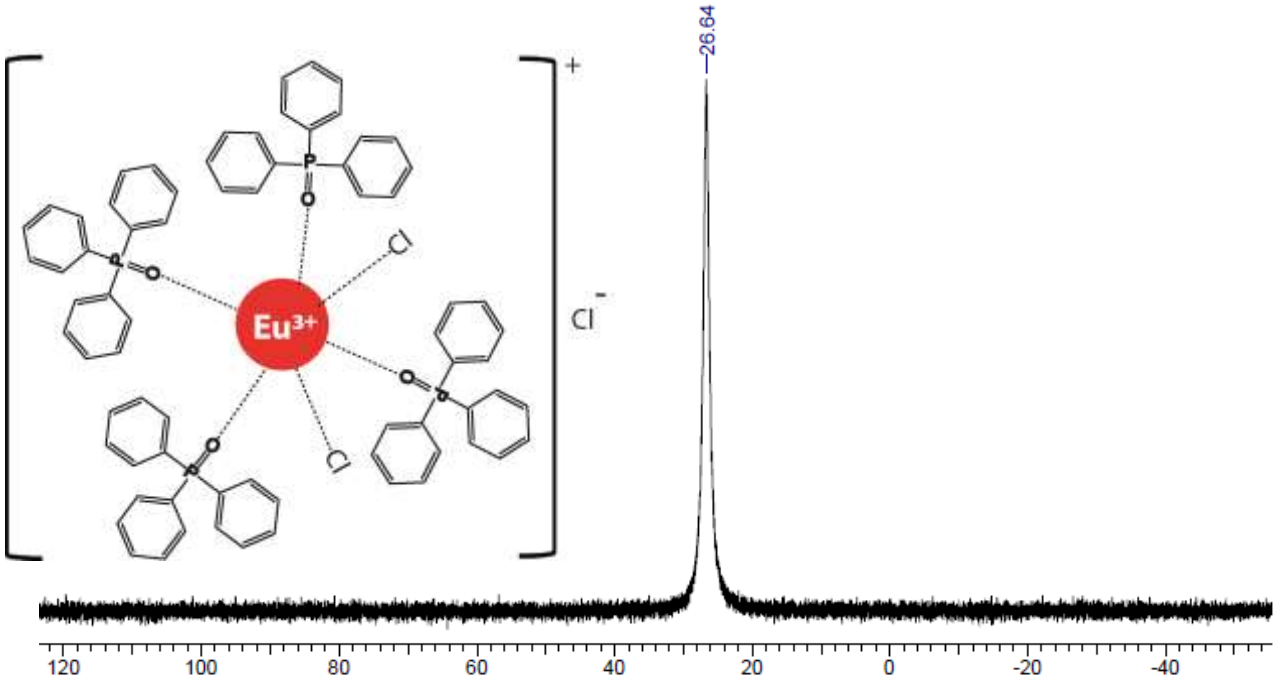
Figure S18. ^{19}F NMR spectrum of [Eu(DBM)(BTFA)(TTA)$(TPPO)_2$] obtained via synthetic route 1.



^{19}F NMR (376 MHz, $CDCl_3$): δ −78 ppm, and δ −80 ppm.

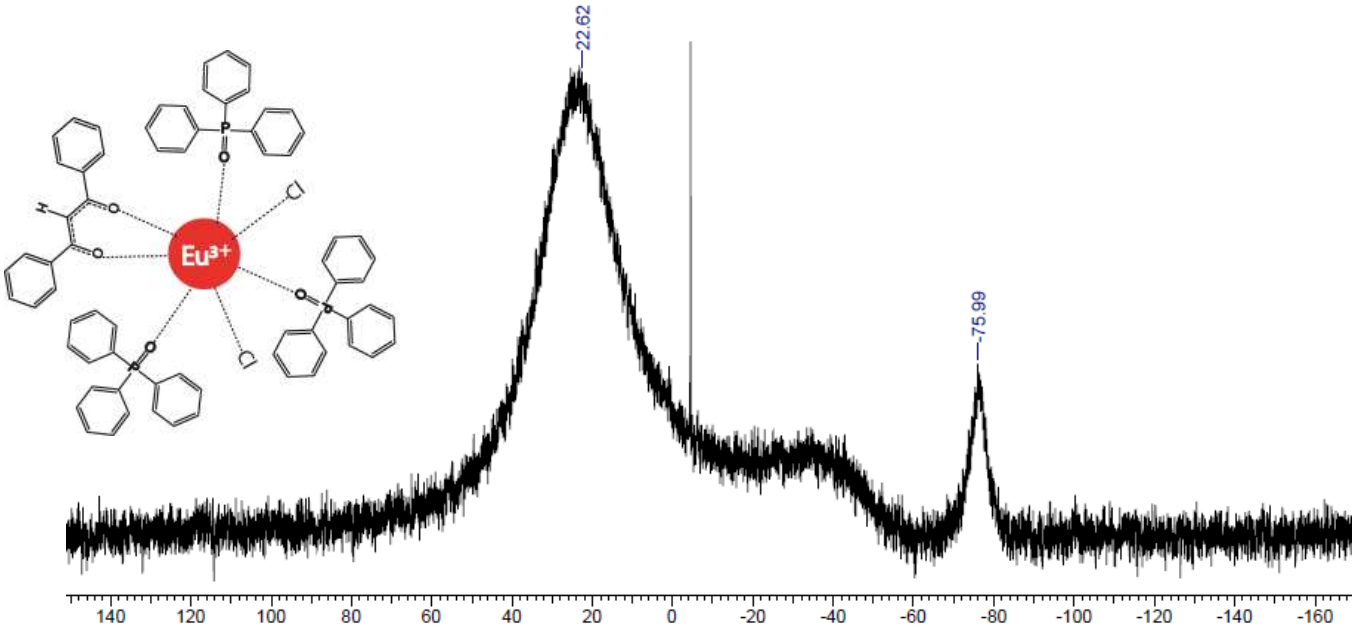
Figure S19. ^{19}F NMR spectrum of [Eu(DBM)(BTFA)(TTA)$(TPPO)_2$] obtained via synthetic route 6.

^{31}P NMR Spectra



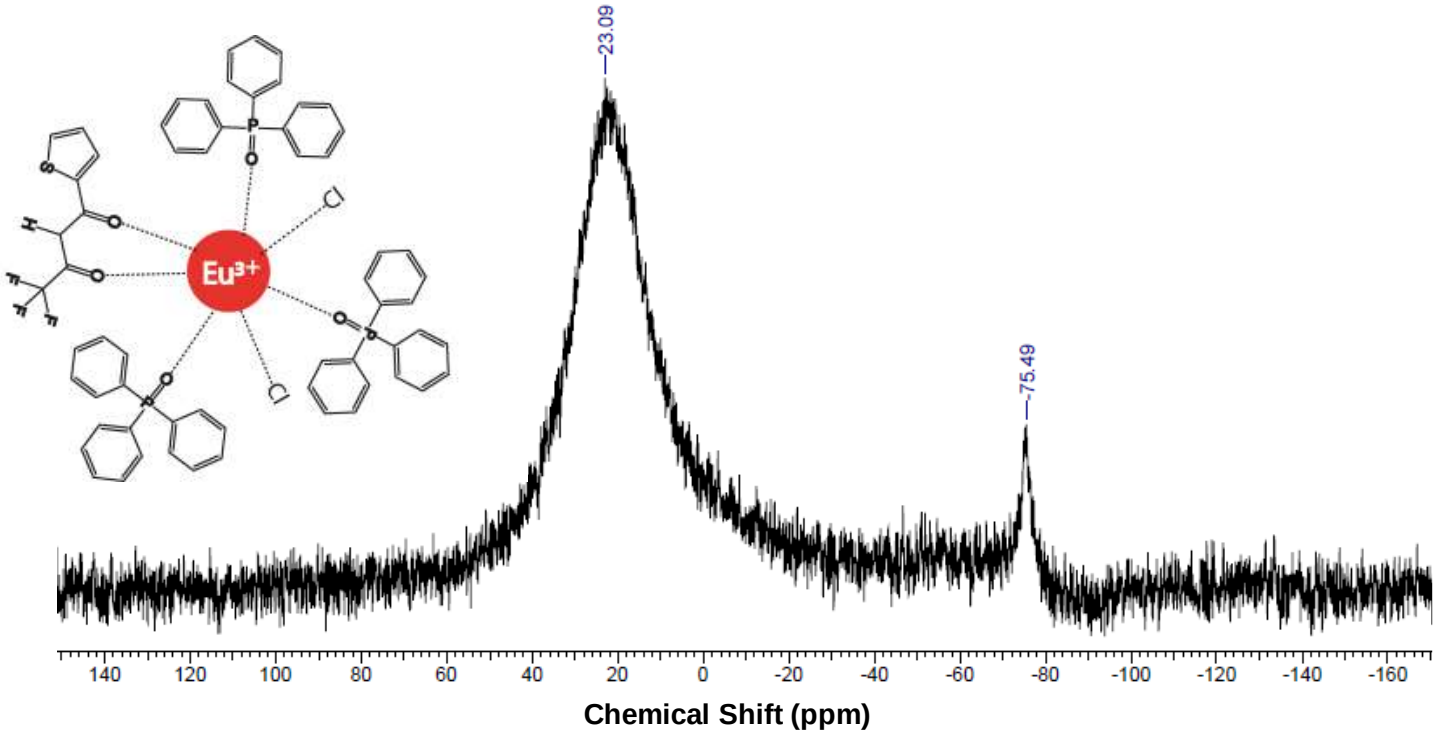
^{31}P NMR (162 MHz, $CDCl_3$): δ 27 ppm.

Figure S20. ^{31}P NMR spectrum of $[EuCl_2(TPPO)_4]Cl.3H_2O$.

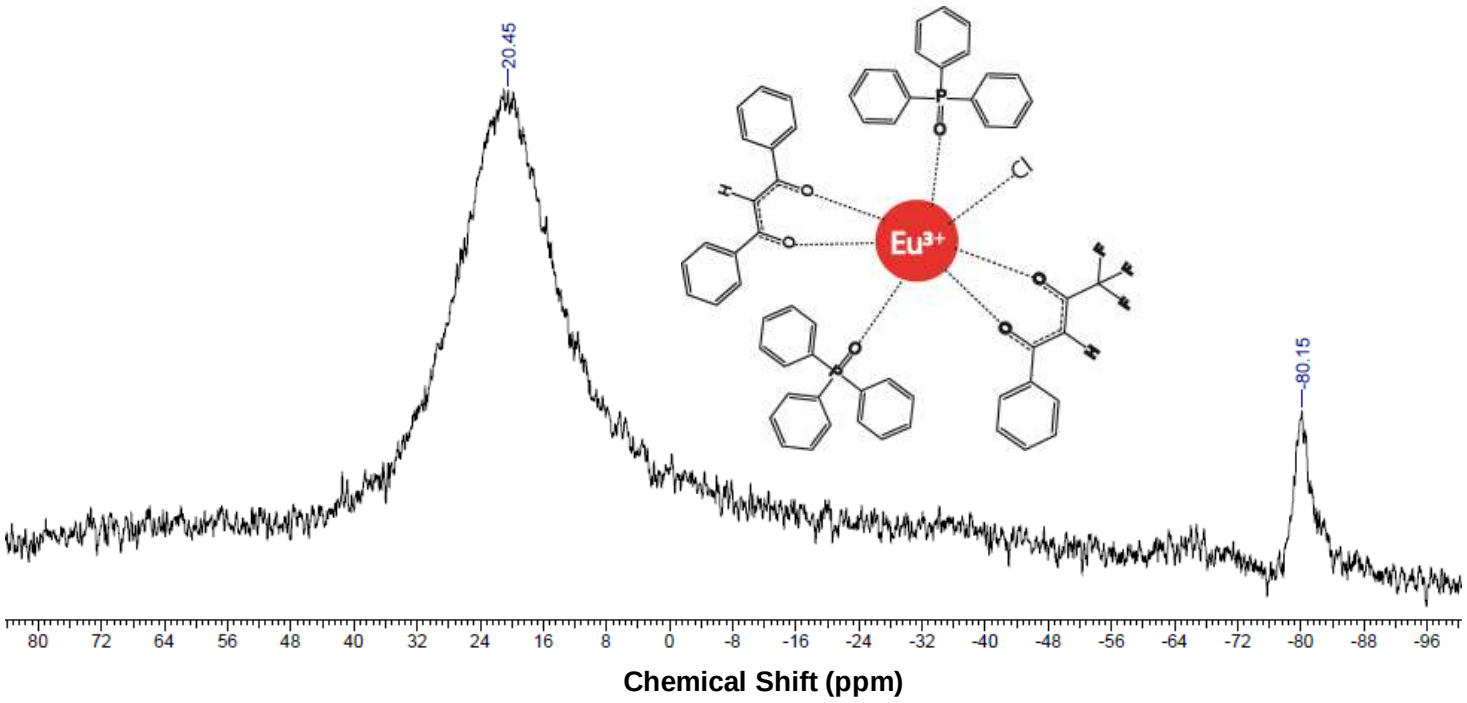


^{31}P NMR (162 MHz, $CDCl_3$): δ 23 ppm, and δ −76 ppm.

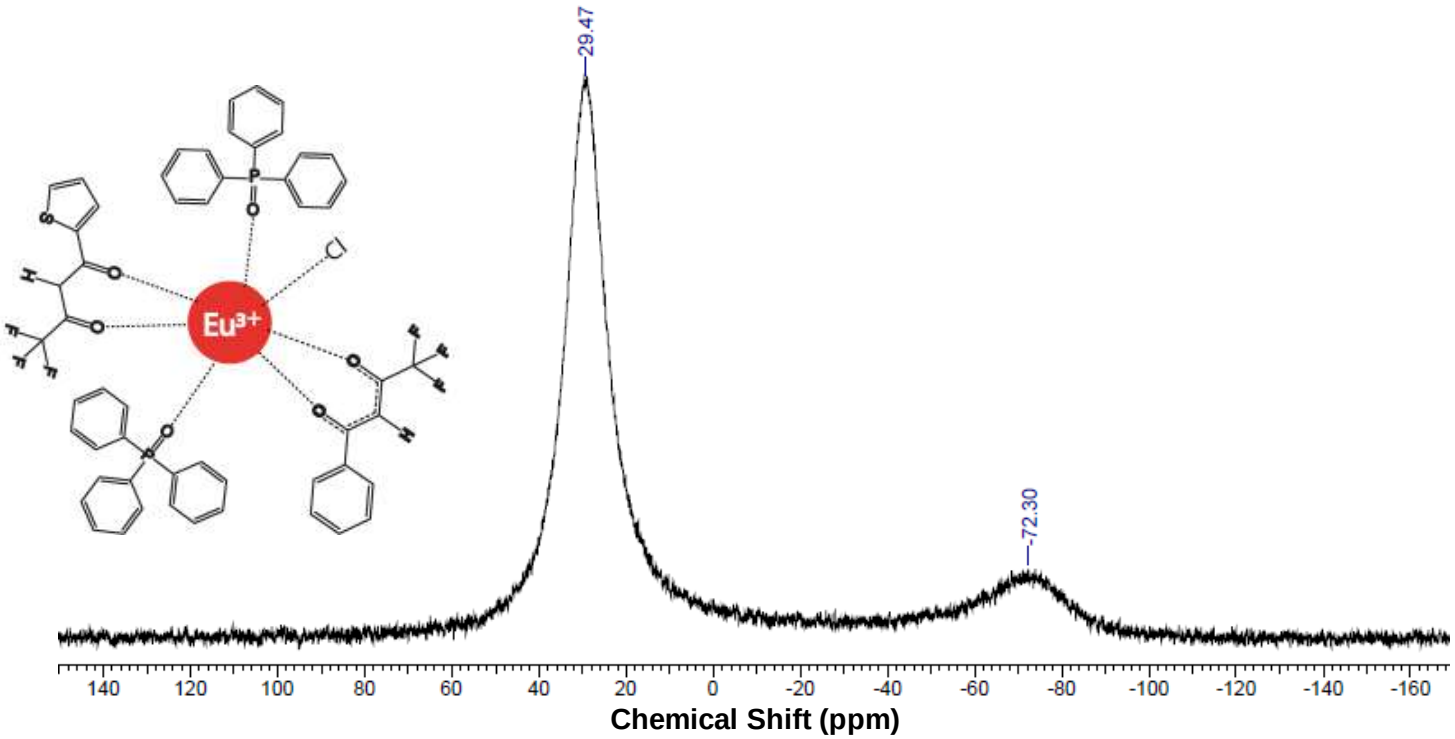
Figure S21. ^{31}P NMR spectrum of $[EuCl_2(DBM)(TPPO)_3]$.



^{31}P NMR (162 MHz, $CDCl_3$): δ 23 ppm, and δ −75 ppm.
Figure S22. ^{31}P NMR spectrum of [$EuCl_2(TTA)(TPPO)_3$].

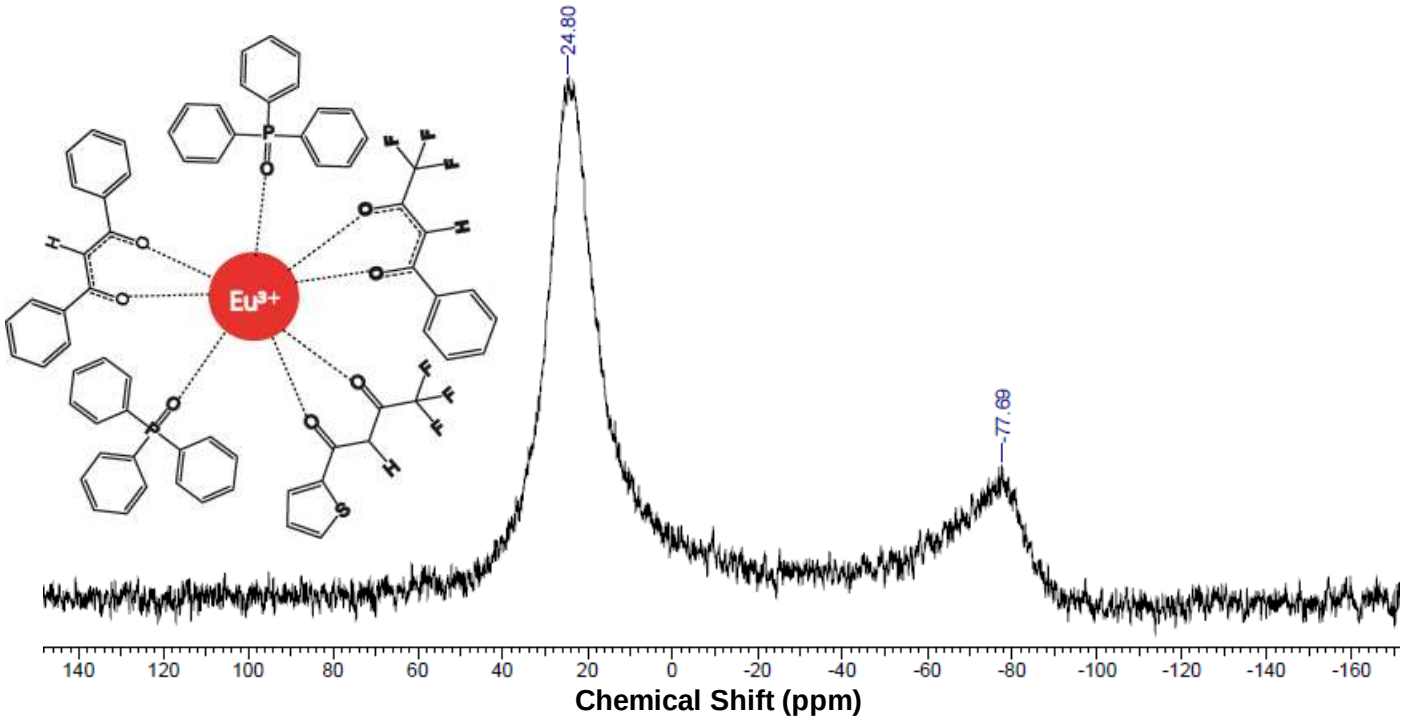


^{31}P NMR (162 MHz, $CDCl_3$): δ 20 ppm, and δ −80 ppm.
Figure S23. ^{31}P NMR spectrum of [$EuCl(DBM)(BTFA)(TPPO)_2$].



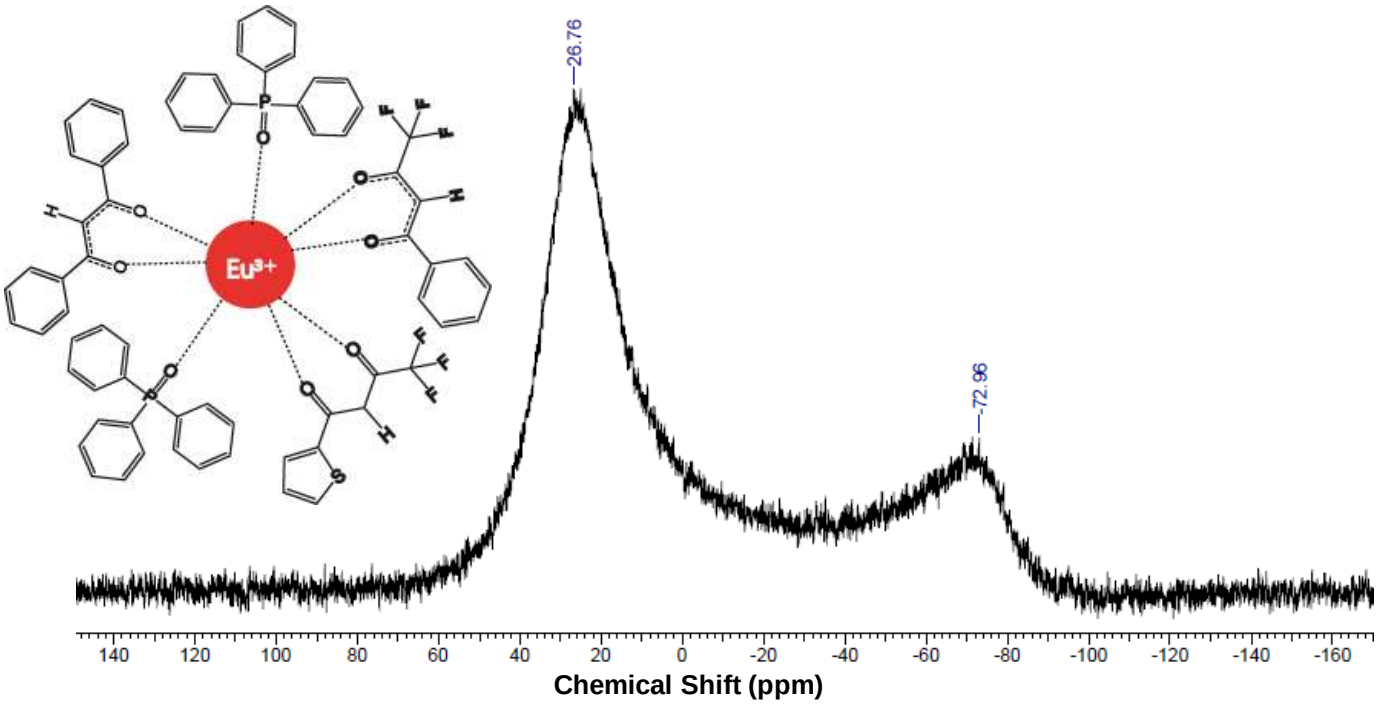
^{31}P NMR (162 MHz, $CDCl_3$): δ 29 ppm, and δ −72 ppm.

Figure S24. ^{31}P NMR spectrum of [EuCl(TTA)(BTFA)$(TPPO)_2$].



^{31}P NMR (162 MHz, $CDCl_3$): δ 25 ppm, and δ −78 ppm.

Figure S25. ^{31}P NMR spectrum of [Eu(DBM)(BTFA)(TTA)$(TPPO)_2$] obtained via synthetic route 1.



^{31}P NMR (162 MHz, $CDCl_3$): δ 27 ppm, and δ −73 ppm.

Figure S26. ^{31}P NMR spectrum of [Eu(DBM)(BTFA)(TTA)$(TPPO)_2$] obtained via synthetic route 6.