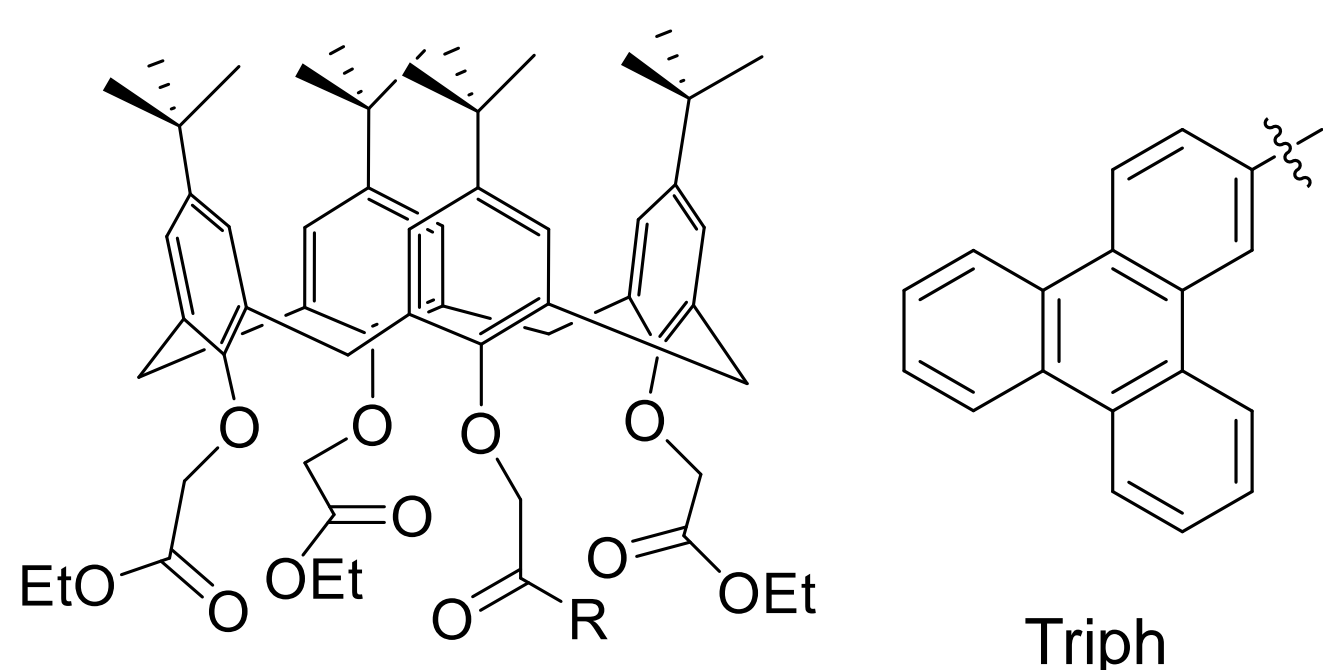


# Ligand structure of Eu(III) complexes

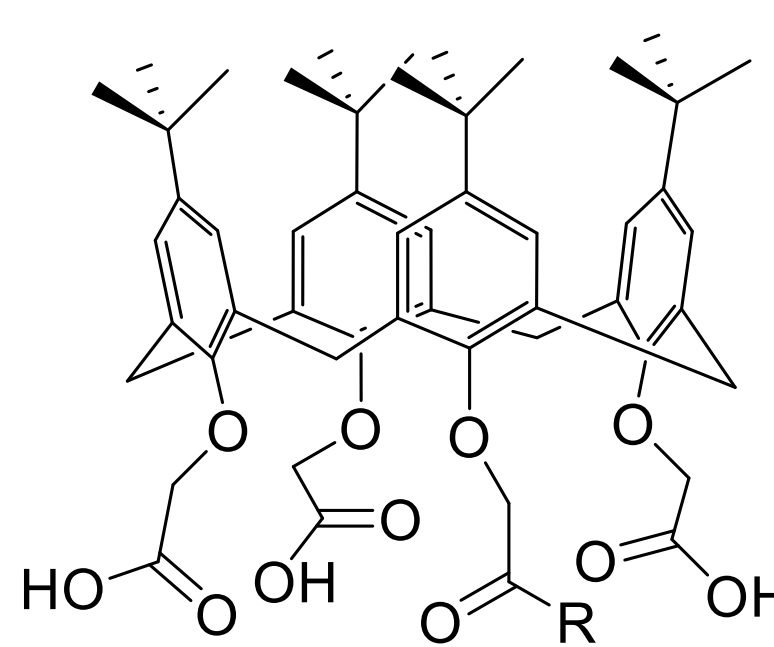


R = NHCH<sub>2</sub>Triph

R = OCH<sub>2</sub>Triph ( $\tau$  = 0.29 ms in CH<sub>3</sub>OH)

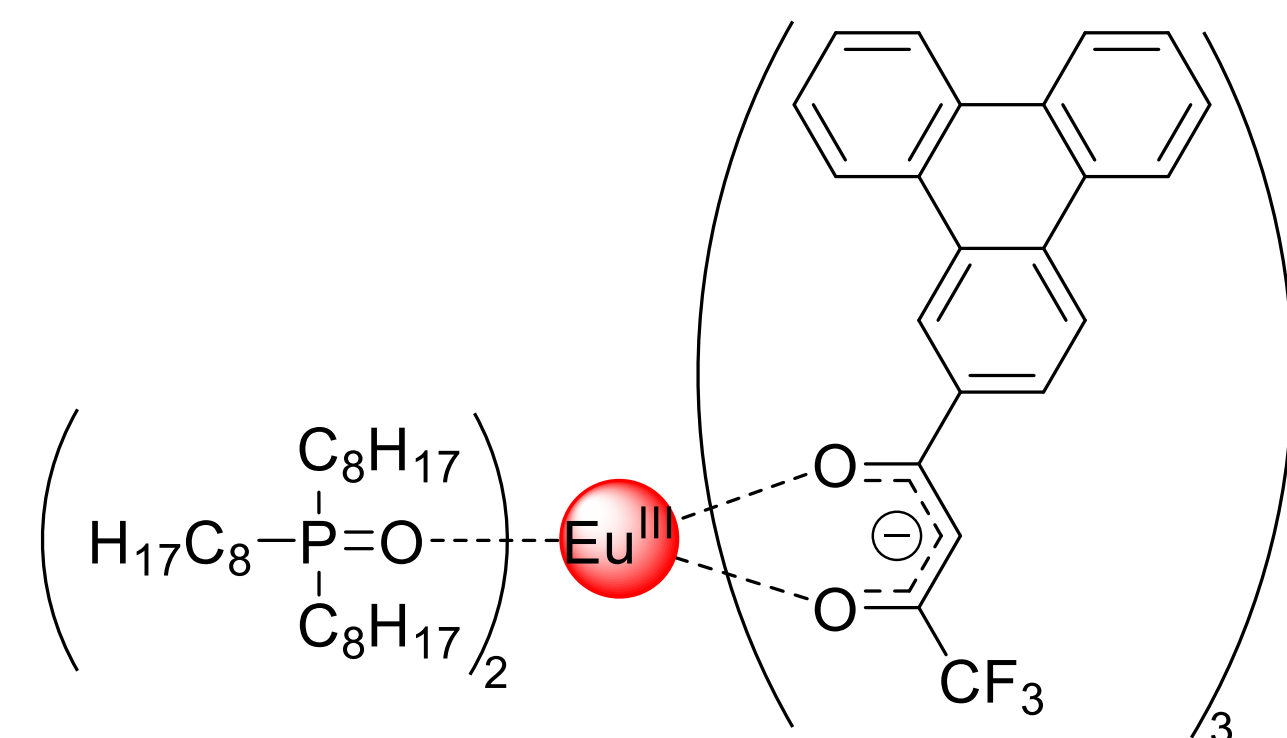
R = N(n-Pr)CH<sub>2</sub>Triph ( $\tau$  = 0.50 ms in CH<sub>3</sub>OH)

Ref. 49



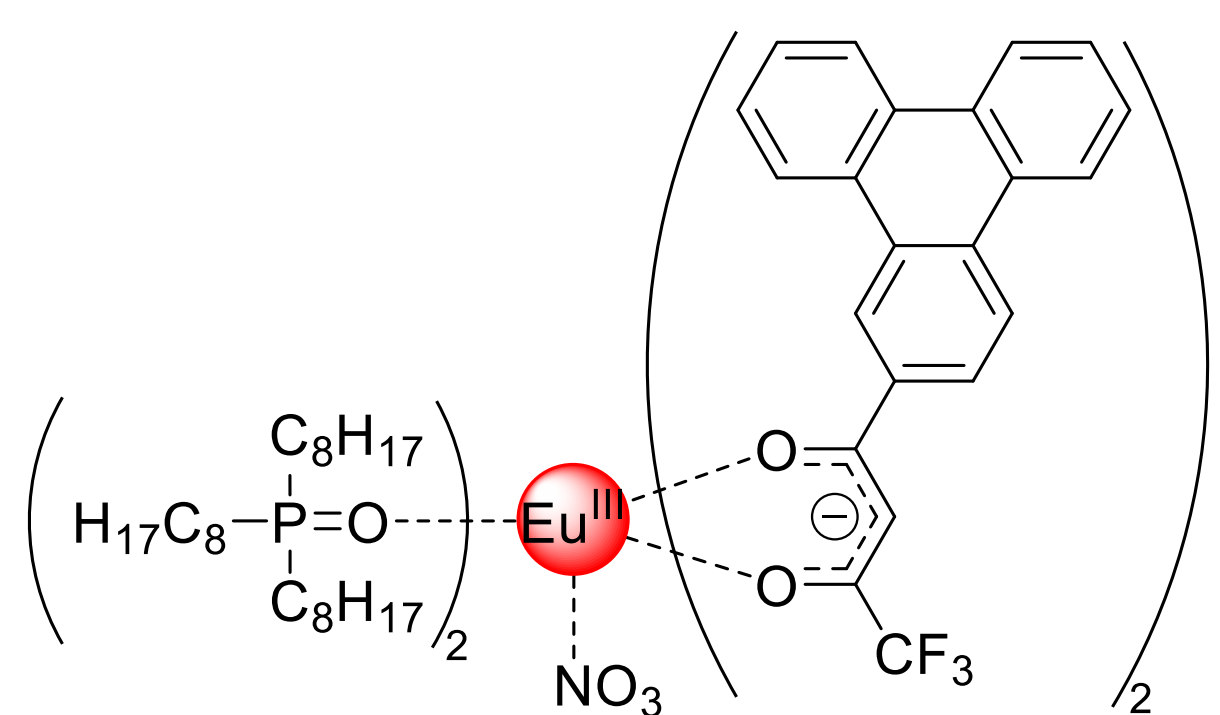
R = NHCH<sub>2</sub>Triph ( $\tau$  = 0.23 ms in CH<sub>3</sub>OH)

R = N(n-Pr)CH<sub>2</sub>Triph ( $\tau$  = 0.73 ms in CH<sub>3</sub>OH)



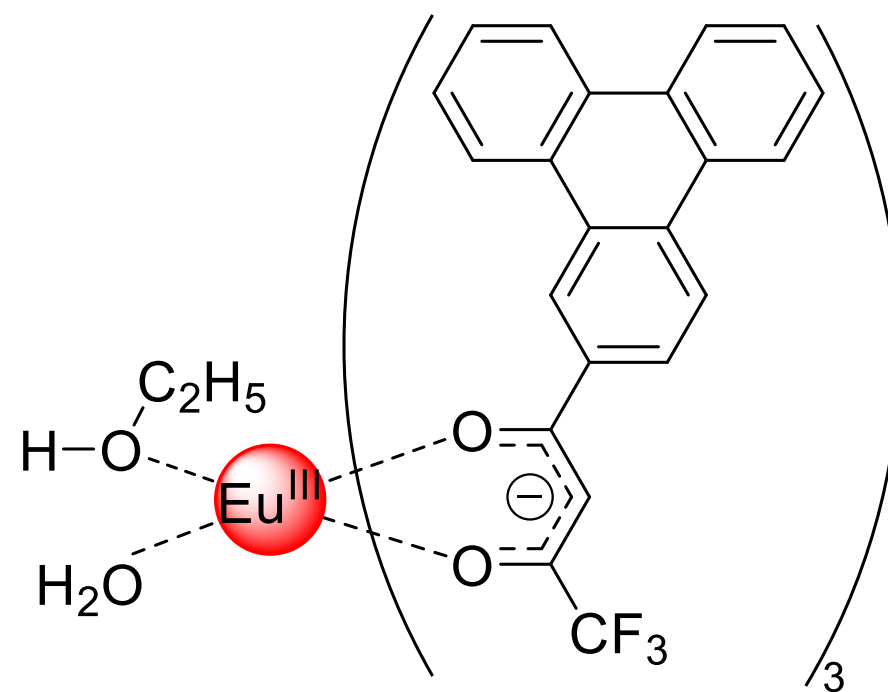
(Liquid crystal)  $\tau$  = 1.01 ms,  $\Phi_{\text{tot}}$  = 63 %

Ref. 50



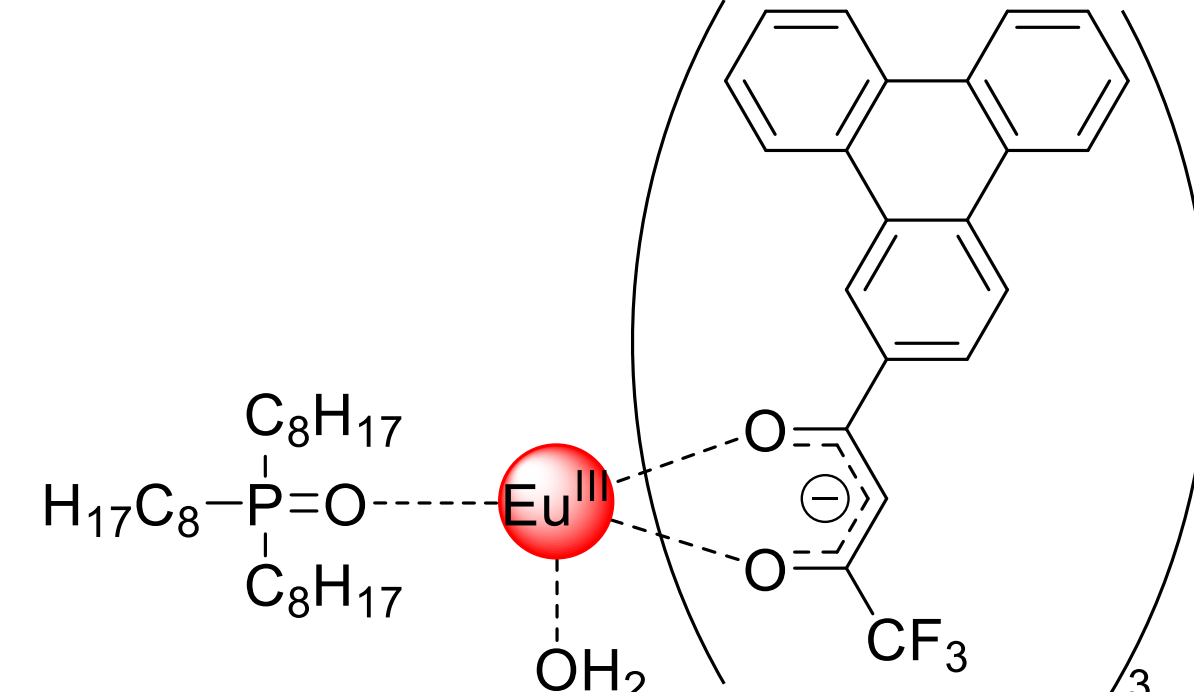
(Liquid crystal)  $\tau$  = 1.11 ms,  $\Phi_{\text{tot}}$  = 65 %

Ref. 50



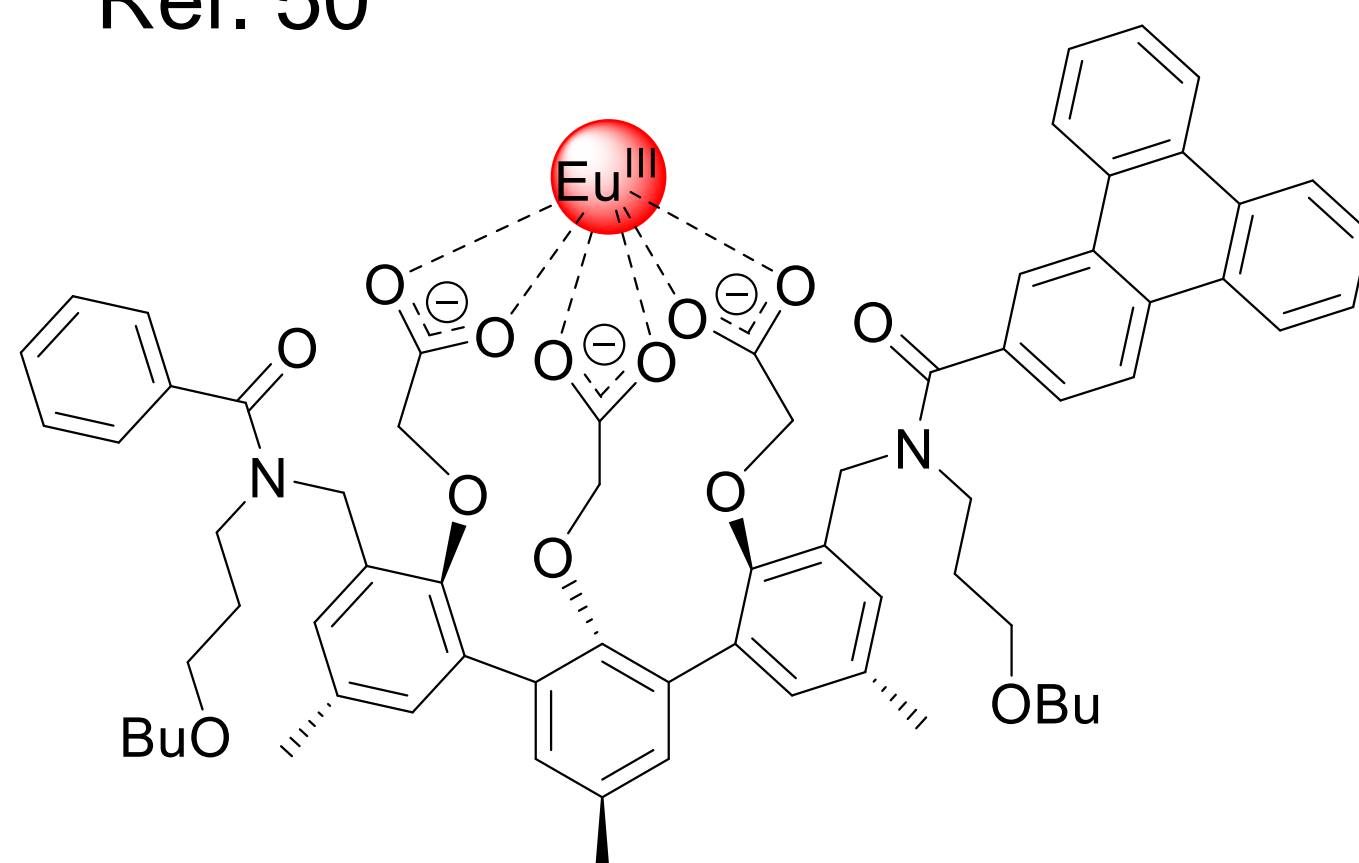
(Solid)  $\tau$  = 0.41 ms,  $\Phi_{\text{tot}}$  = 10 %

Ref. 50



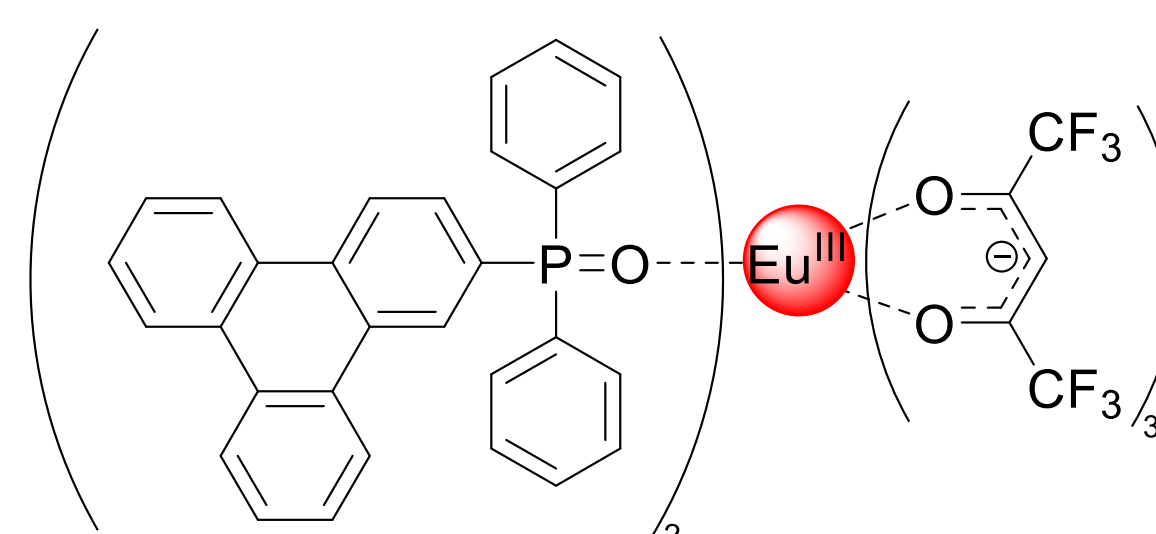
(Solid)  $\tau$  = 0.80 ms,  $\Phi_{\text{tot}}$  = 30 %

Ref. 50



(CH<sub>3</sub>OH)  $\tau$  = 0.86 ms,  $\Phi_{\text{tot}}$  = 3 %

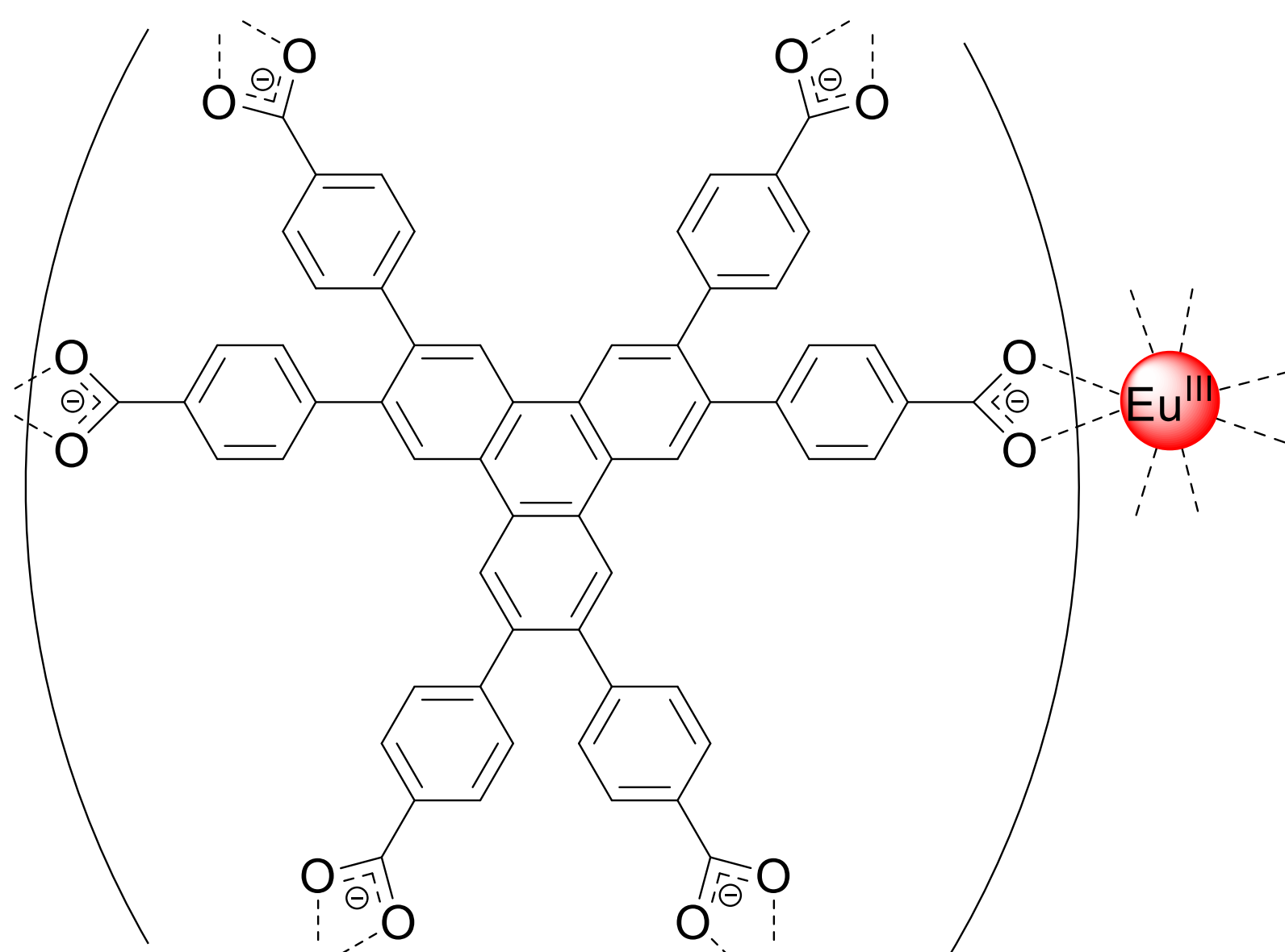
Ref. 51



(CH<sub>2</sub>Cl<sub>2</sub>)  $\tau$  = 0.79 ms,  $\Phi_{\text{tot}}$  = 63 %,  $\Phi_{\text{ff}}$  = 76 %

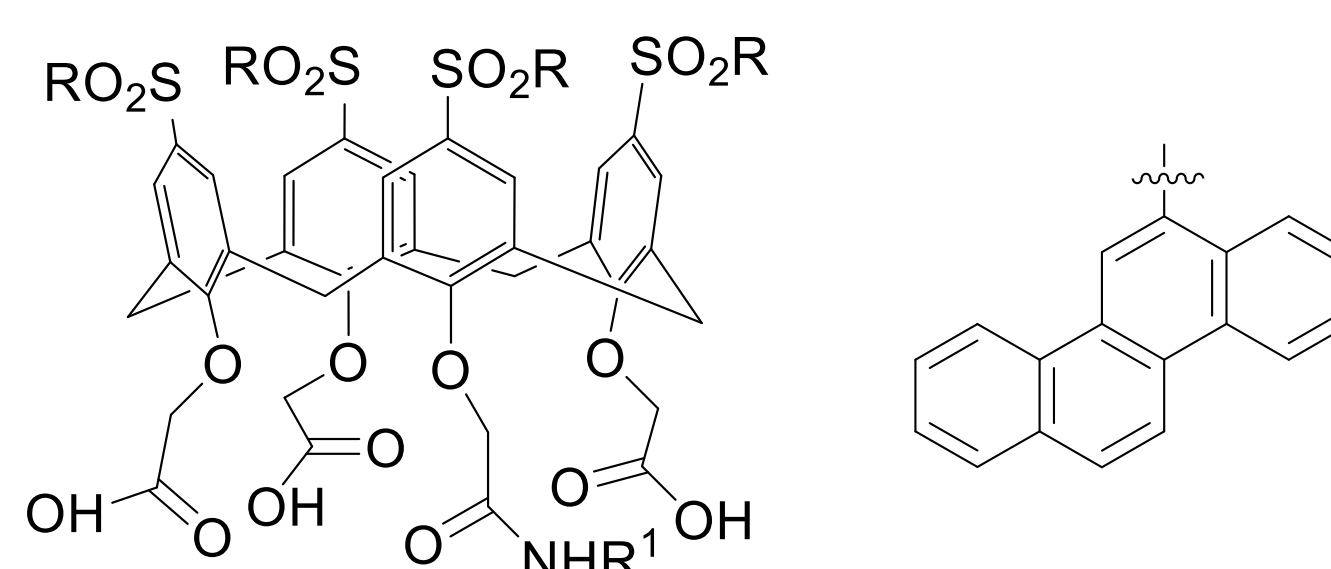
Ref. 52

## Ligand structure of Eu(III) complexes



(Solid)  $\tau$  = 0.74 ms,  $\Phi_{\text{ff}}$  = 56 %

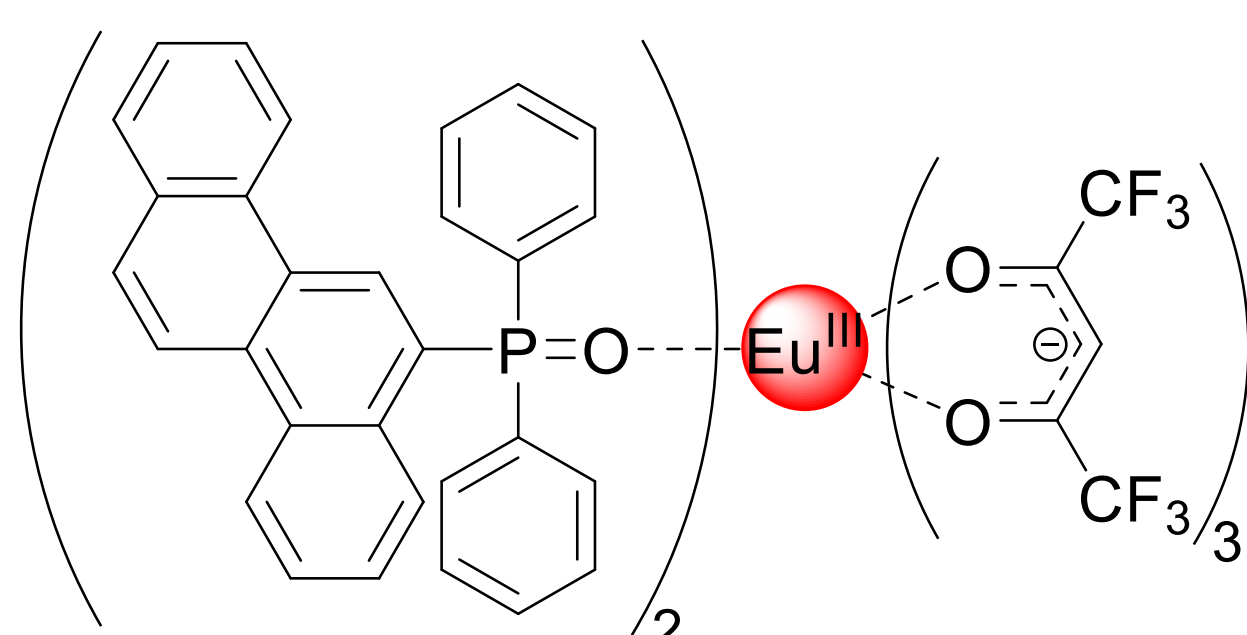
Ref. 53



R = NHCH<sub>2</sub>C(O)NC(CH<sub>2</sub>OH)<sub>3</sub>

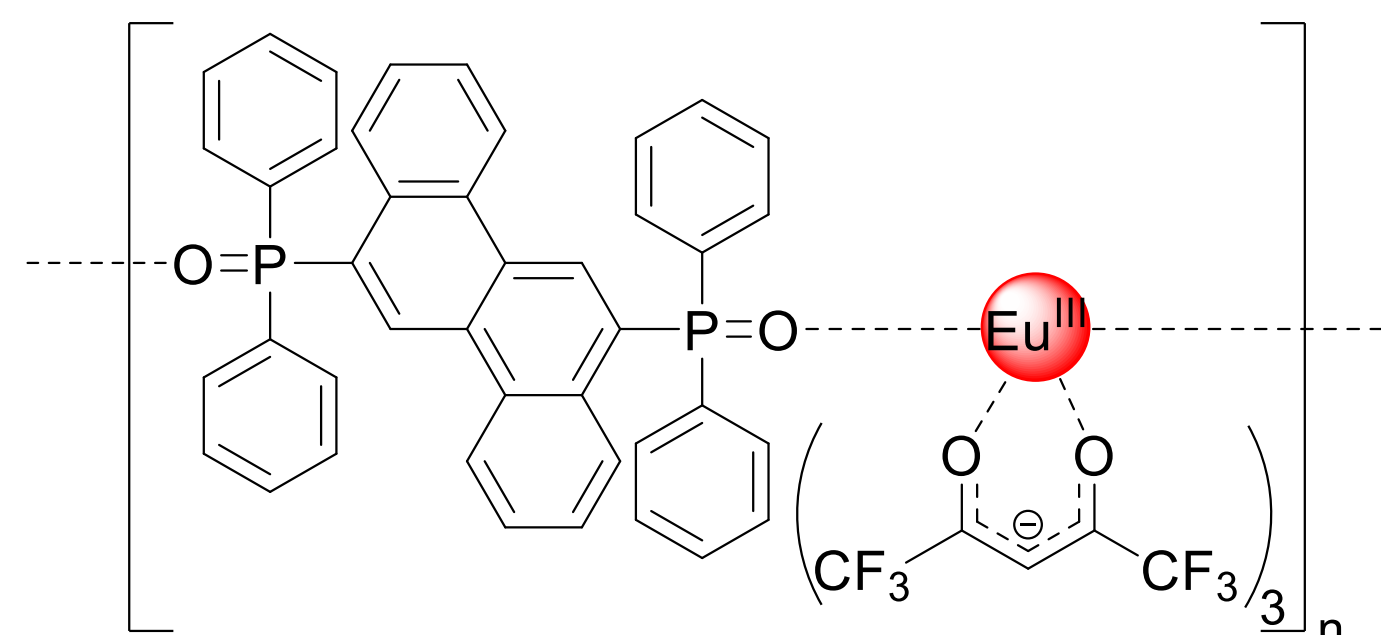
R<sup>1</sup> = CH<sub>2</sub>Chrysene

Ref. 54



(Solid)  $\tau$  = 0.65 ms,  $\Phi_{\text{tot}}$  = 22 %,  $\Phi_{\text{ff}}$  = 73 %,  $\Phi_{\text{ff}}$  = 73 %

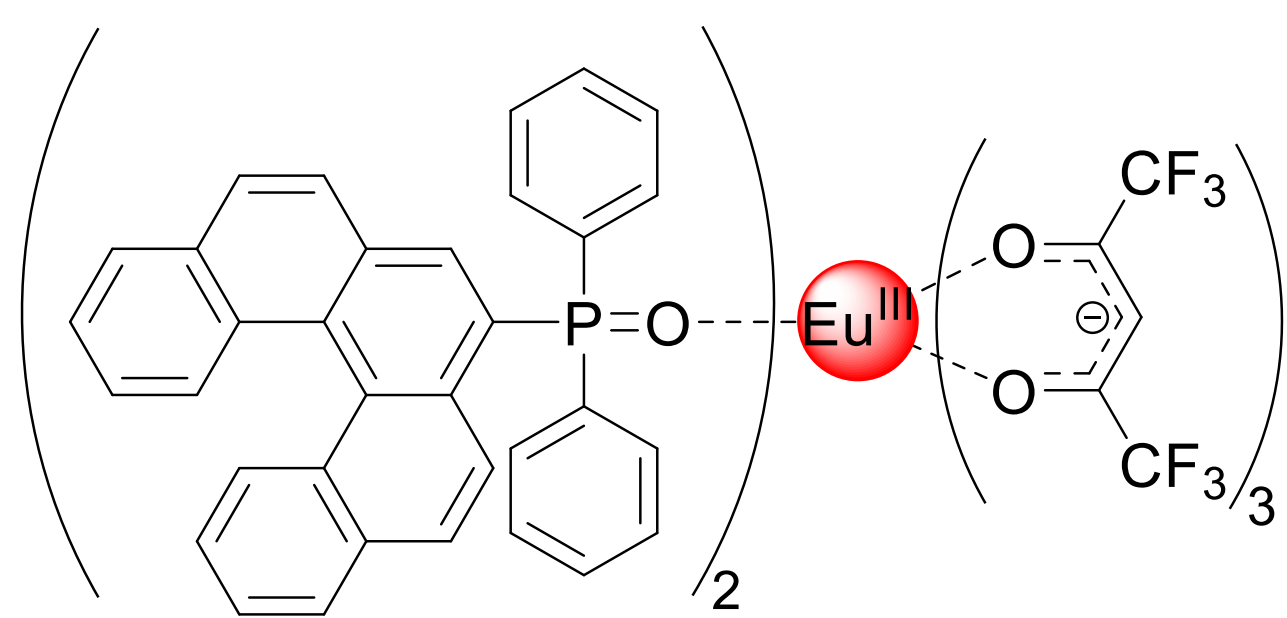
Ref. 55



(Solid)  $\tau$  = 0.77 ms,  $\Phi_{\text{tot}}$  = 36 %,  $\Phi_{\text{ff}}$  = 69 %

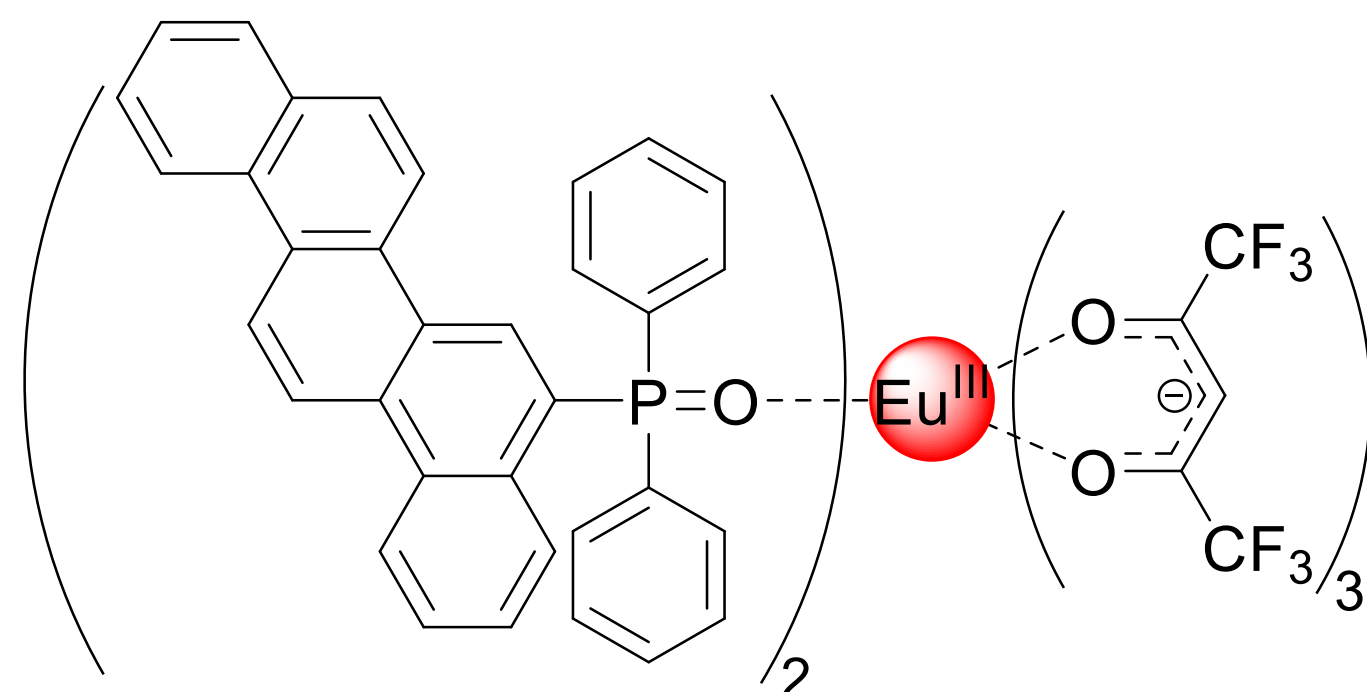
Ref. 56

Figure S1. Chemical structures of Eu(III) complexes



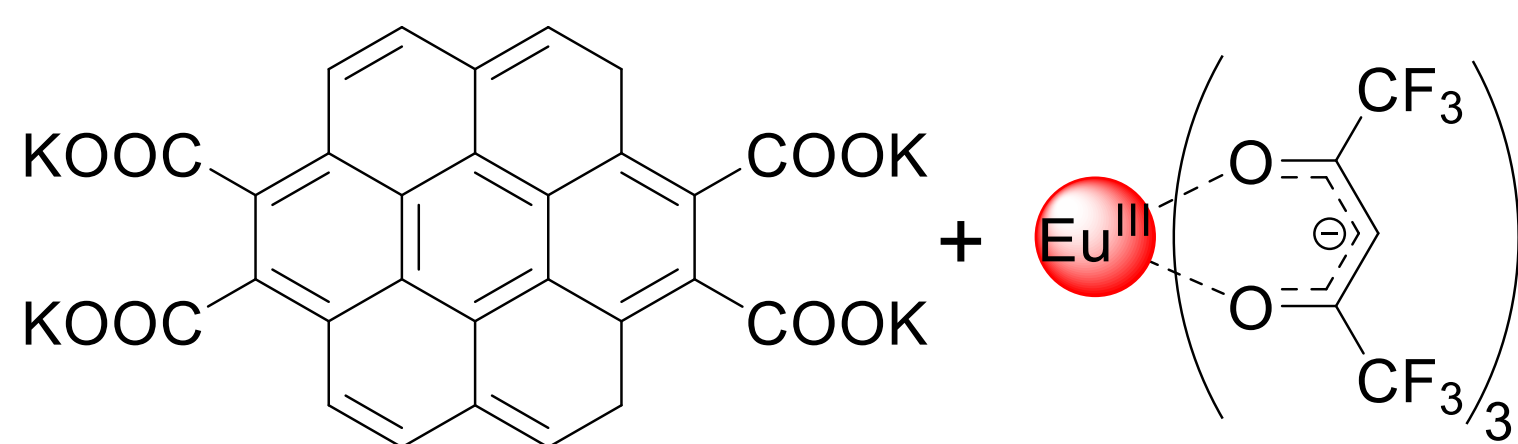
(Solid)  $\tau = 0.34$  ms,  $\Phi_{\text{tot}} = 3.6$  %,  $\Phi_{\text{ff}} = 36$  %

Ref. 44



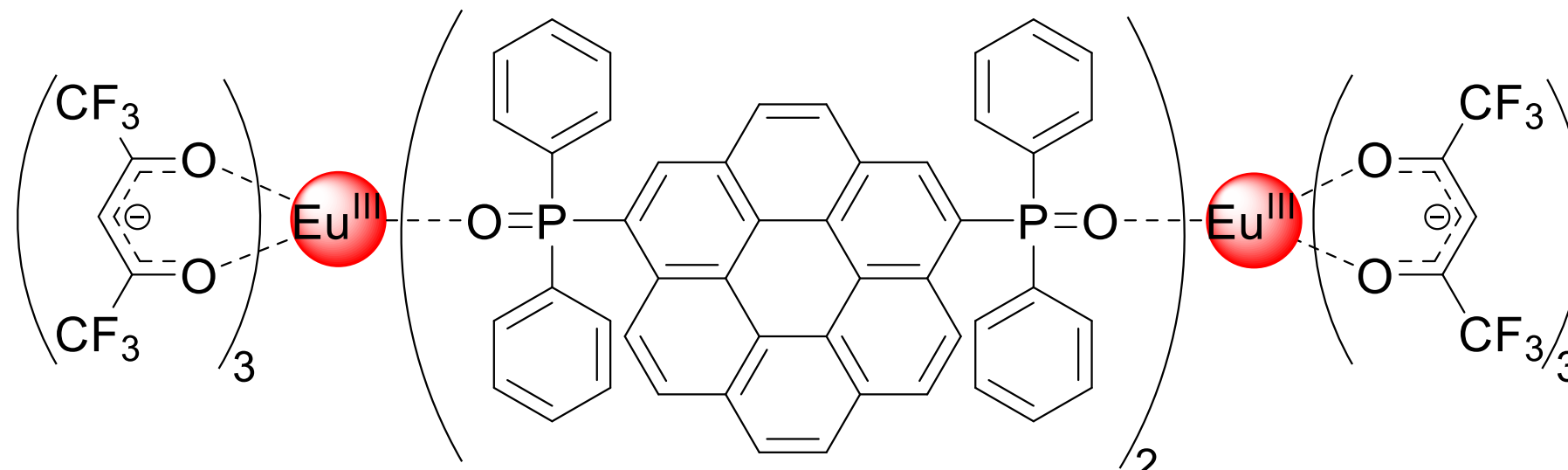
(Solid)  $\tau = 0.57$  ms (0.63 ms),  $\Phi_{\text{ff}} = 51$  % (52%)

Ref. 57



(PVA)  $\Phi_{\text{tot}} = 21 \sim 42$  %

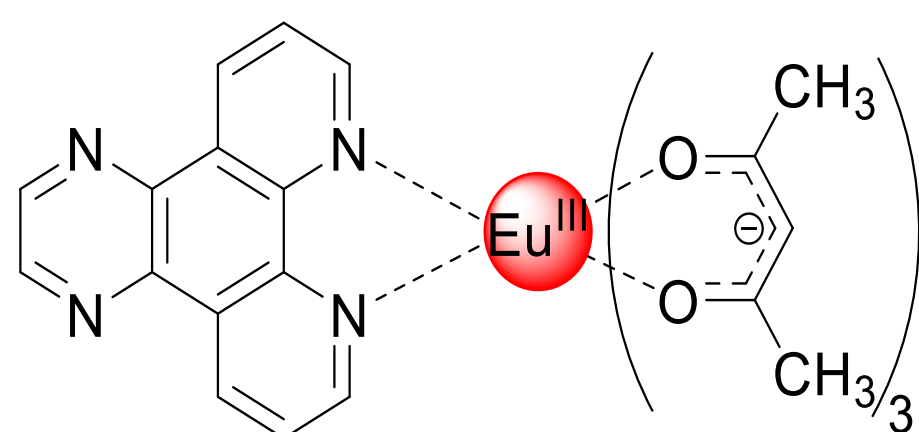
Ref. 58



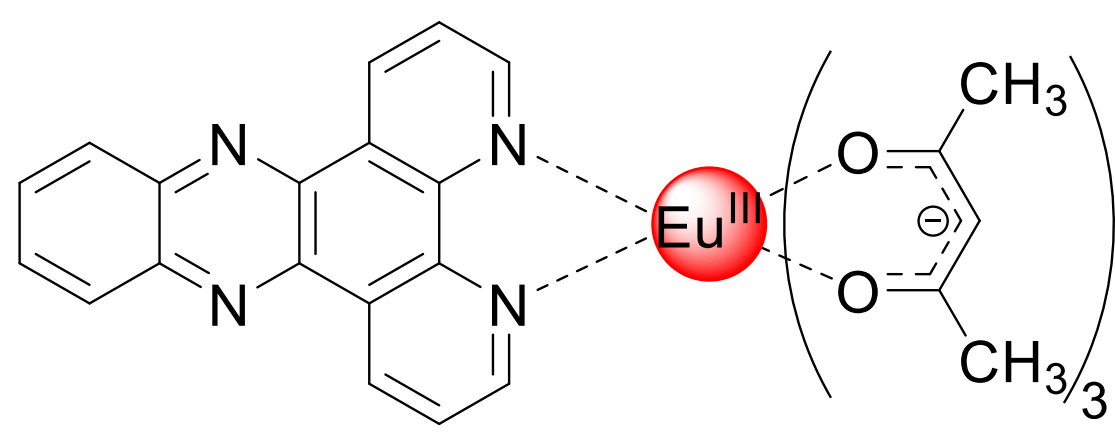
(CH<sub>2</sub>Cl<sub>2</sub>)  $\tau = 0.70$  ms,  $\Phi_{\text{tot}} = 36$  %

Ref. 59

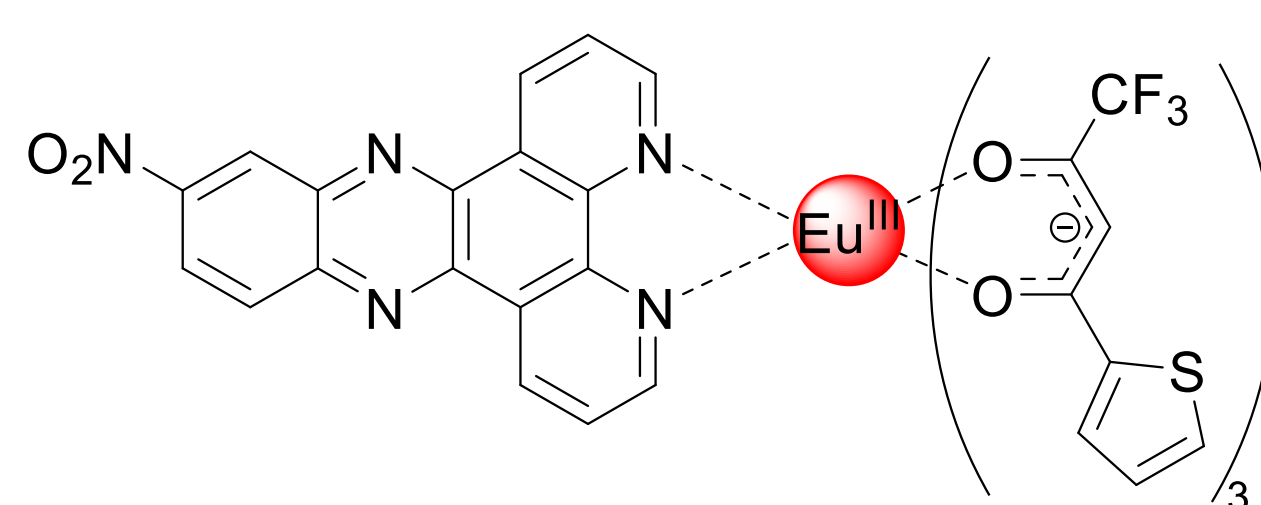
Figure S2. Chemical structures of Eu(III) complexes



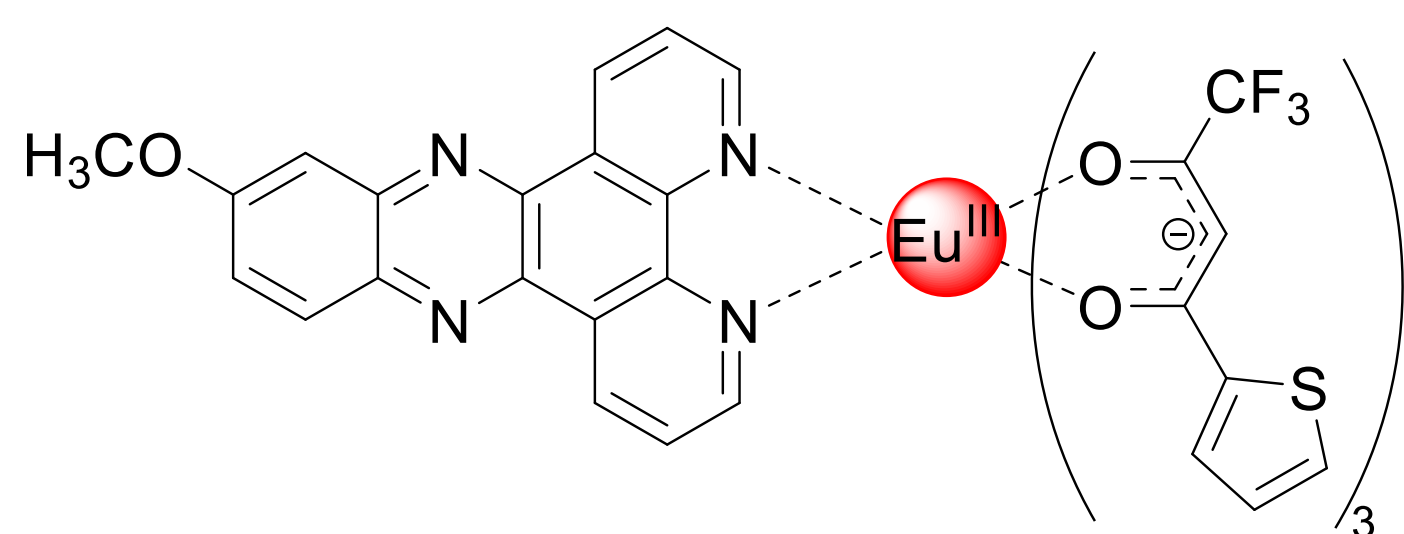
Ref. 60



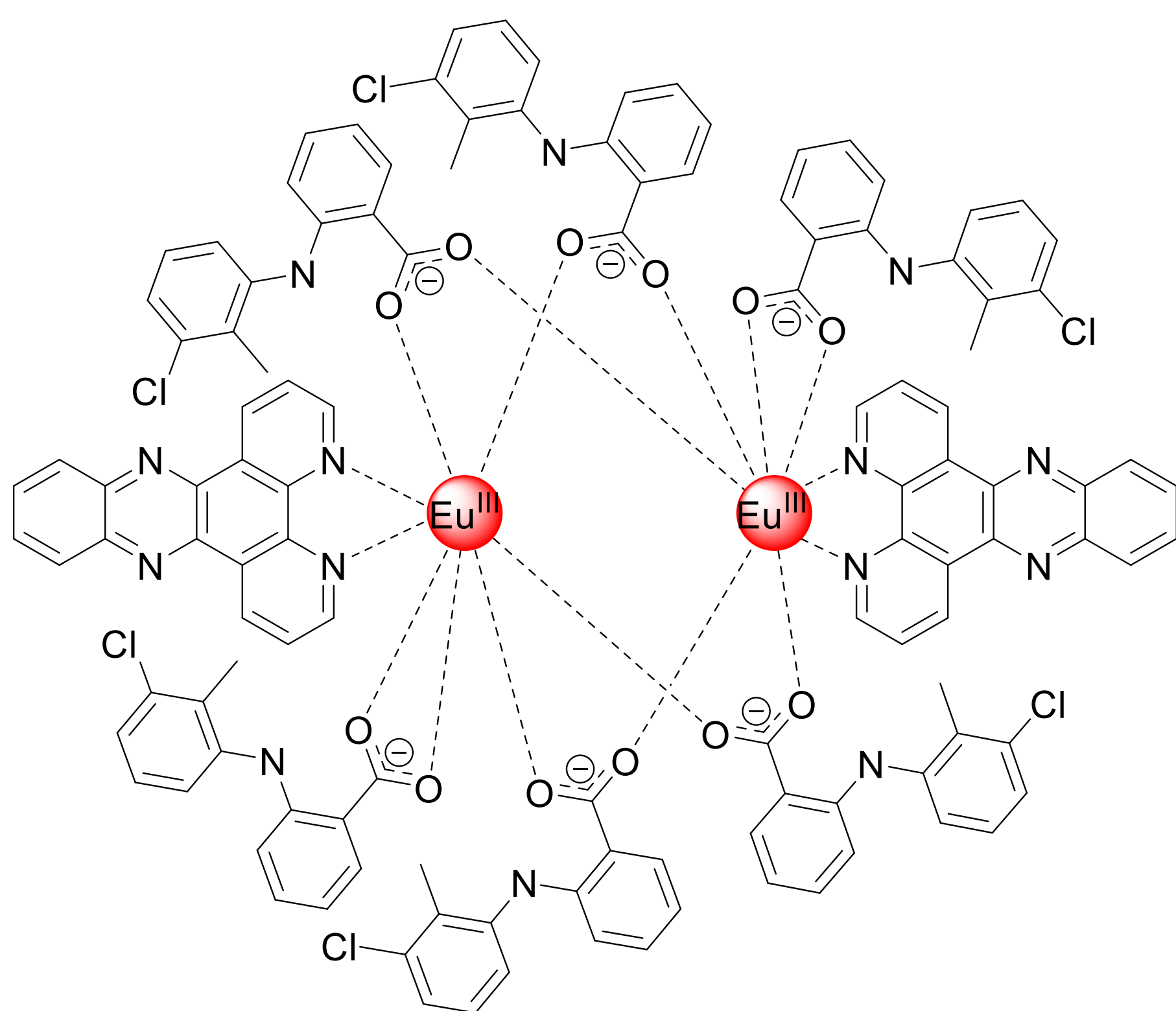
Ref. 60



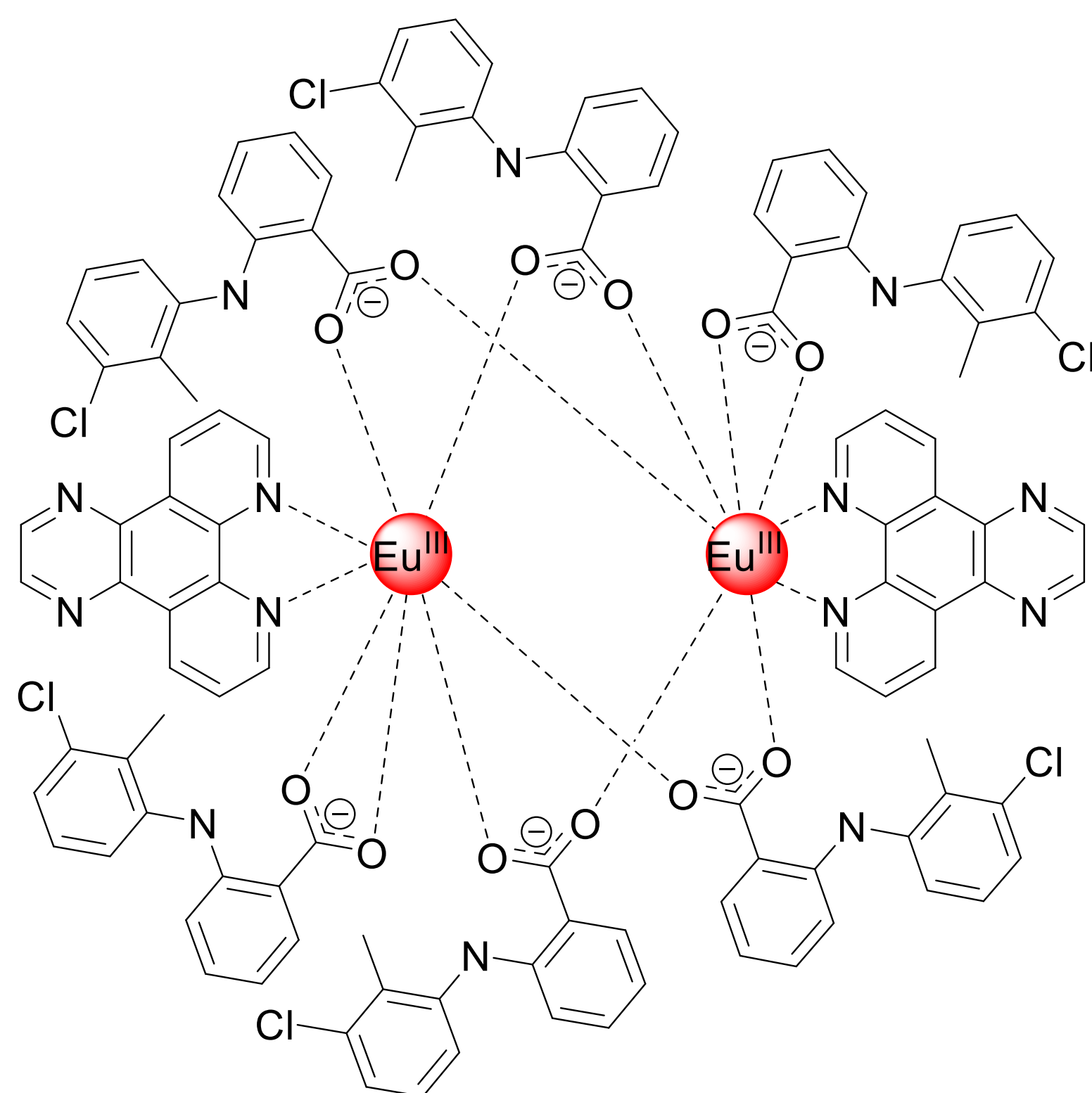
Ref. 61



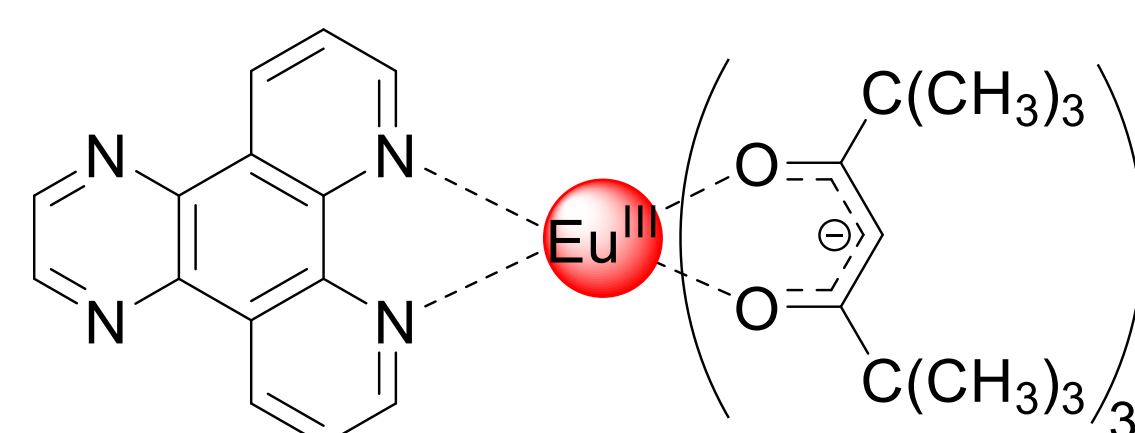
Ref. 61



Ref. 62



Ref. 62

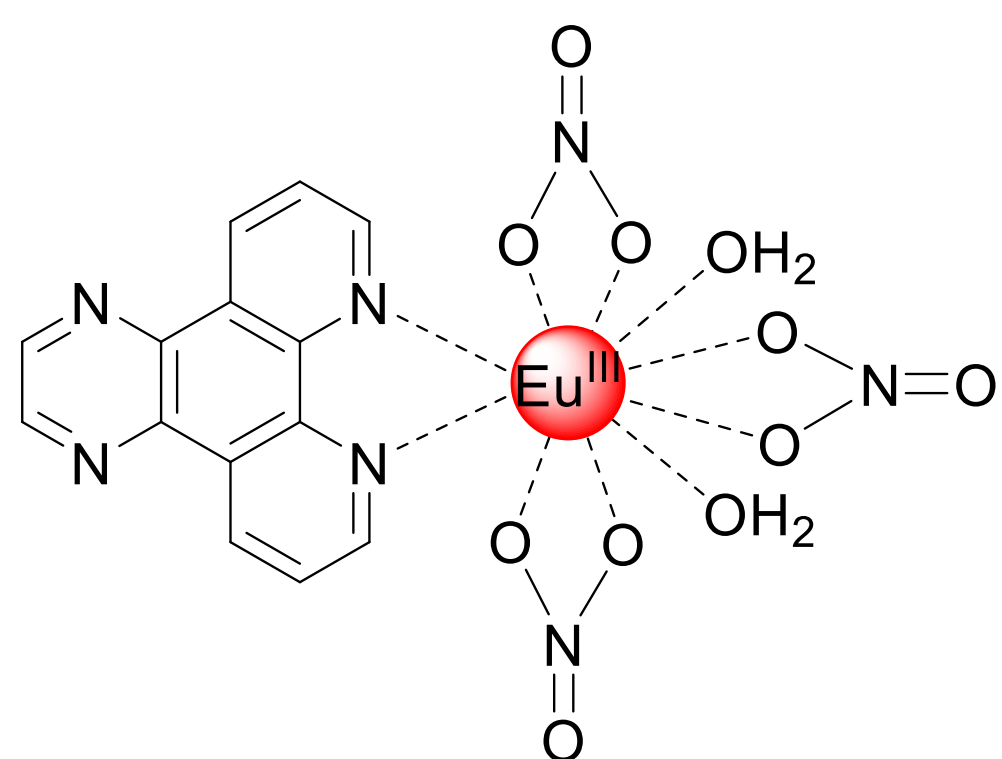


(Solid)  $\tau = 0.72$  ms,  $\Phi_{\text{tot}} = 5.7$  %,  $\Phi_{\text{ff}} = 54$  %  
(CH<sub>2</sub>Cl<sub>2</sub>)  $\tau = 0.76$  ms,  $\Phi_{\text{tot}} = 1.2$  %,  $\Phi_{\text{ff}} = 61$  %

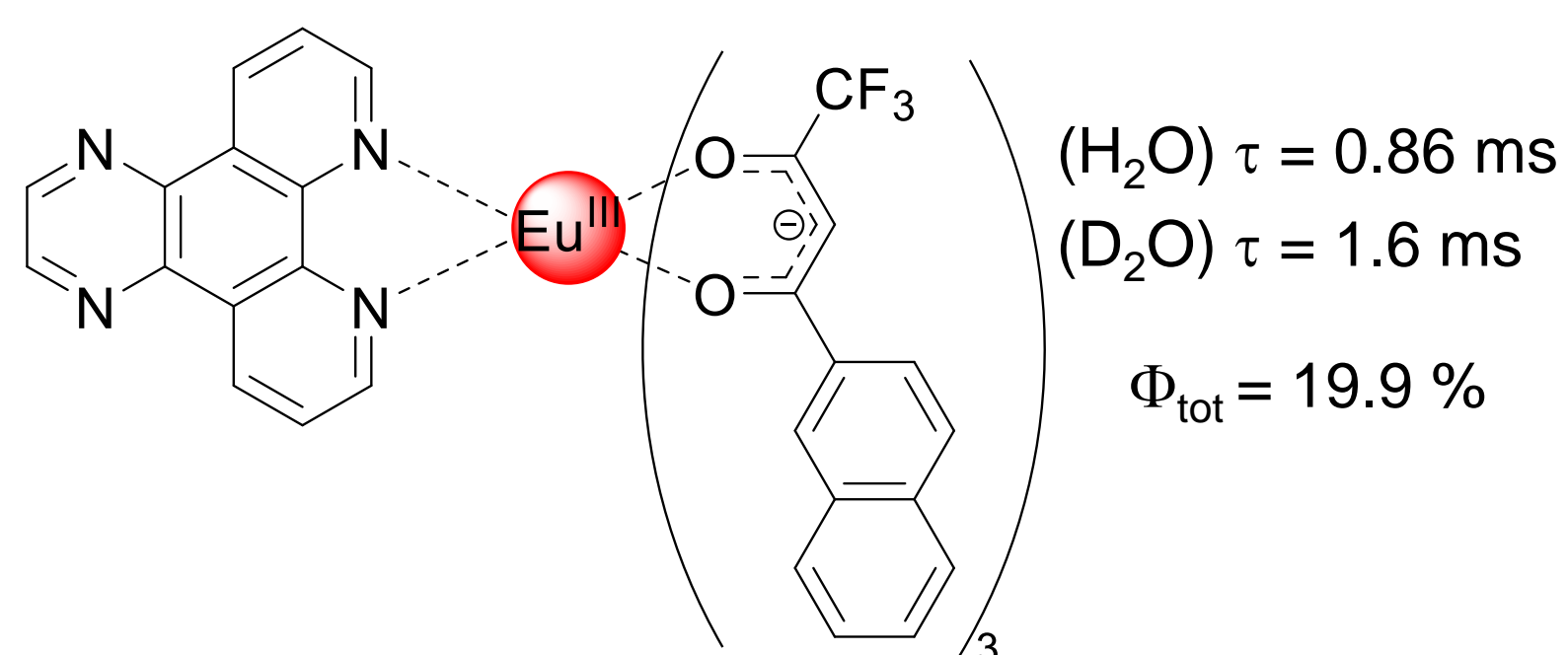
Ref. 63

Figure S3. Chemical structures of Eu(III) complexes

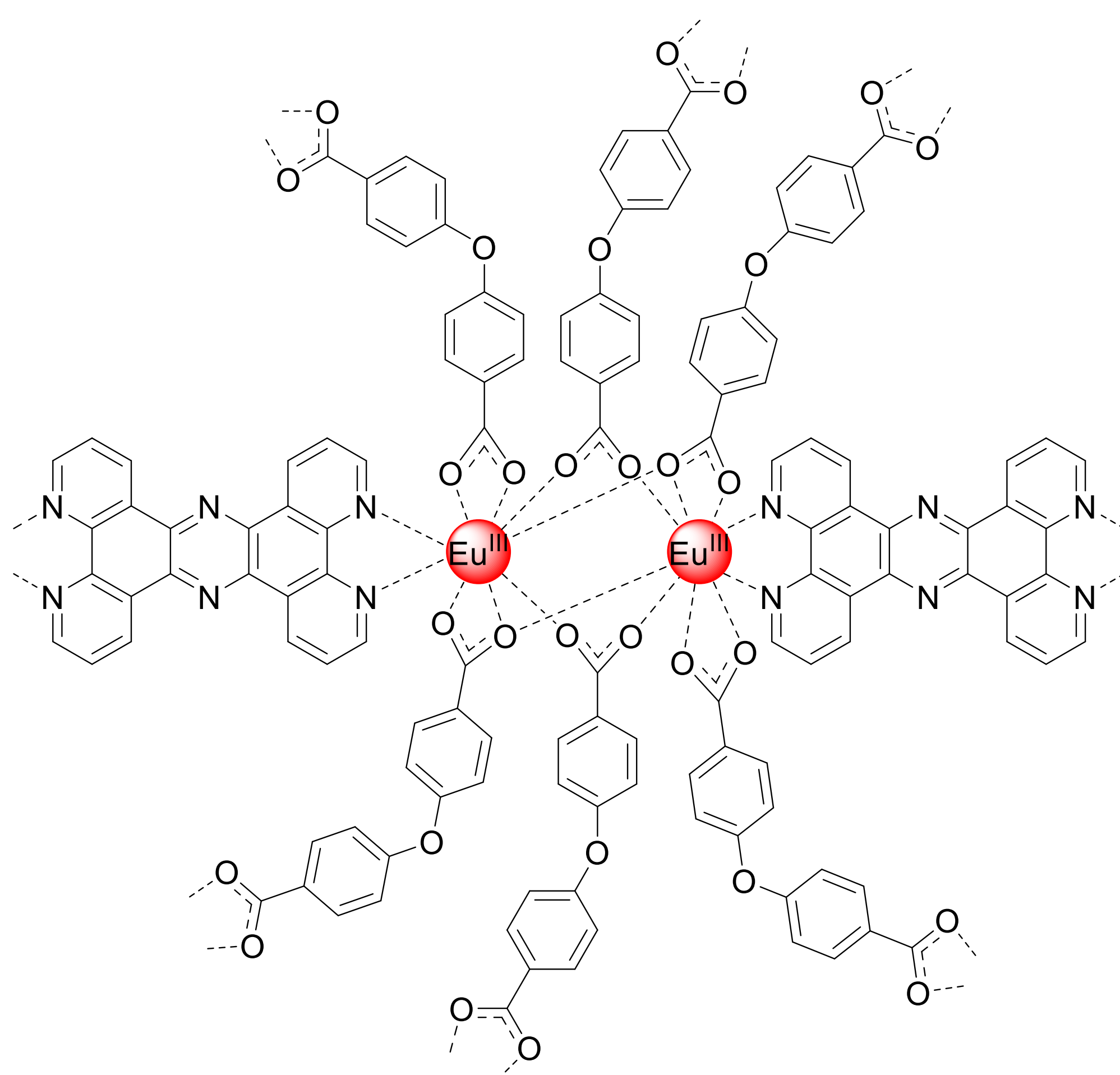




Ref. 64

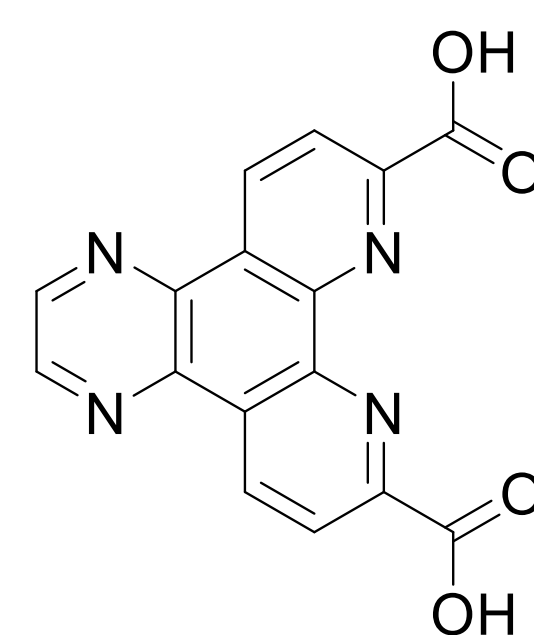


Ref. 64

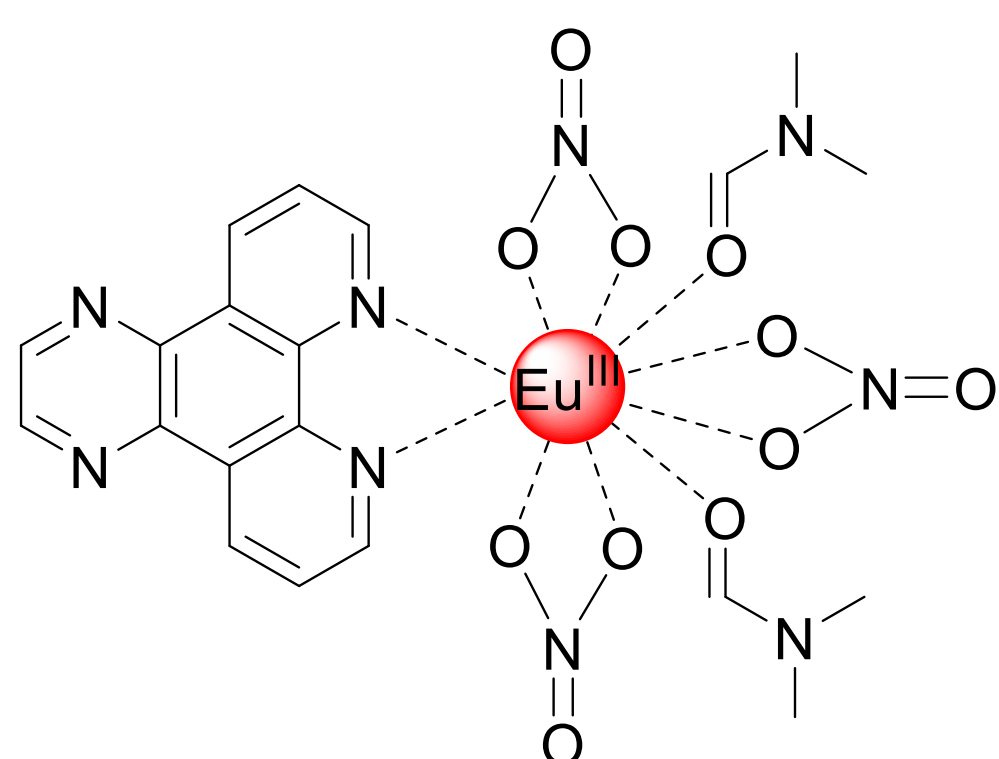


Ref. 65

(Ligand)

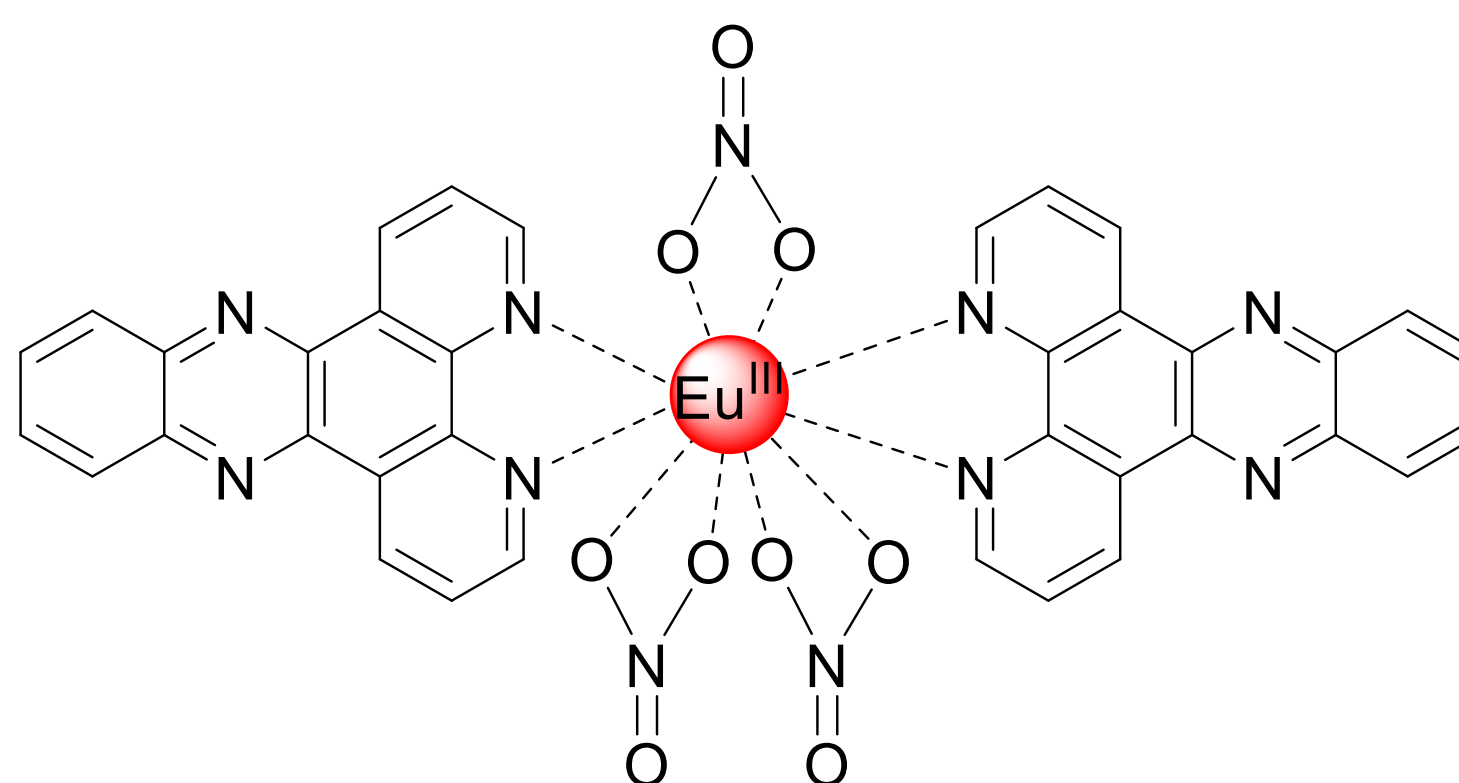


Ref. 66



(DMF)  $\tau$  = 0.467 ms,  $\Phi_{\text{tot}}$  = 32.5 %

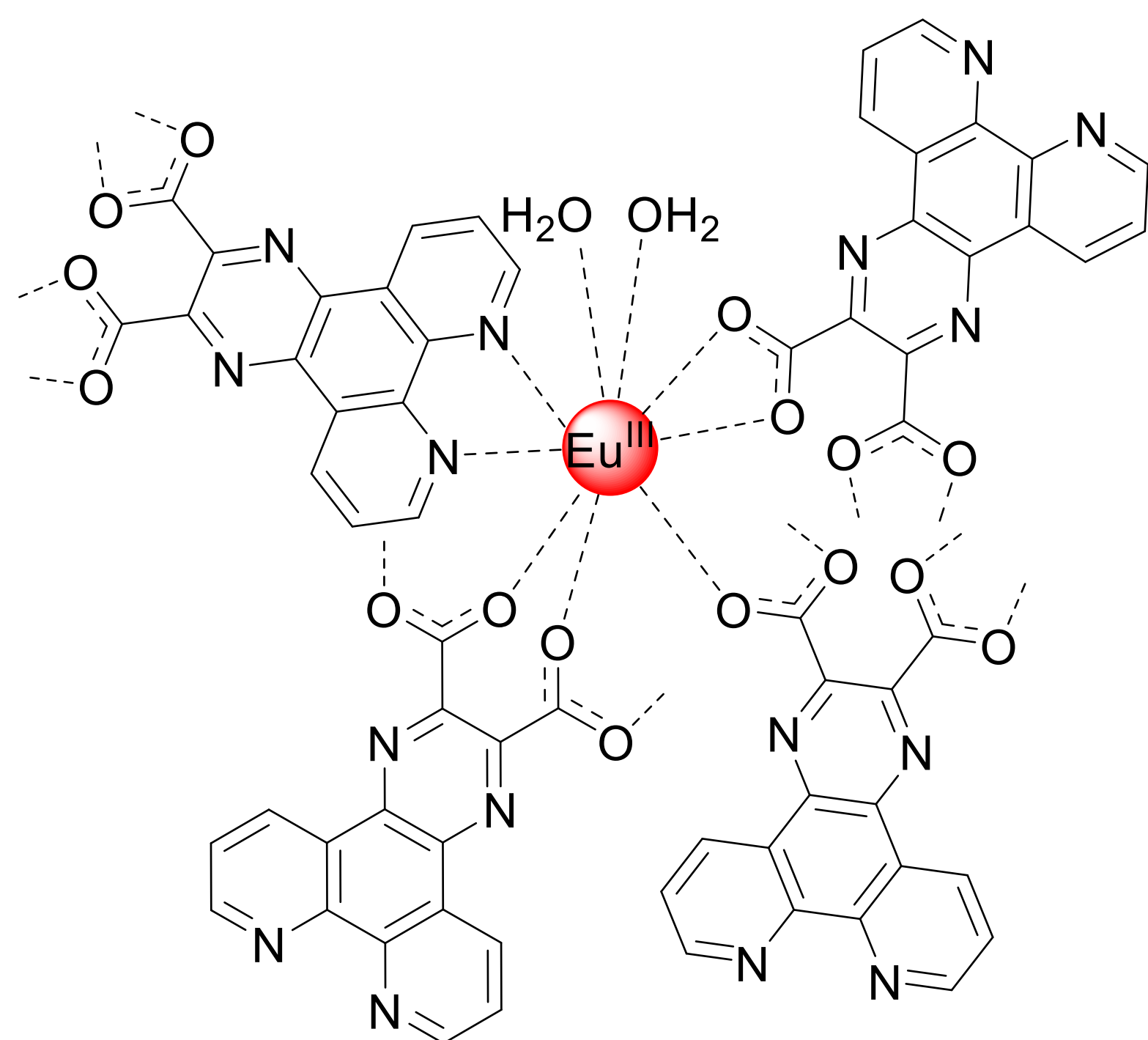
Ref. 67



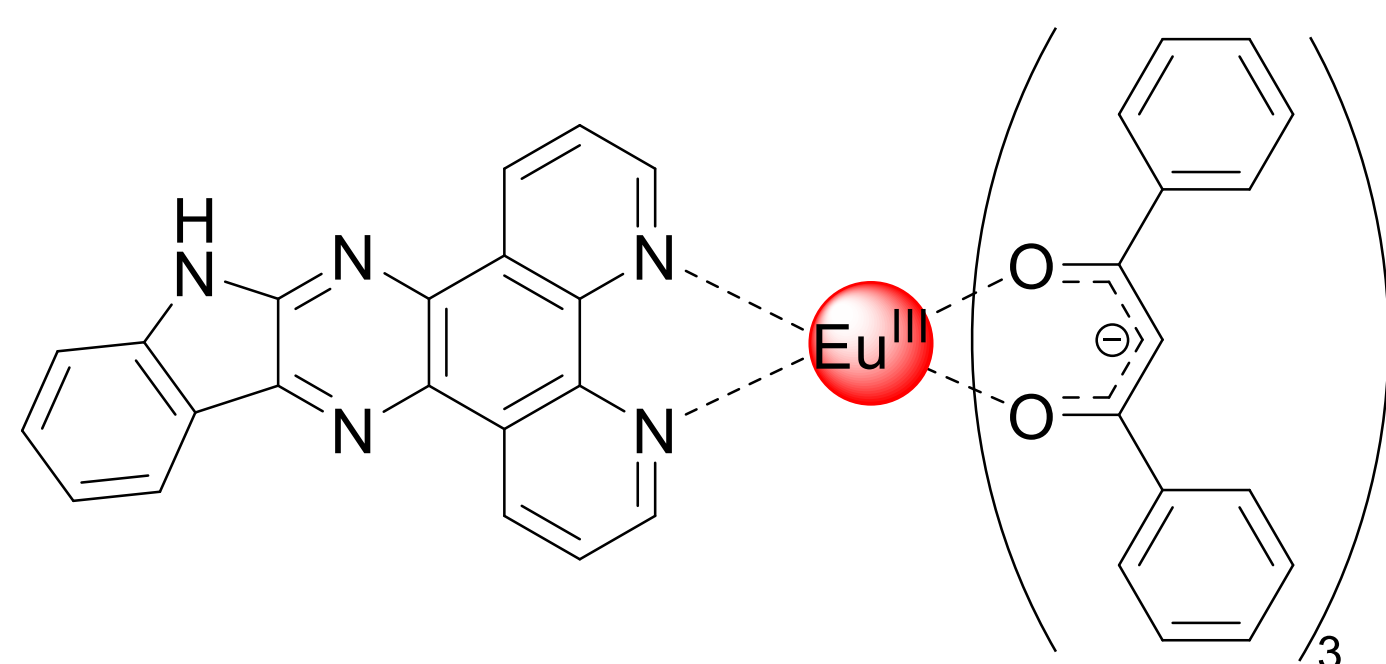
(DMF)  $\tau$  = 0.492 ms,  $\Phi_{\text{tot}}$  = 38.5 %

Ref. 67

Figure S4. Chemical structures of Eu(III) complexes

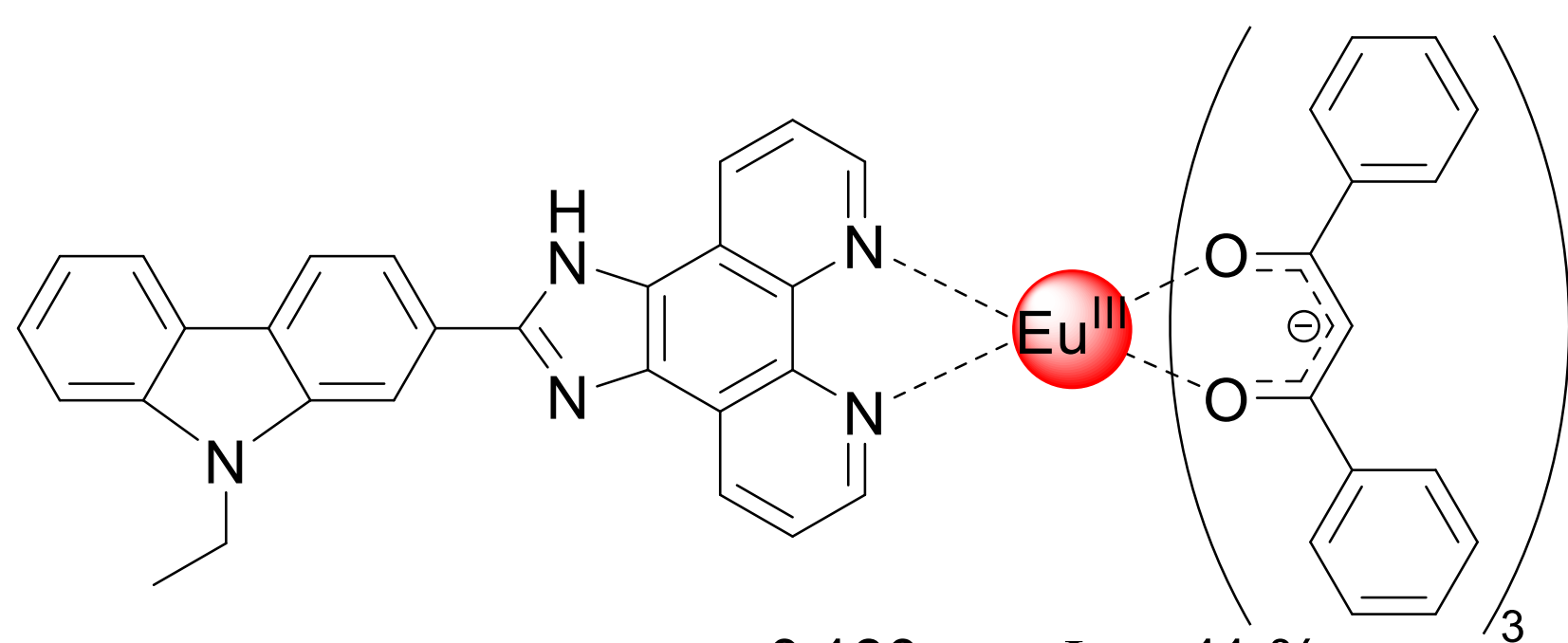


Ref. 68, 69



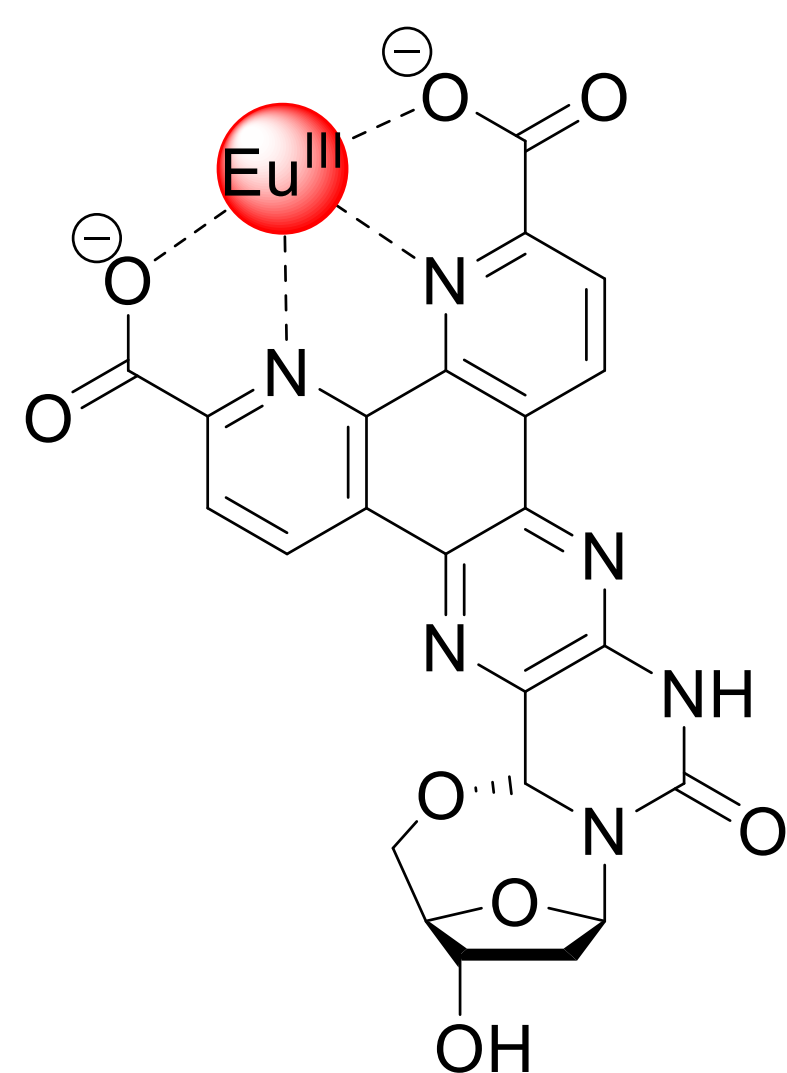
$\tau = 0.403$  ms,  $\Phi_{\text{ff}} = 53$  %

Ref. 70

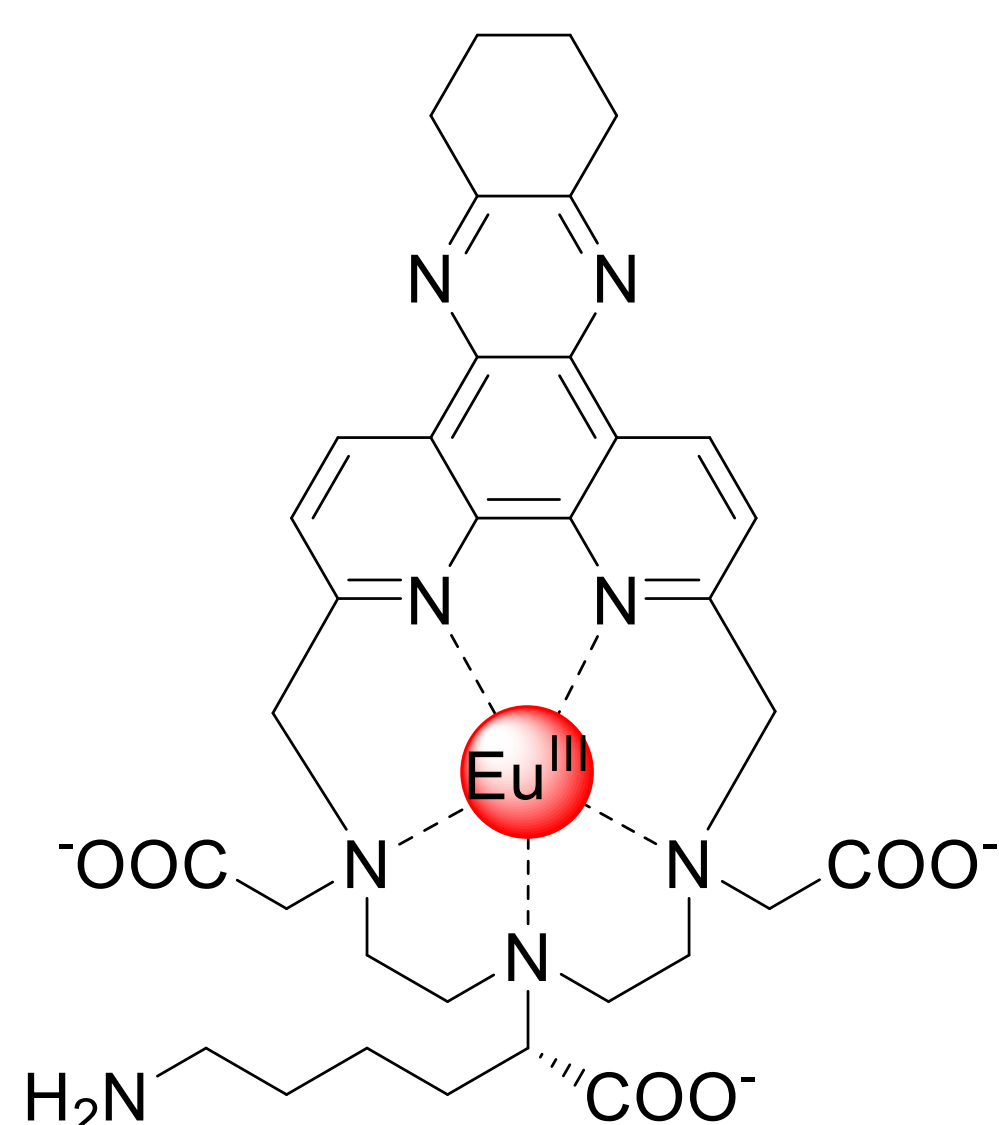


$\tau = 0.190$  ms,  $\Phi_{\text{ff}} = 11$  %

Ref. 70



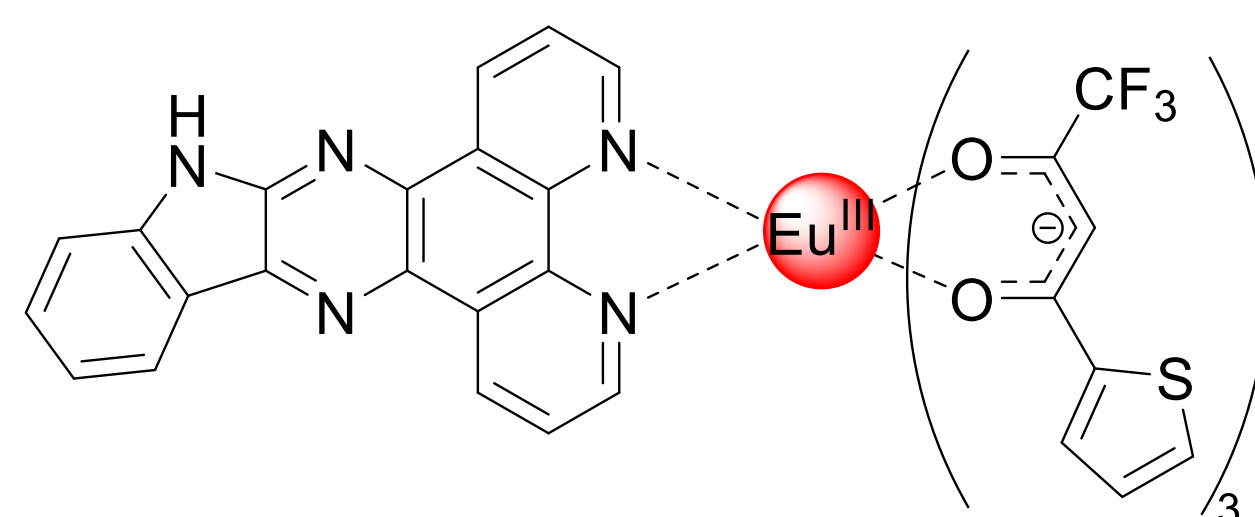
Ref. 72



(H<sub>2</sub>O)  $\tau = 0.46$  ms,  $\Phi_{\text{tot}} = 3$  %

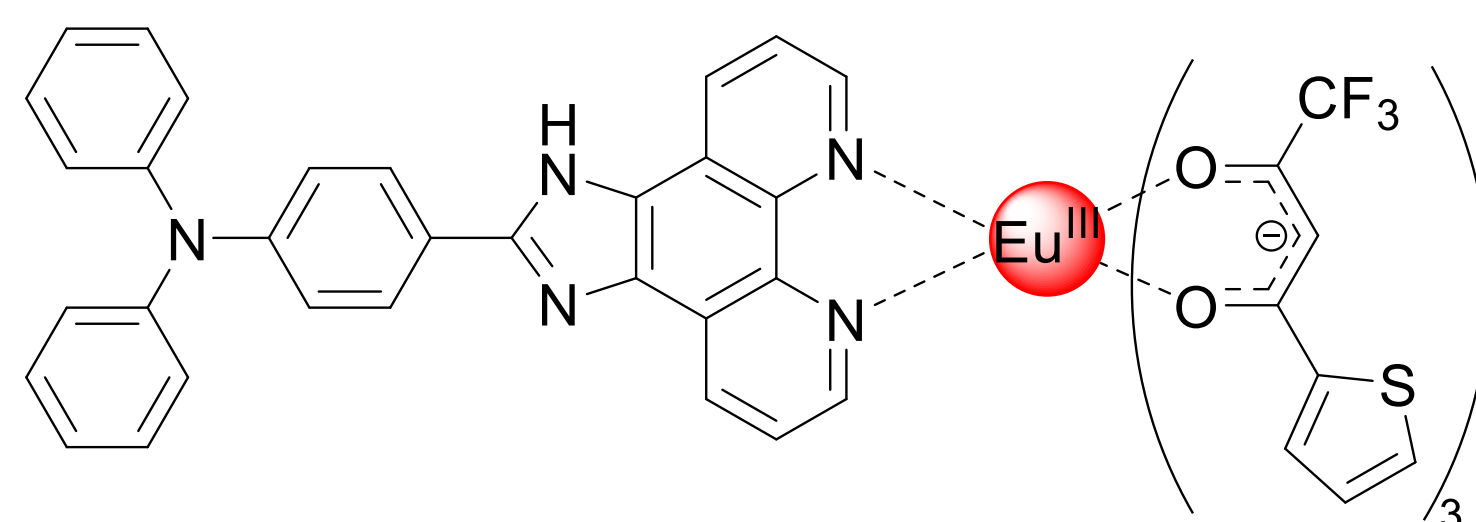
(D<sub>2</sub>O)  $\tau = 1.49$  ms

Ref. 73



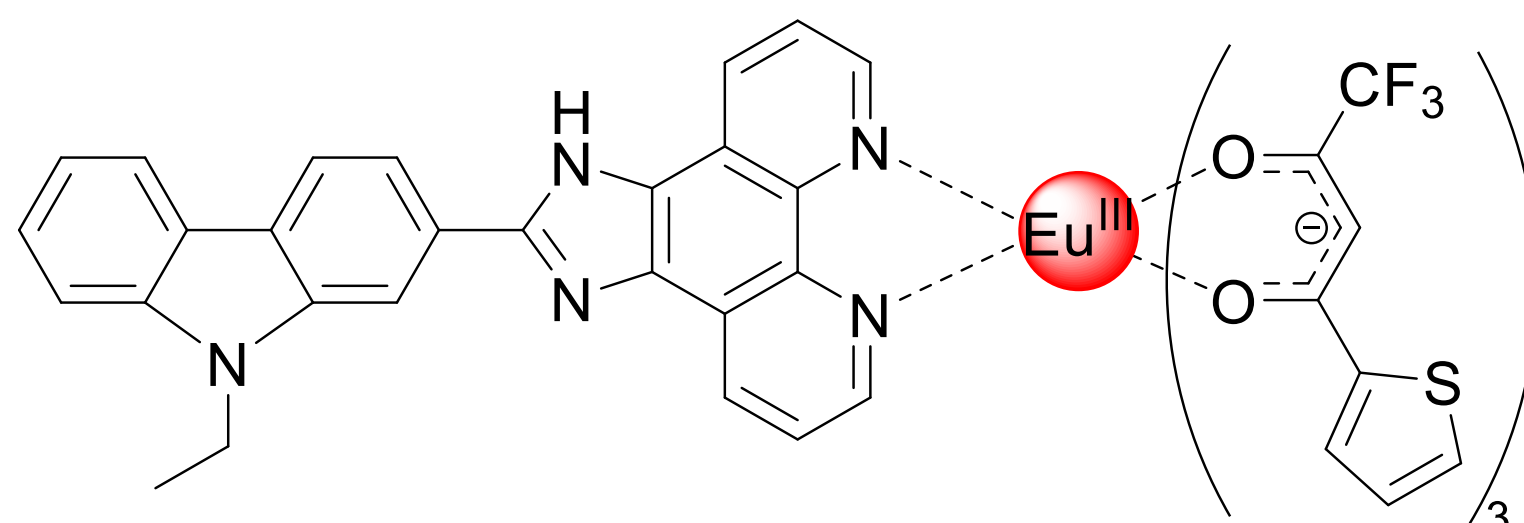
$\tau = 0.308$  ms,  $\Phi_{\text{ff}} = 46$  %

Ref. 70



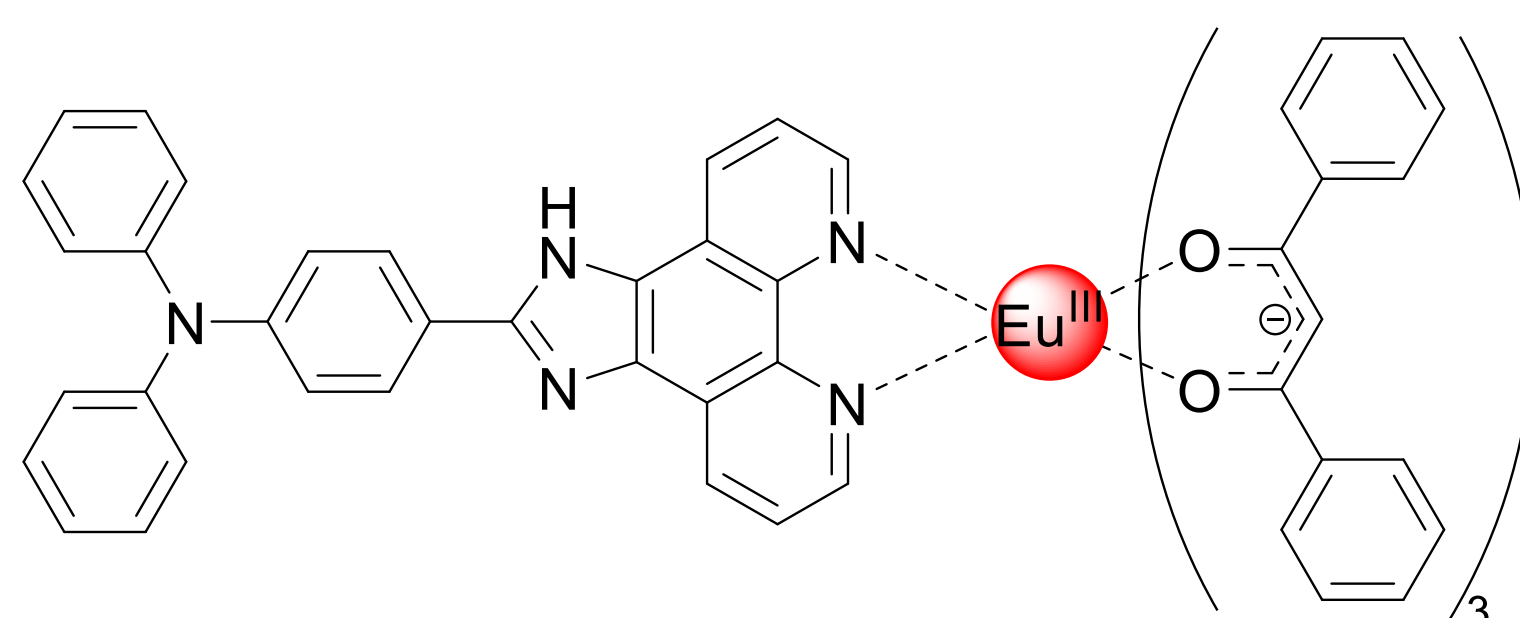
$\tau = 0.269$  ms,  $\Phi_{\text{ff}} = 33$  %

Ref. 70



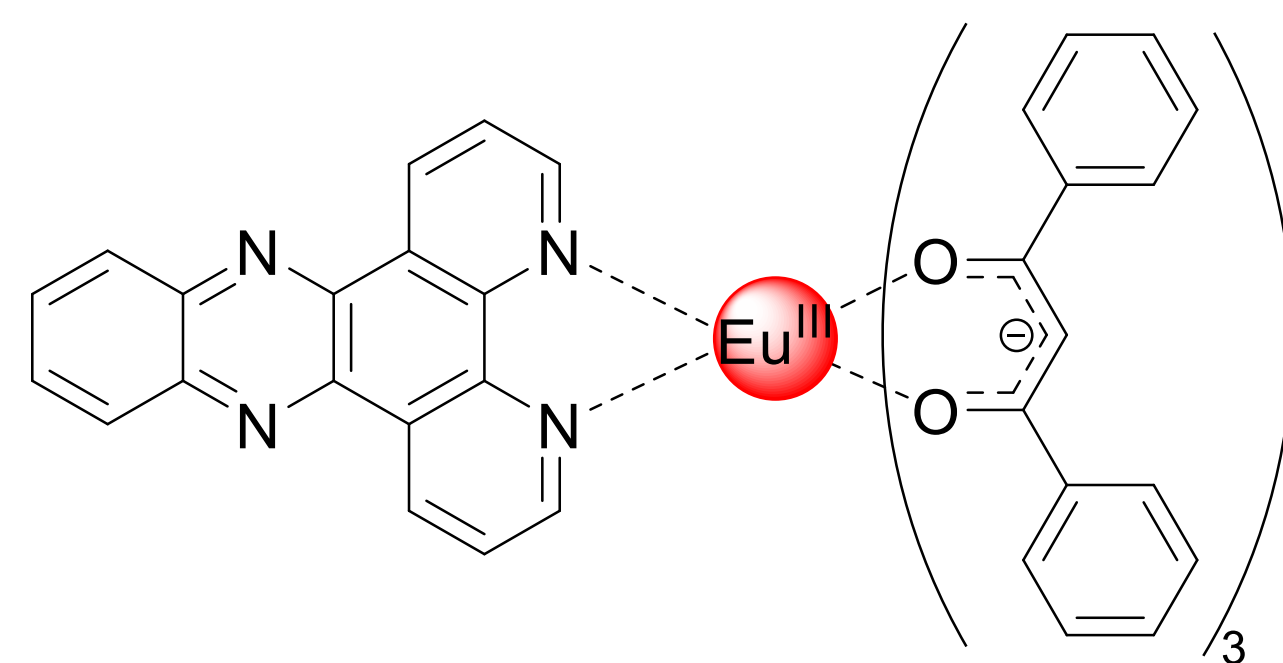
$\tau = 0.190$  ms,  $\Phi_{\text{ff}} = 15$  %

Ref. 70



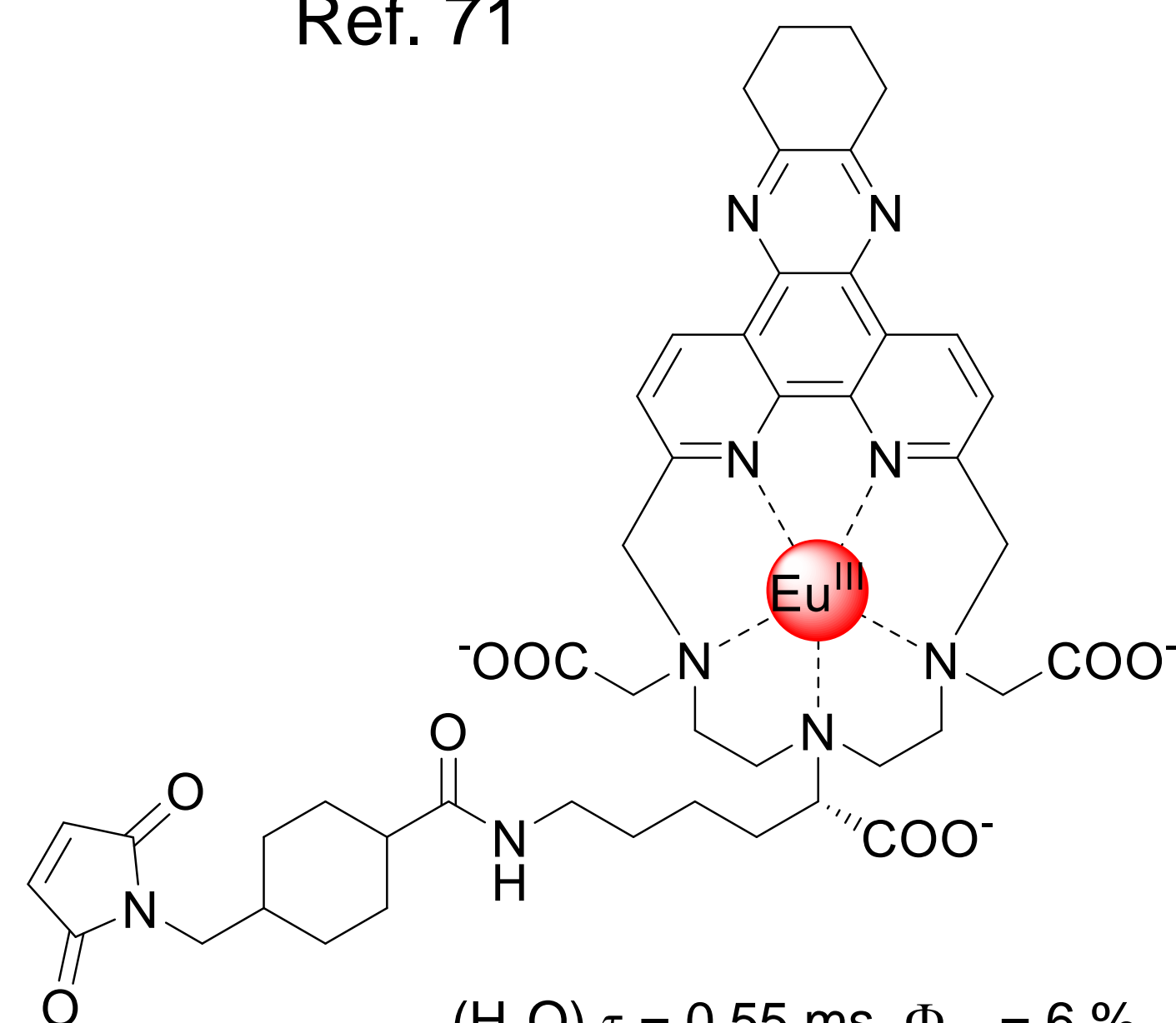
$\tau = 0.301$  ms,  $\Phi_{\text{ff}} = 34$  %

Ref. 70



$\tau = 0.053$  ms,  $\Phi_{\text{tot}} = 0.65$  %

Ref. 71

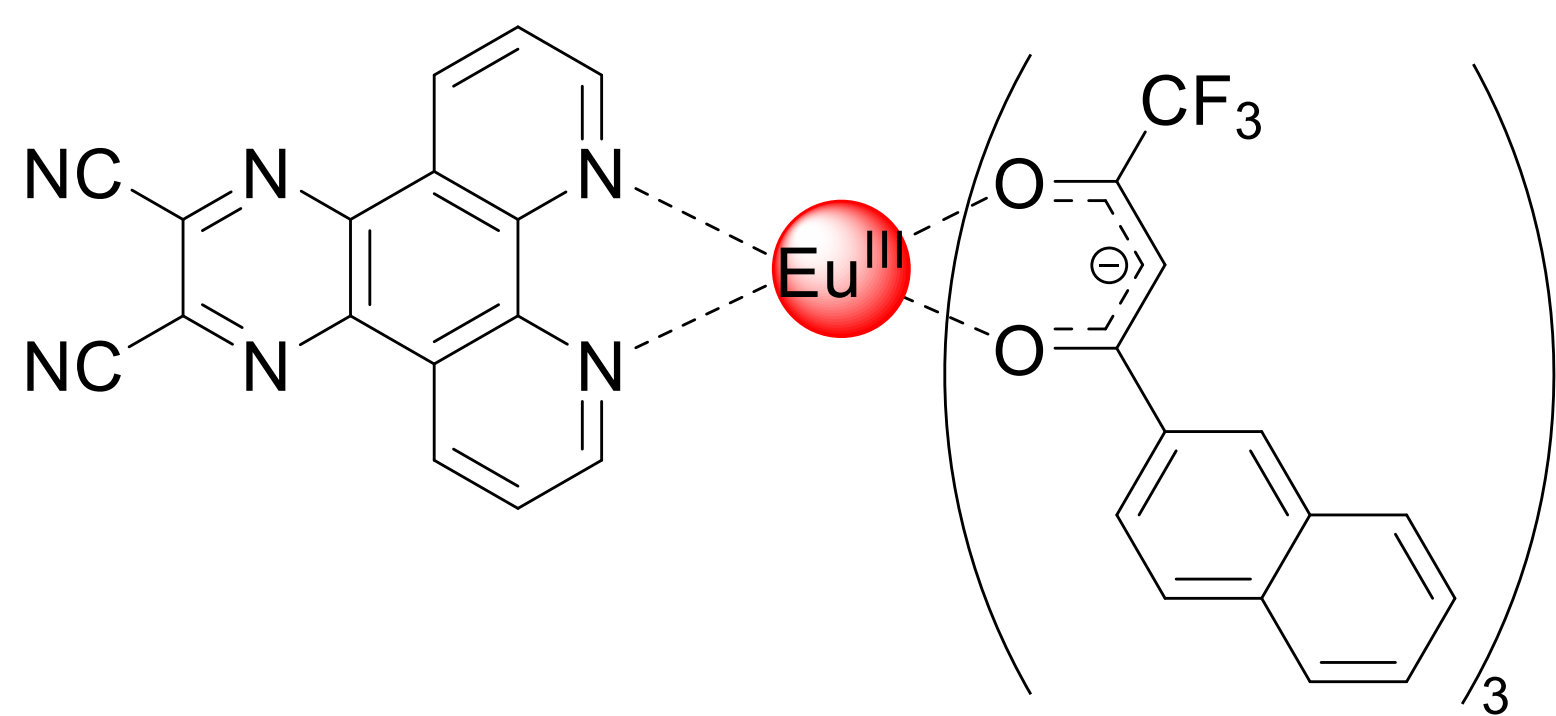


(H<sub>2</sub>O)  $\tau = 0.55$  ms,  $\Phi_{\text{tot}} = 6$  %

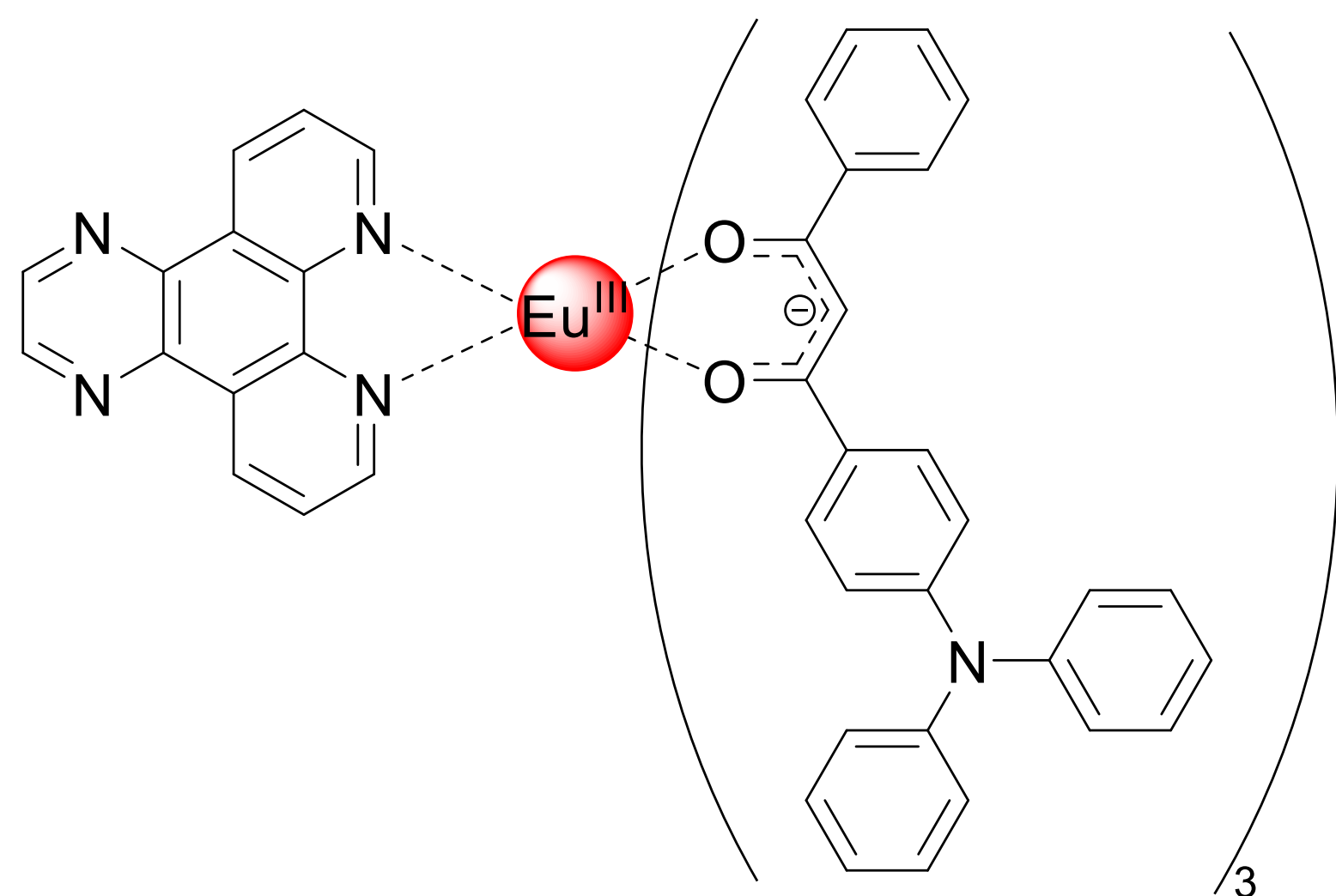
(D<sub>2</sub>O)  $\tau = 1.62$  ms

Ref. 73

Figure S5. Chemical structures of Eu(III) complexes

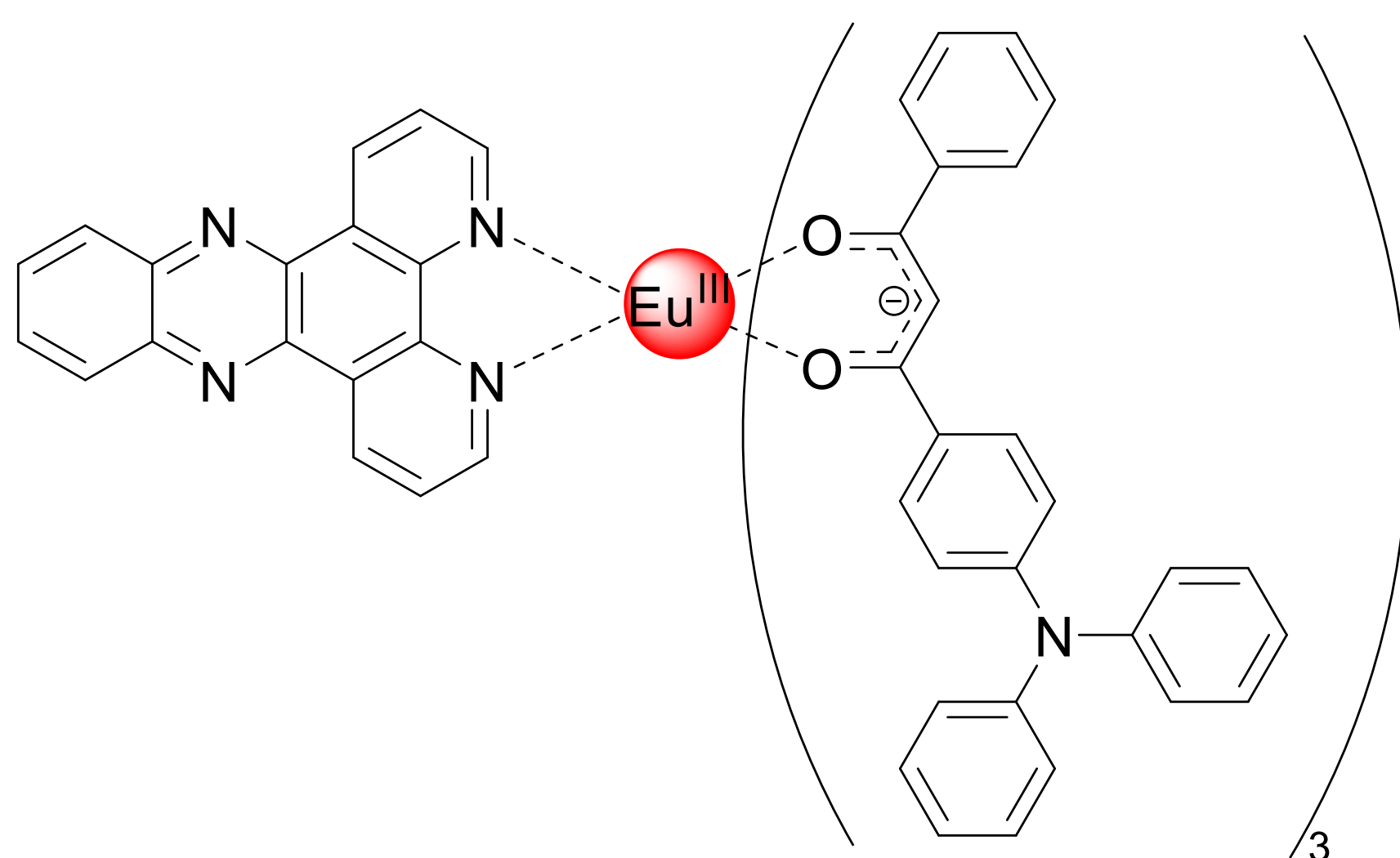


Ref. 74



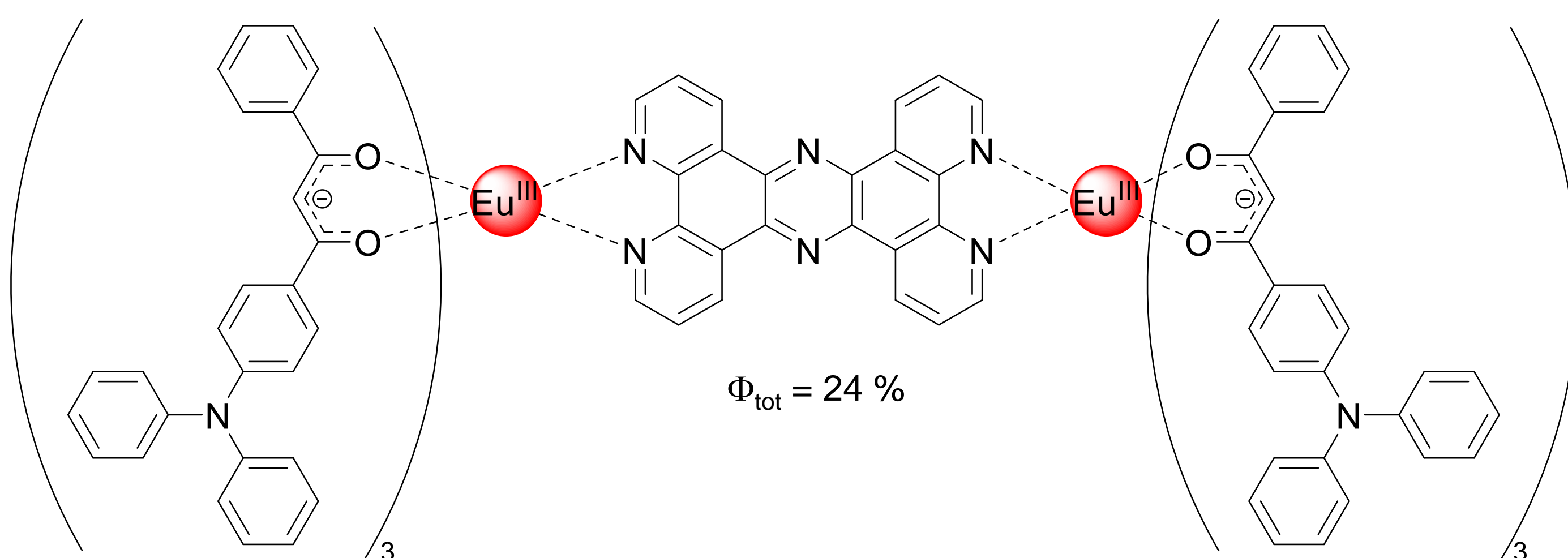
$\Phi_{\text{tot}} = 24 \%$

Ref. 75



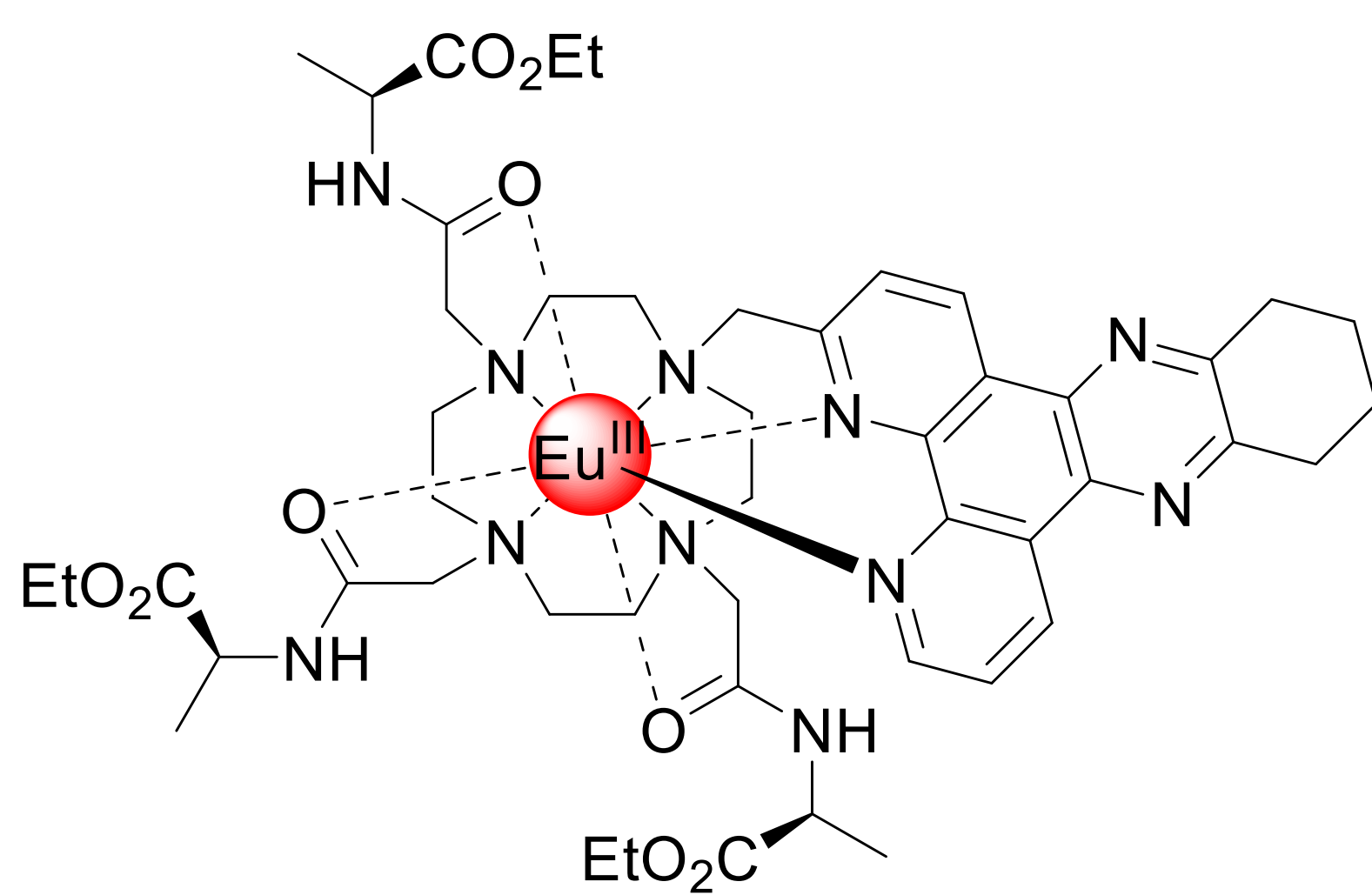
$\Phi_{\text{tot}} = 17 \%$

Ref. 75

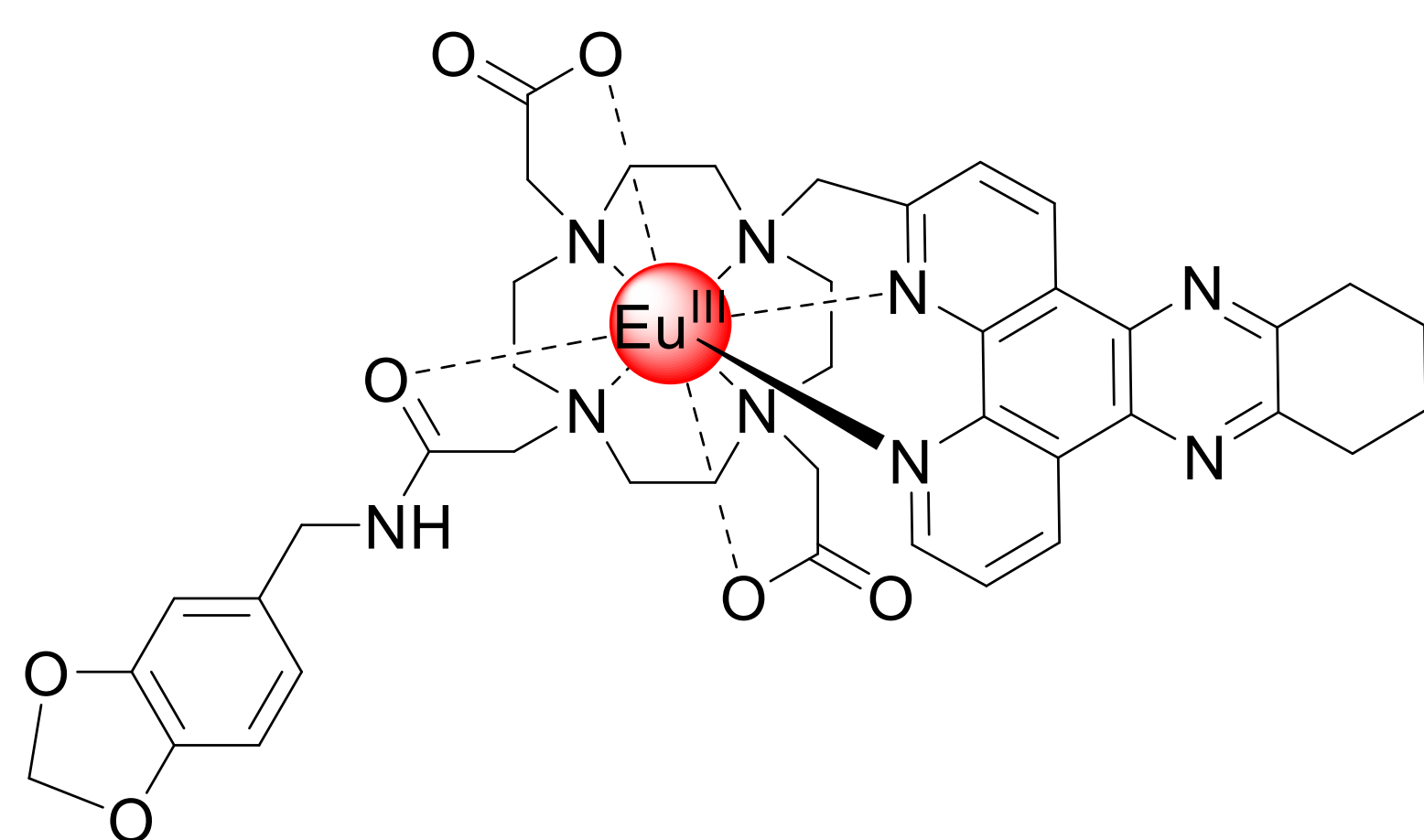


$\Phi_{\text{tot}} = 24 \%$

Ref. 75



Ref. 76



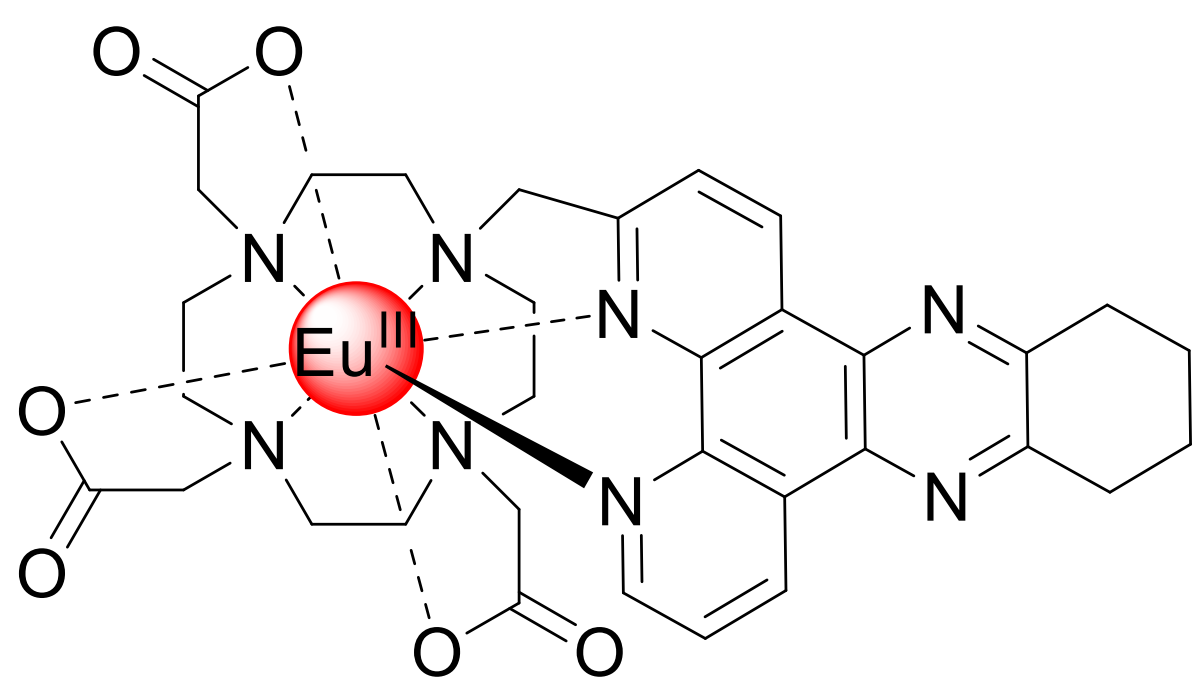
(H<sub>2</sub>O)  $\tau = 0.69$  ms,  $\Phi_{\text{tot}} = 5 \%$

(D<sub>2</sub>O)  $\tau = 1.01$  ms

Ref. 76

Figure S6. Chemical structures of Eu(III) complexes

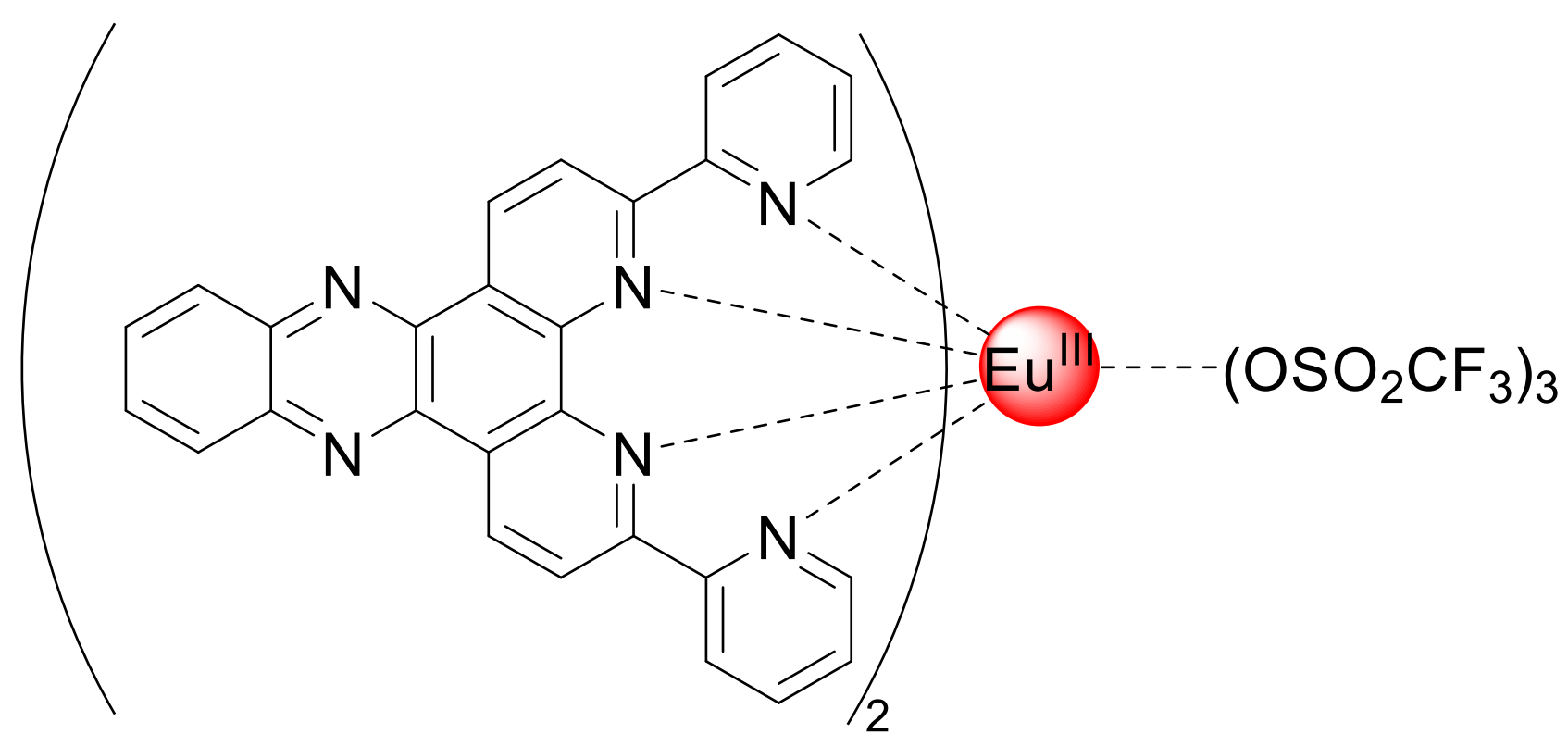




(H<sub>2</sub>O)  $\tau = 1.08$  ms,  $\Phi_{\text{tot}} = 18$  %

(D<sub>2</sub>O)  $\tau = 1.67$  ms

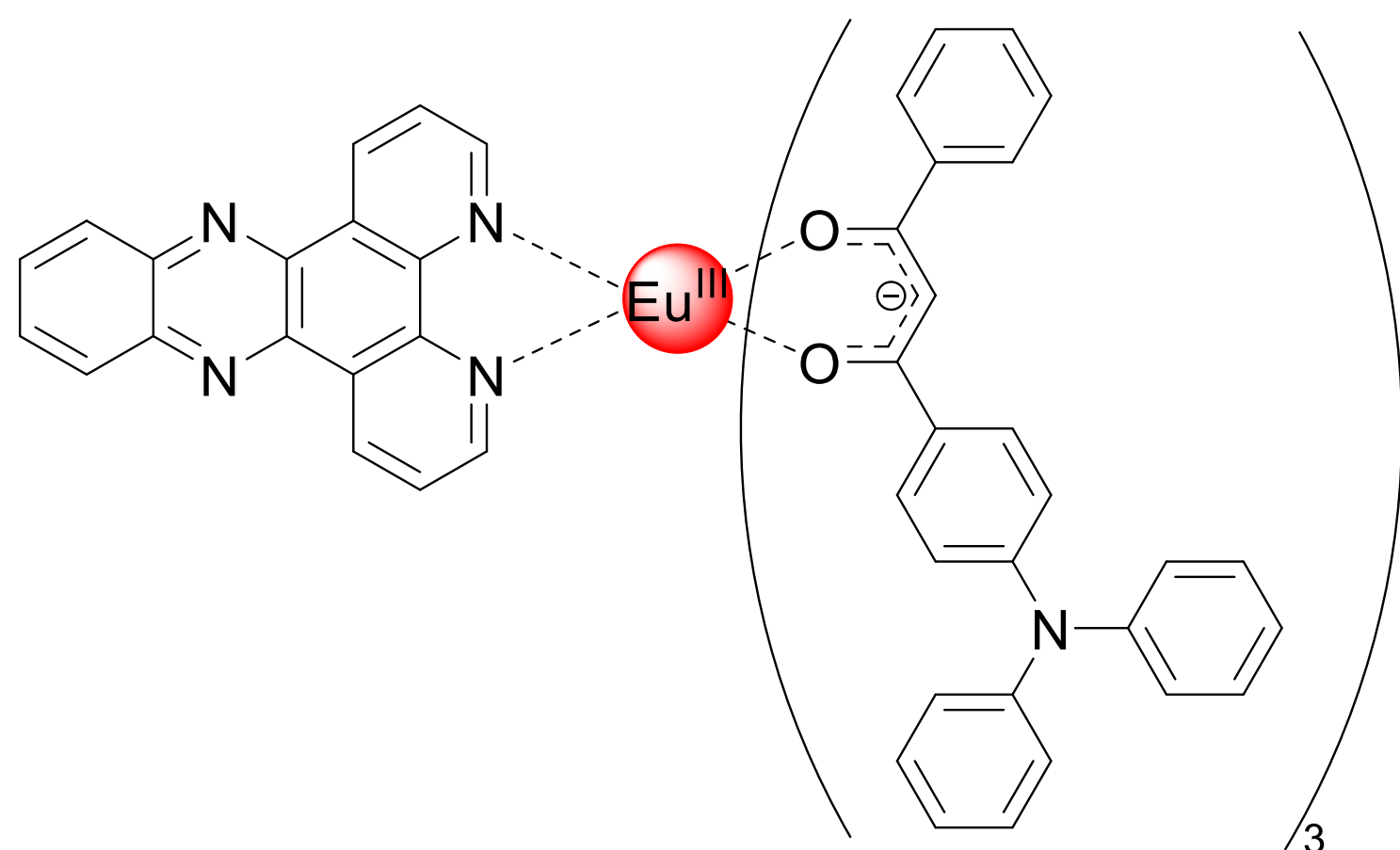
Ref. 76



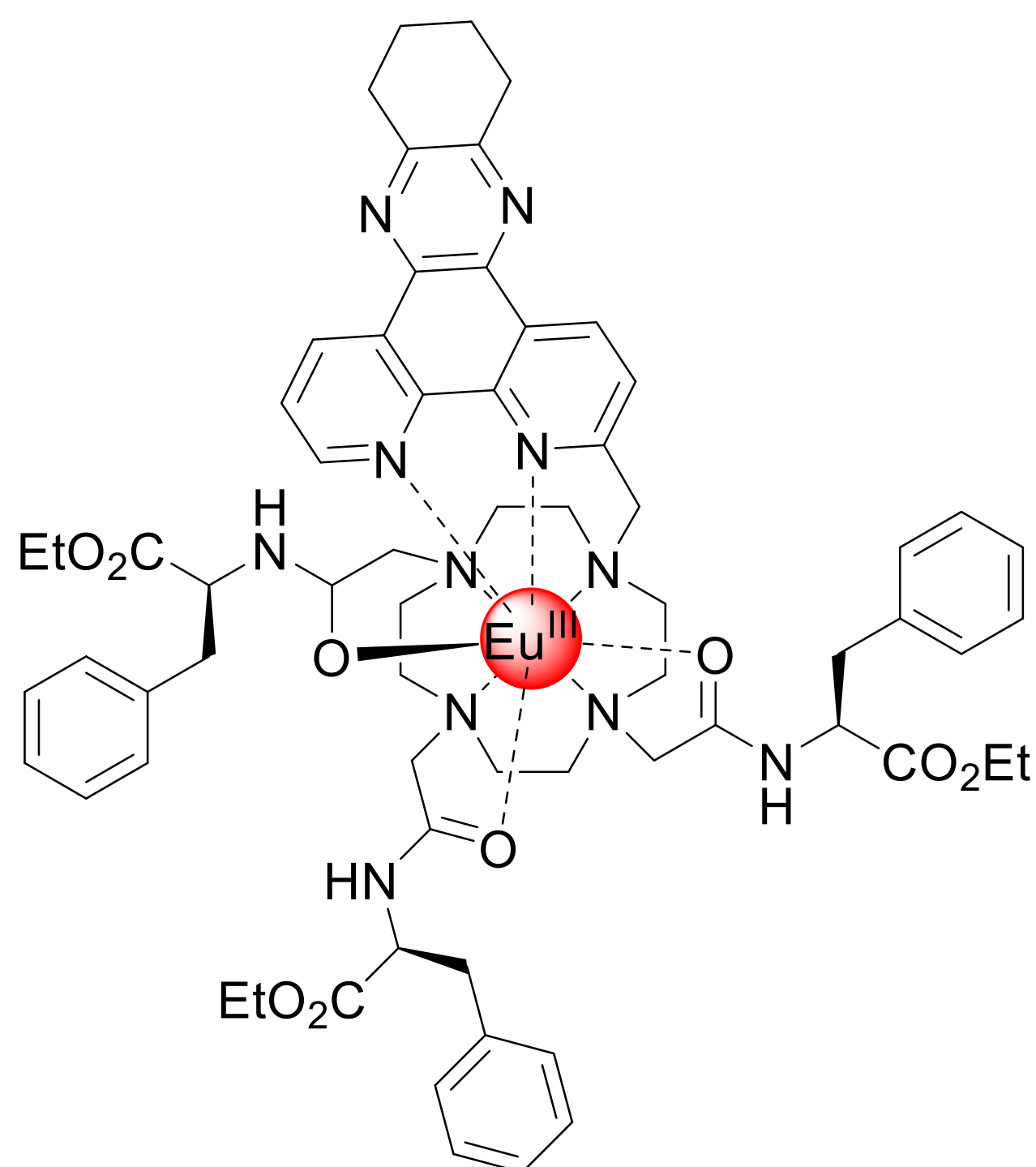
(CH<sub>3</sub>CN)  $\Phi_{\text{tot}} = 0.0072$  %

(Solid)  $\tau = 0.00093$  ms,  $\Phi_{\text{tot}} = 0.003$  %,  $\Phi_{\text{ff}} = 0.034$  %

Ref. 77

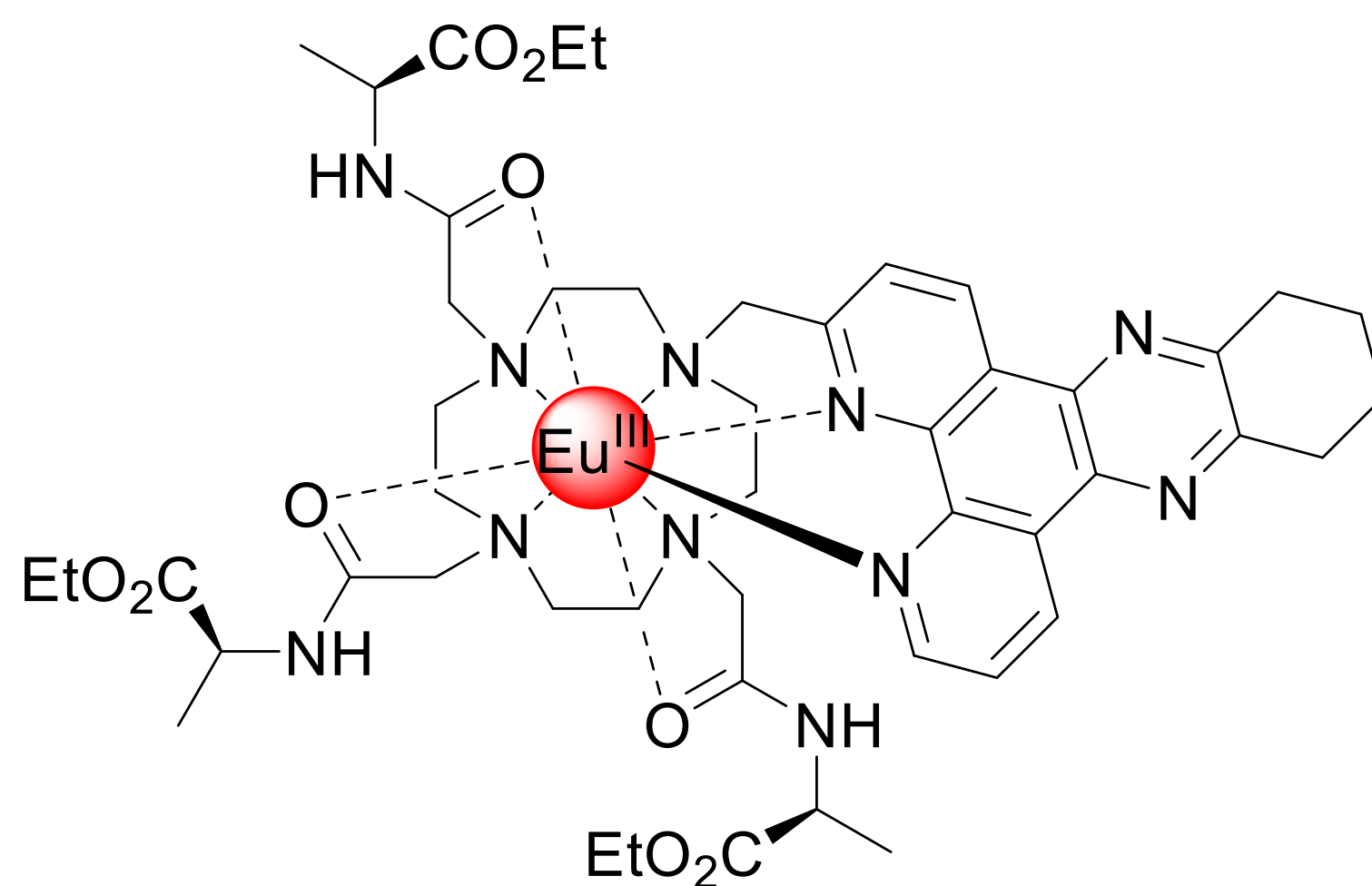


Ref. 78



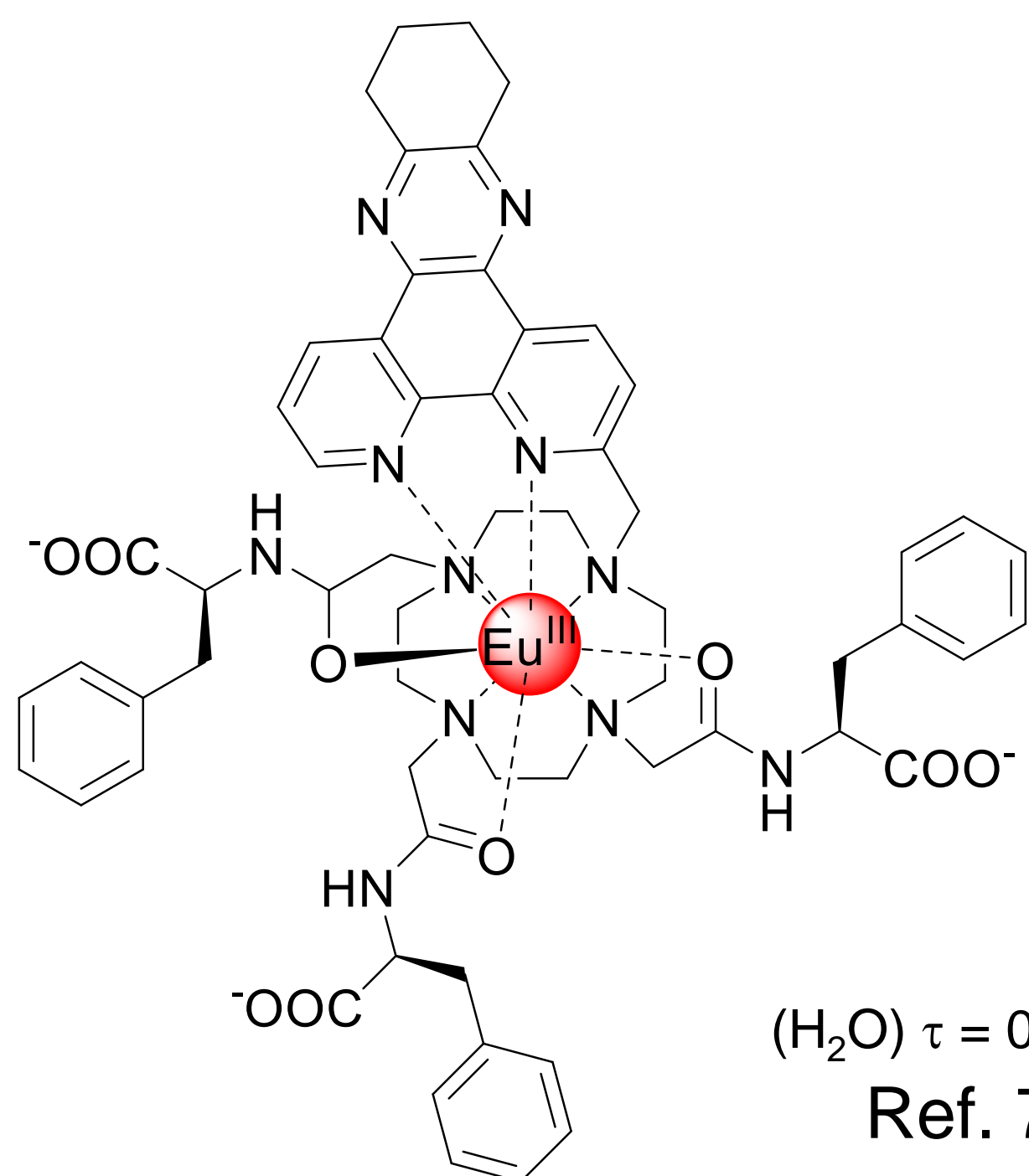
(H<sub>2</sub>O)  $\tau = 1.04$  ms

Ref. 79



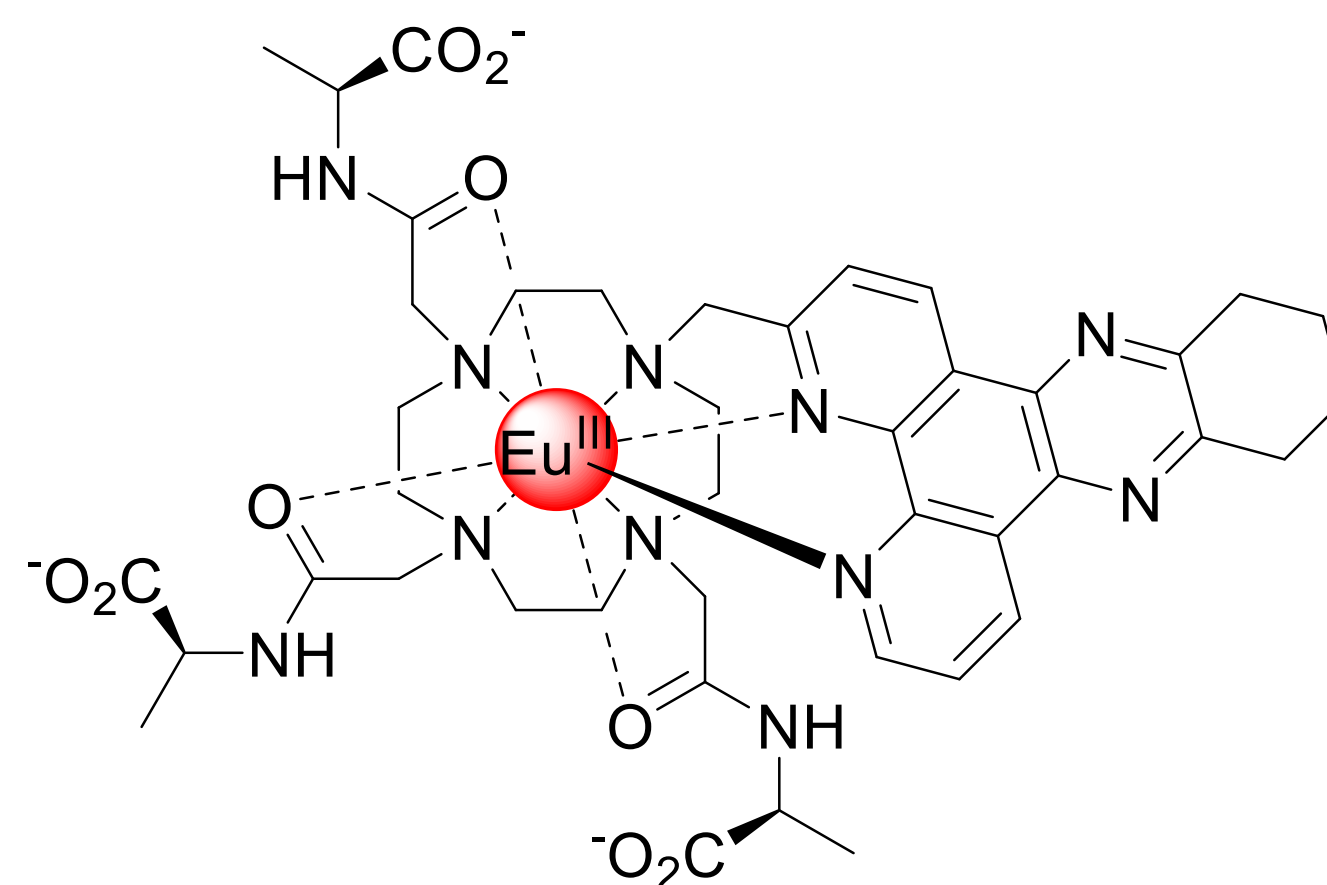
(H<sub>2</sub>O)  $\tau = 0.77$  ms

Ref. 79



(H<sub>2</sub>O)  $\tau = 0.96$  ms

Ref. 79



(H<sub>2</sub>O)  $\tau = 0.79$  ms

Ref. 79

Figure S7. Chemical structures of Eu(III) complexes

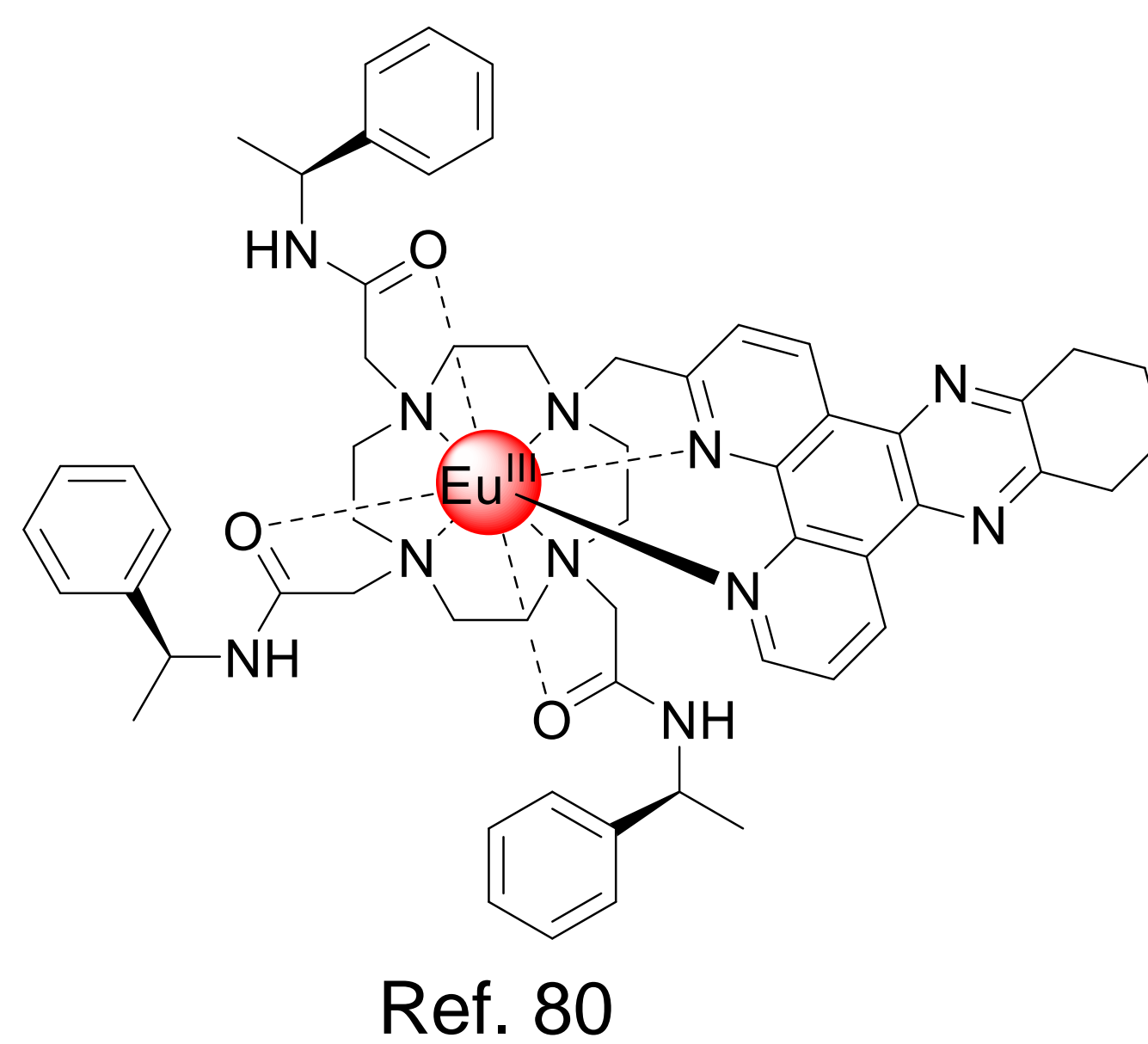
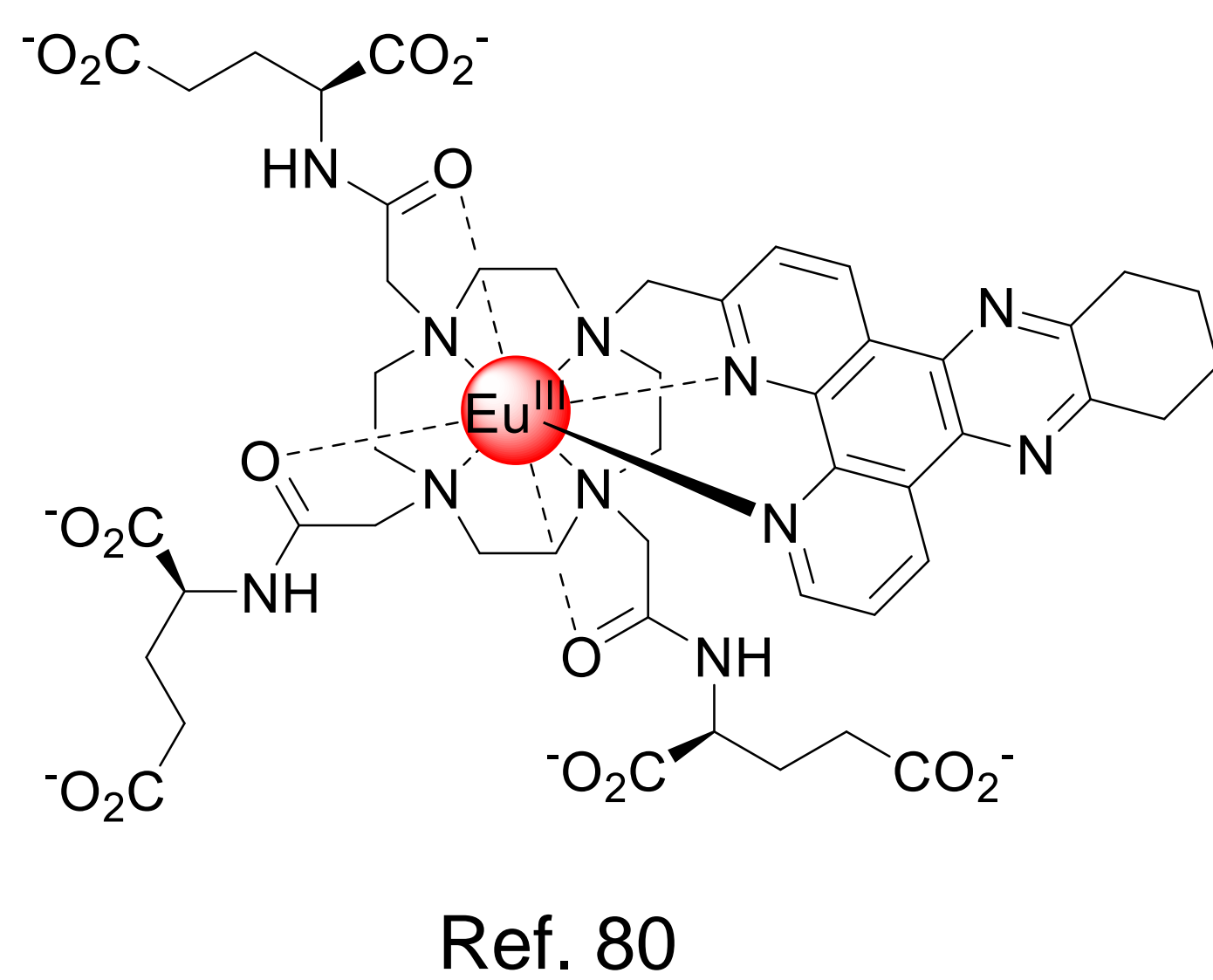
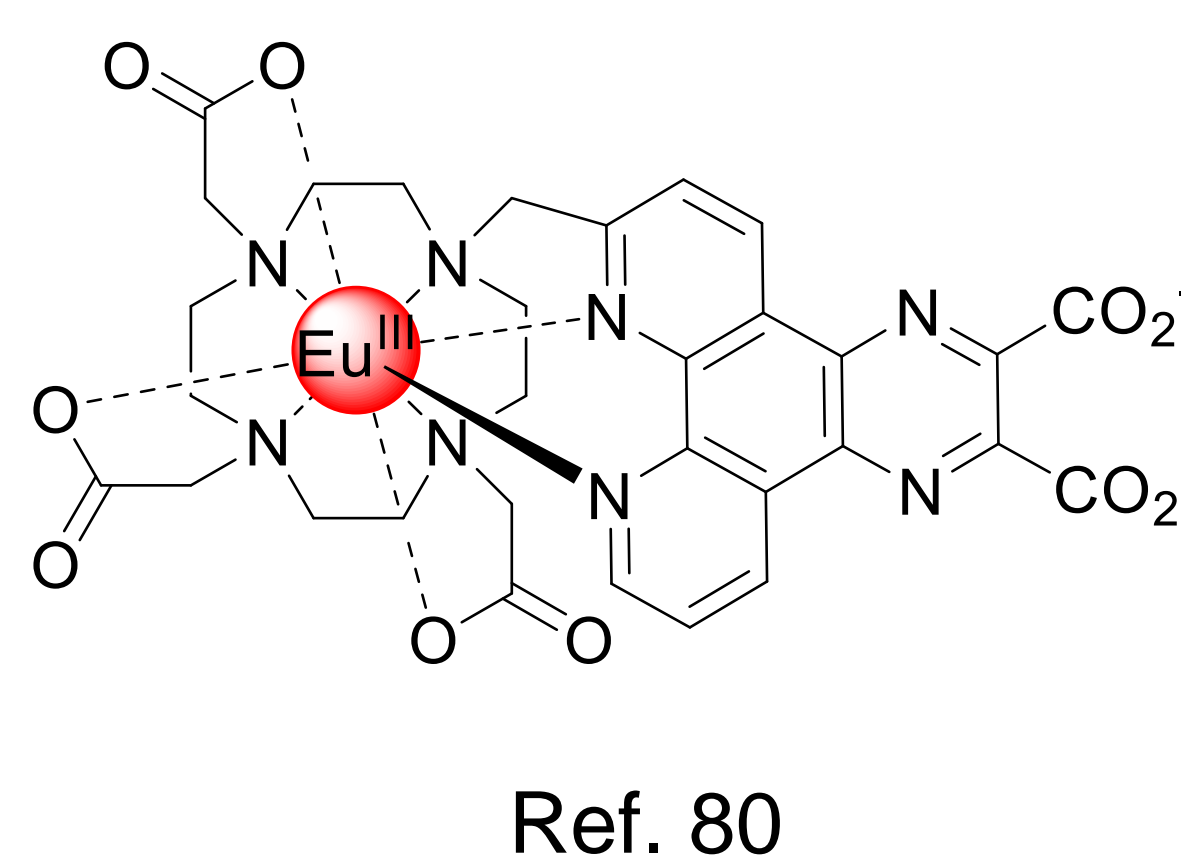
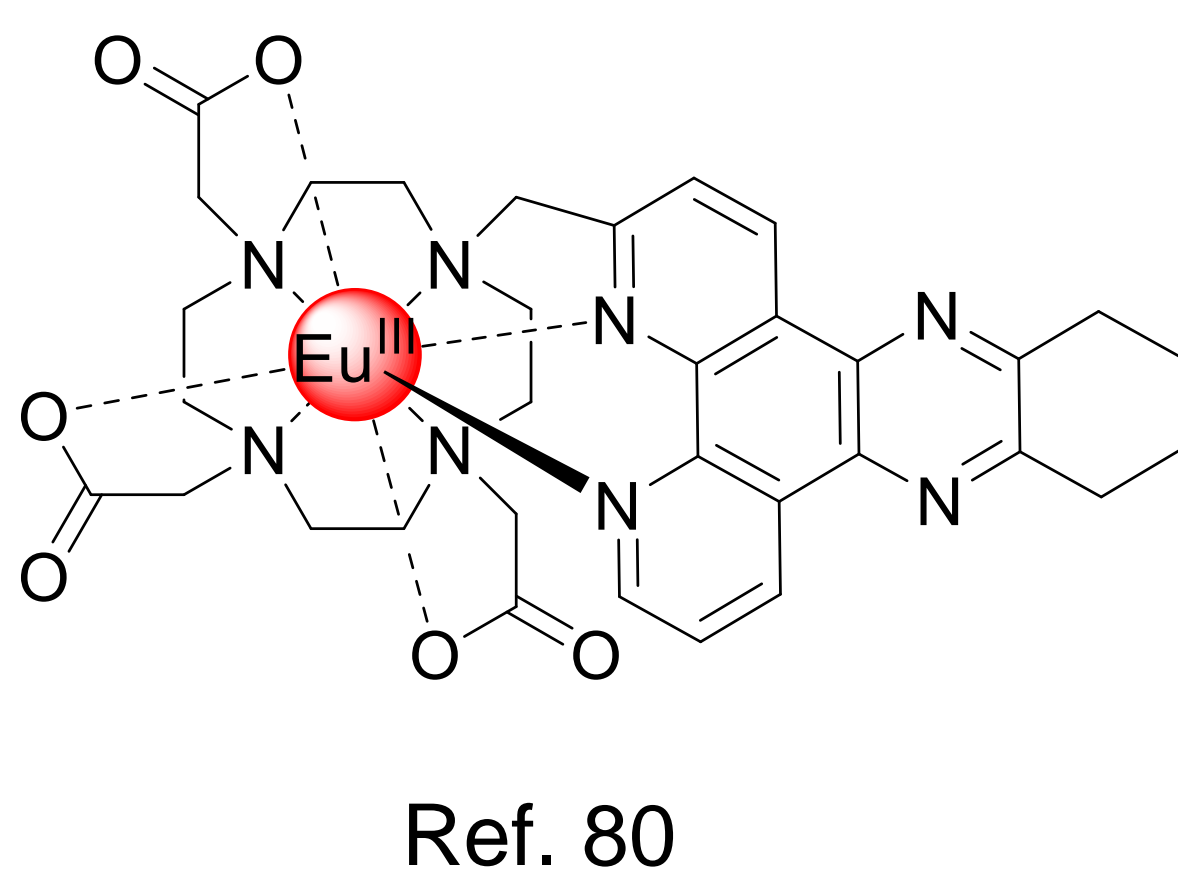
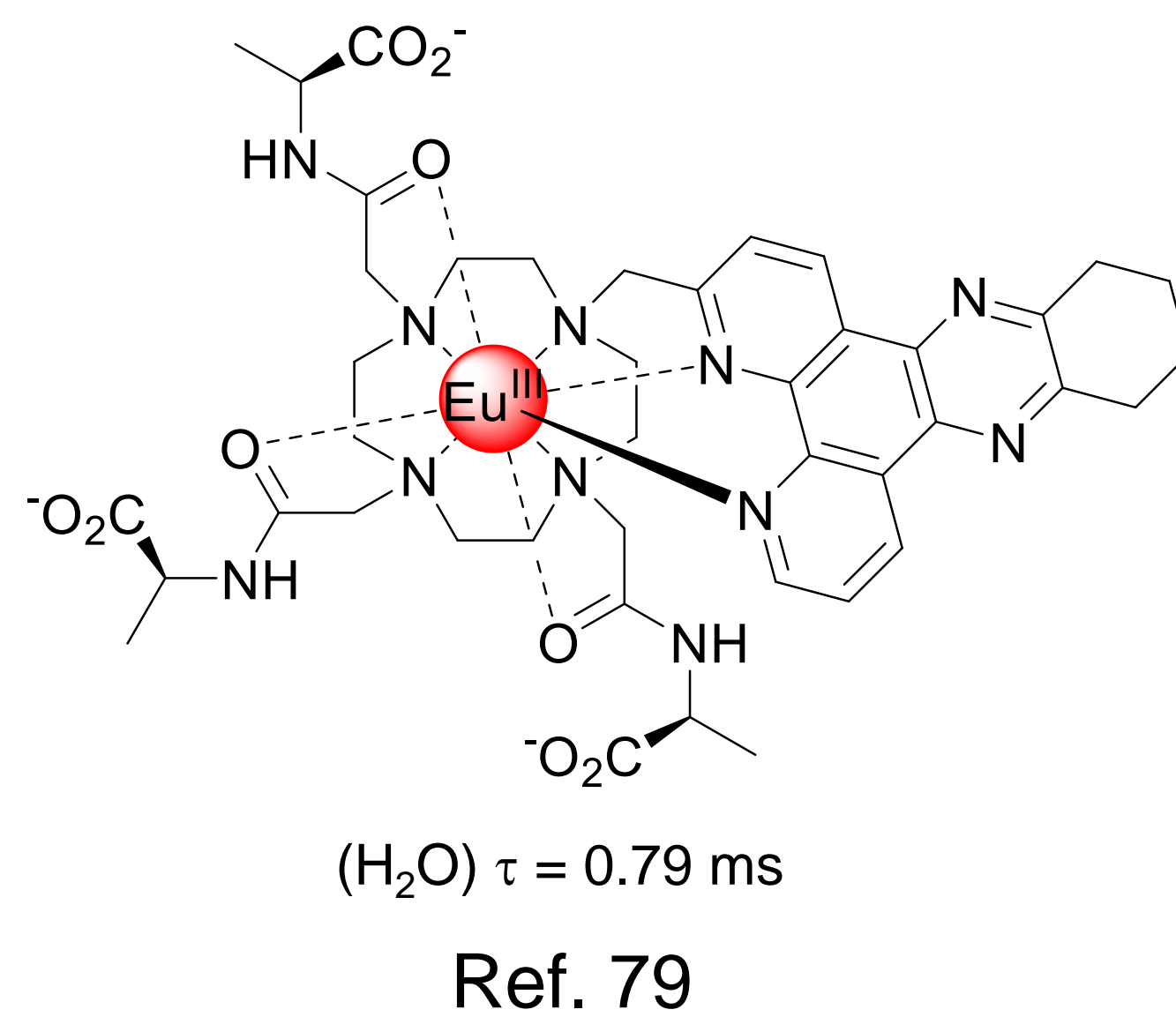
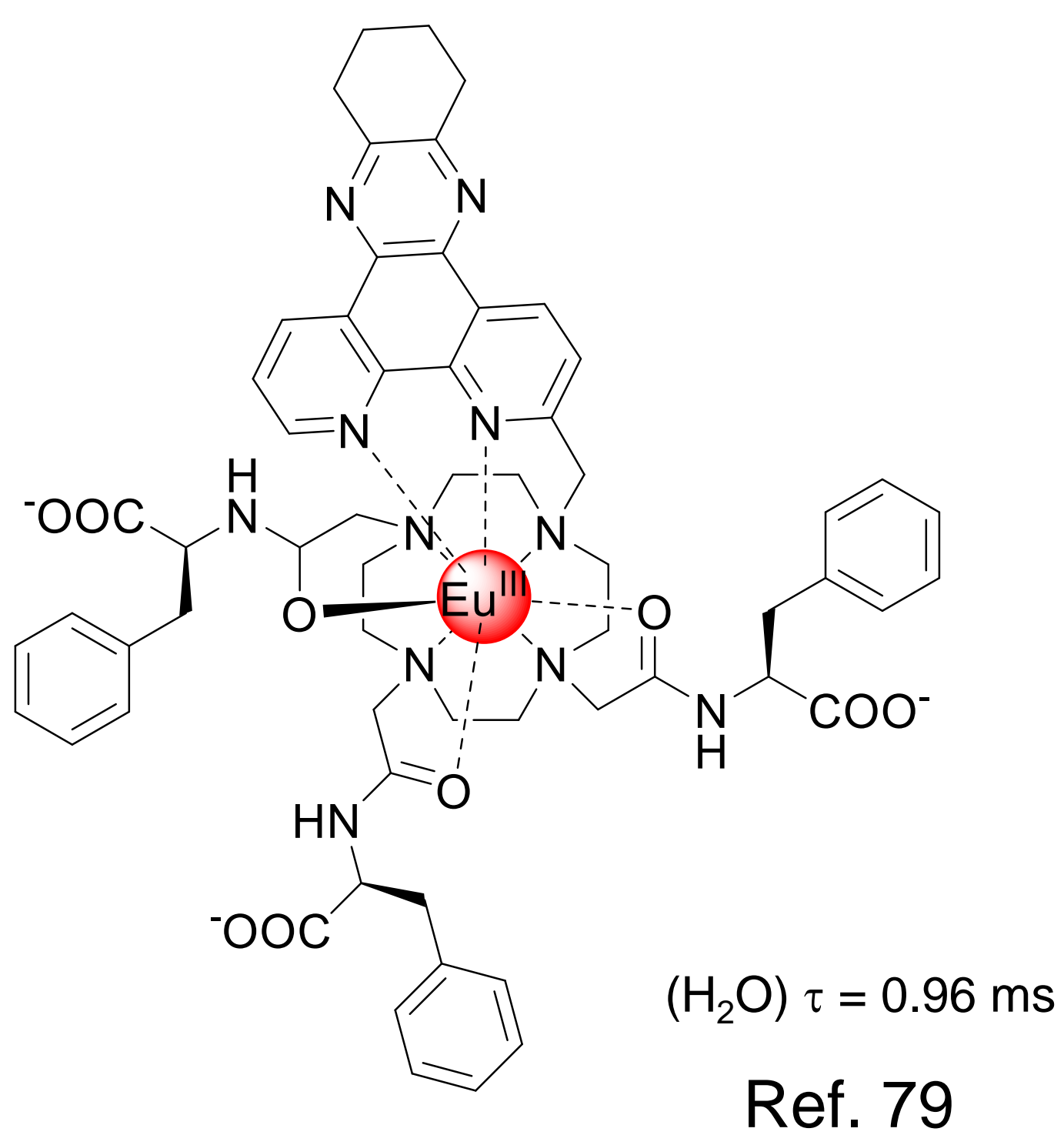
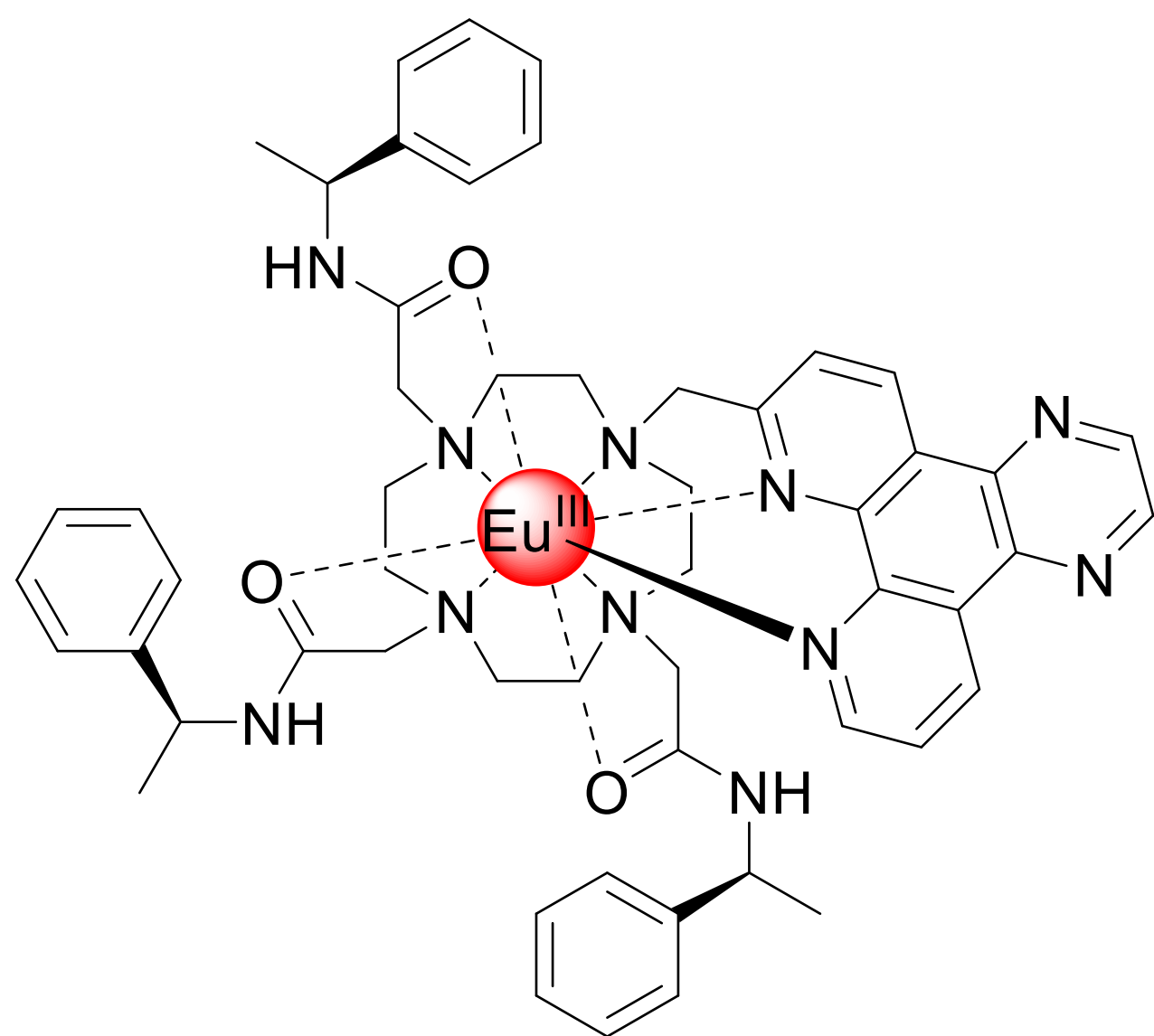


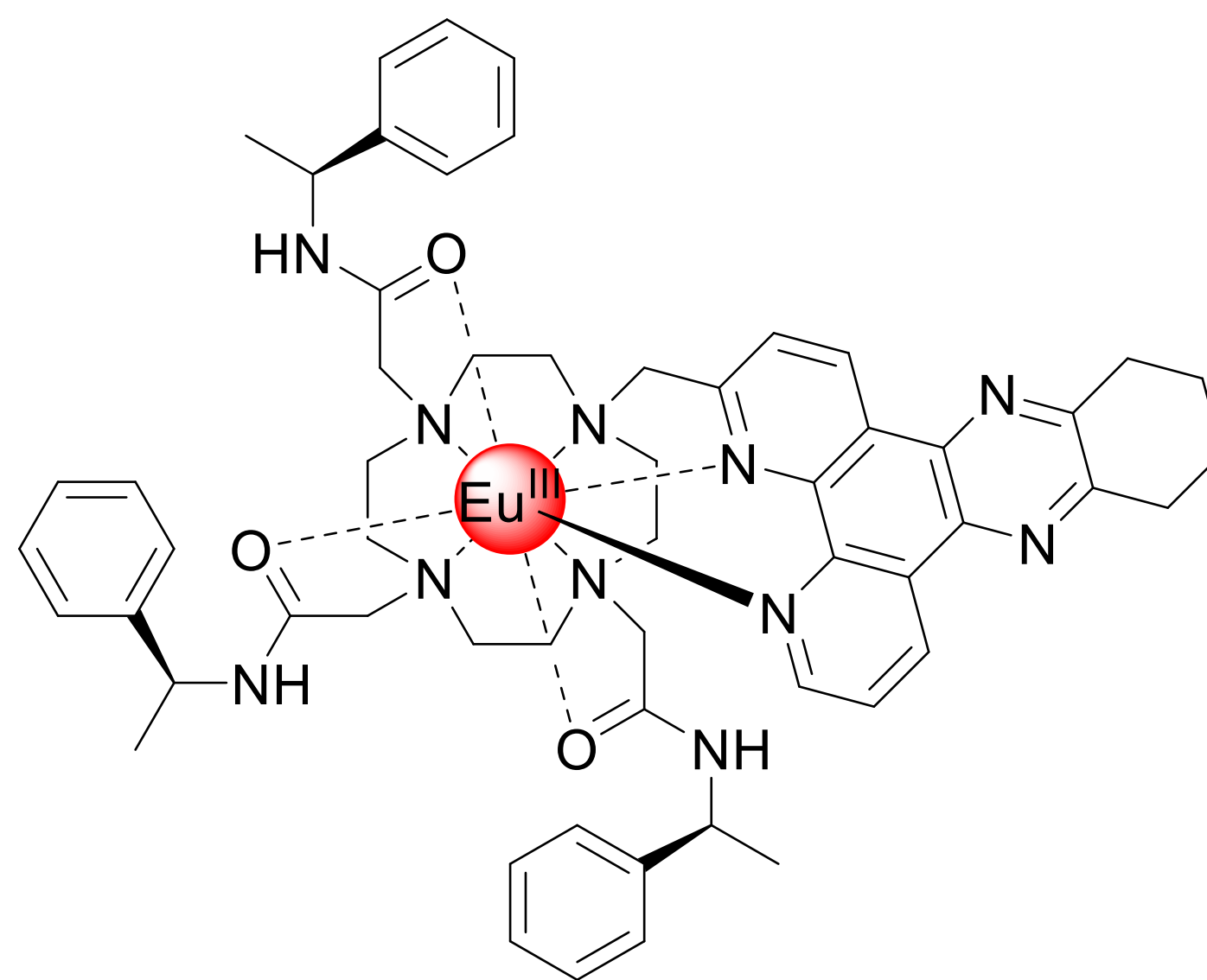
Figure S8. Chemical structures of Eu(III) complexes



(H<sub>2</sub>O)  $\Phi_{\text{tot}} = 21 \%$

(D<sub>2</sub>O)  $\Phi_{\text{tot}} = 27 \%$

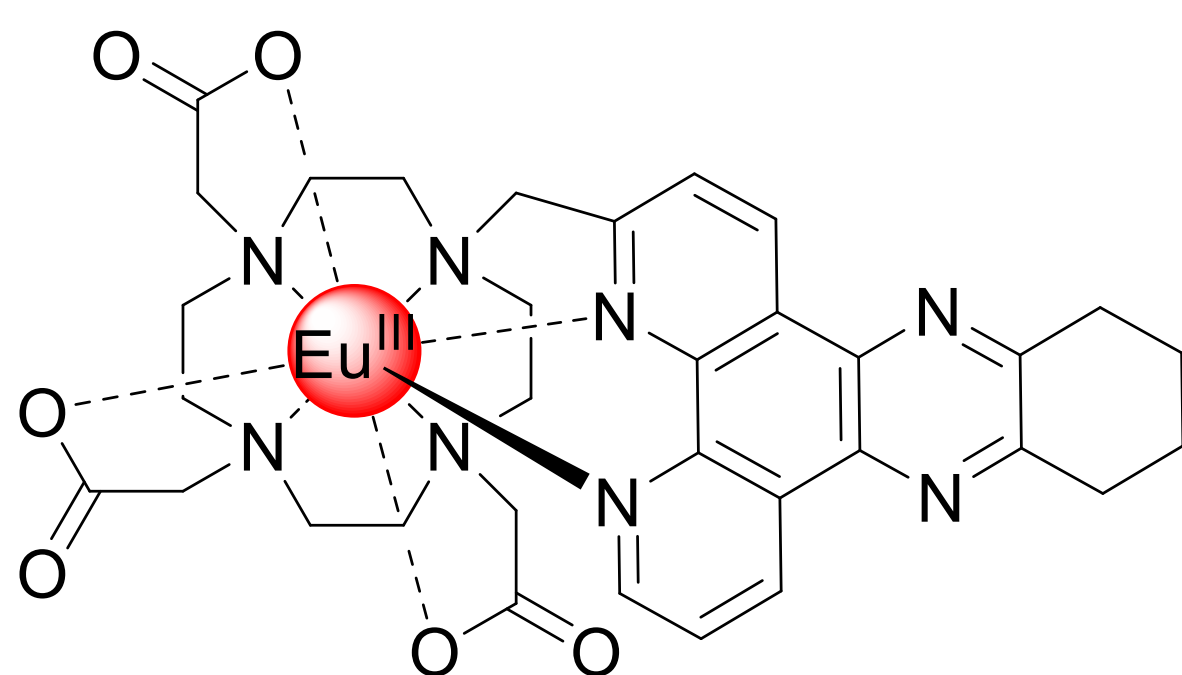
Ref. 81



(H<sub>2</sub>O)  $\Phi_{\text{tot}} = 16 \%$

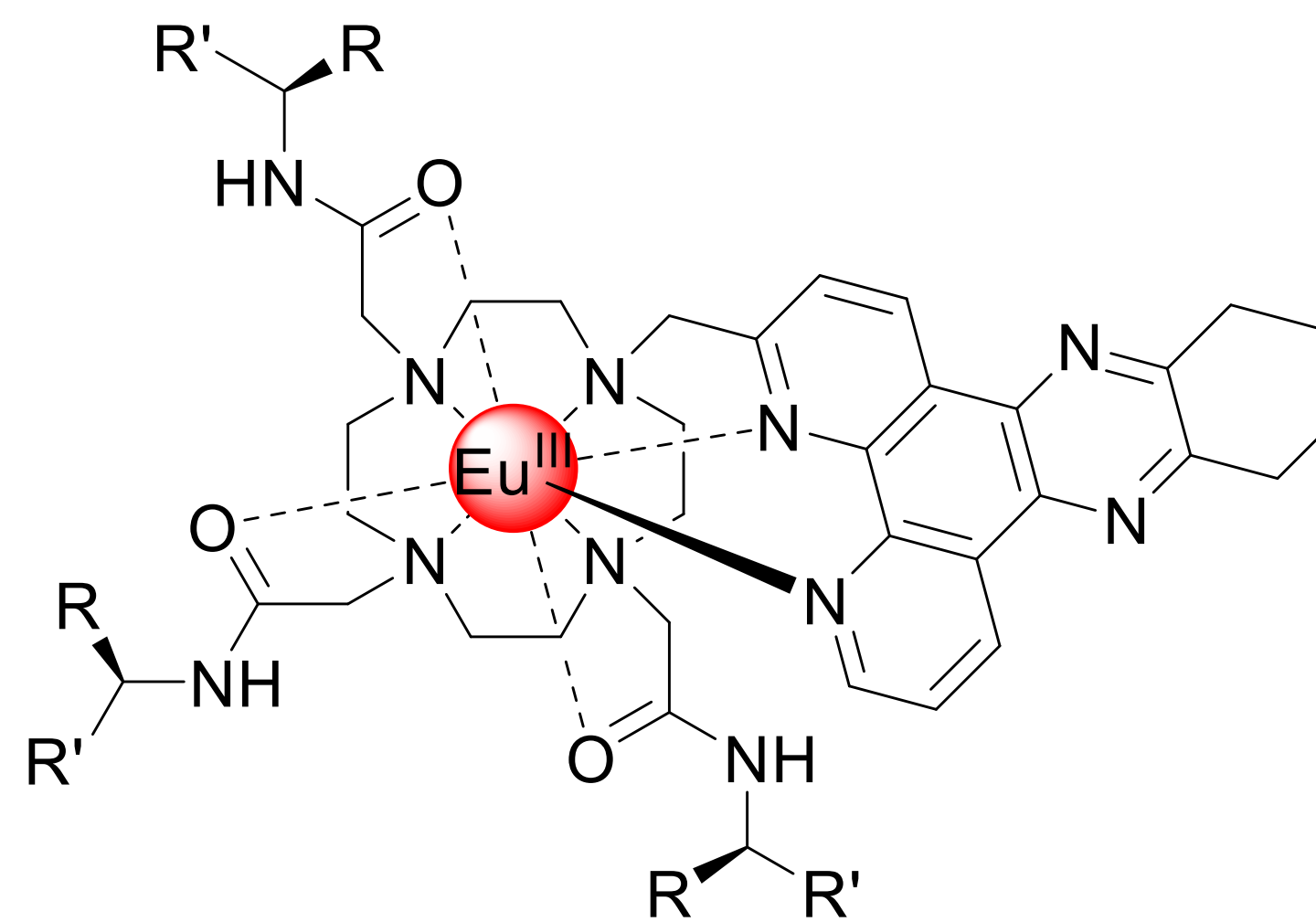
(D<sub>2</sub>O)  $\Phi_{\text{tot}} = 20 \%$

Ref. 81



(H<sub>2</sub>O)  $\Phi_{\text{tot}} = 18 \%$

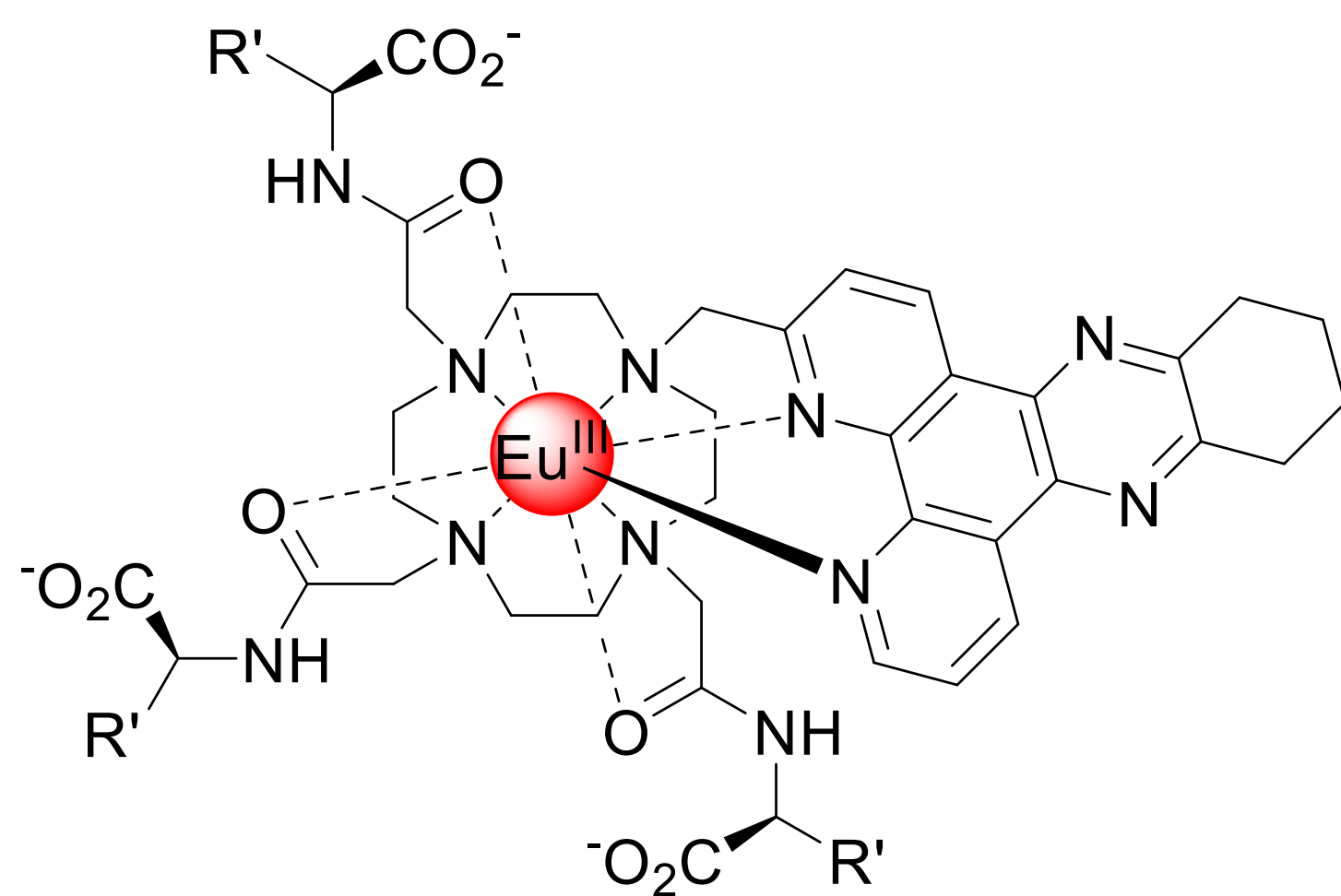
Ref. 81



R = CO<sub>2</sub>Et, R' = Me

R = CO<sub>2</sub>Et, R' = CH<sub>2</sub>CH<sub>2</sub>CO<sub>2</sub>Et

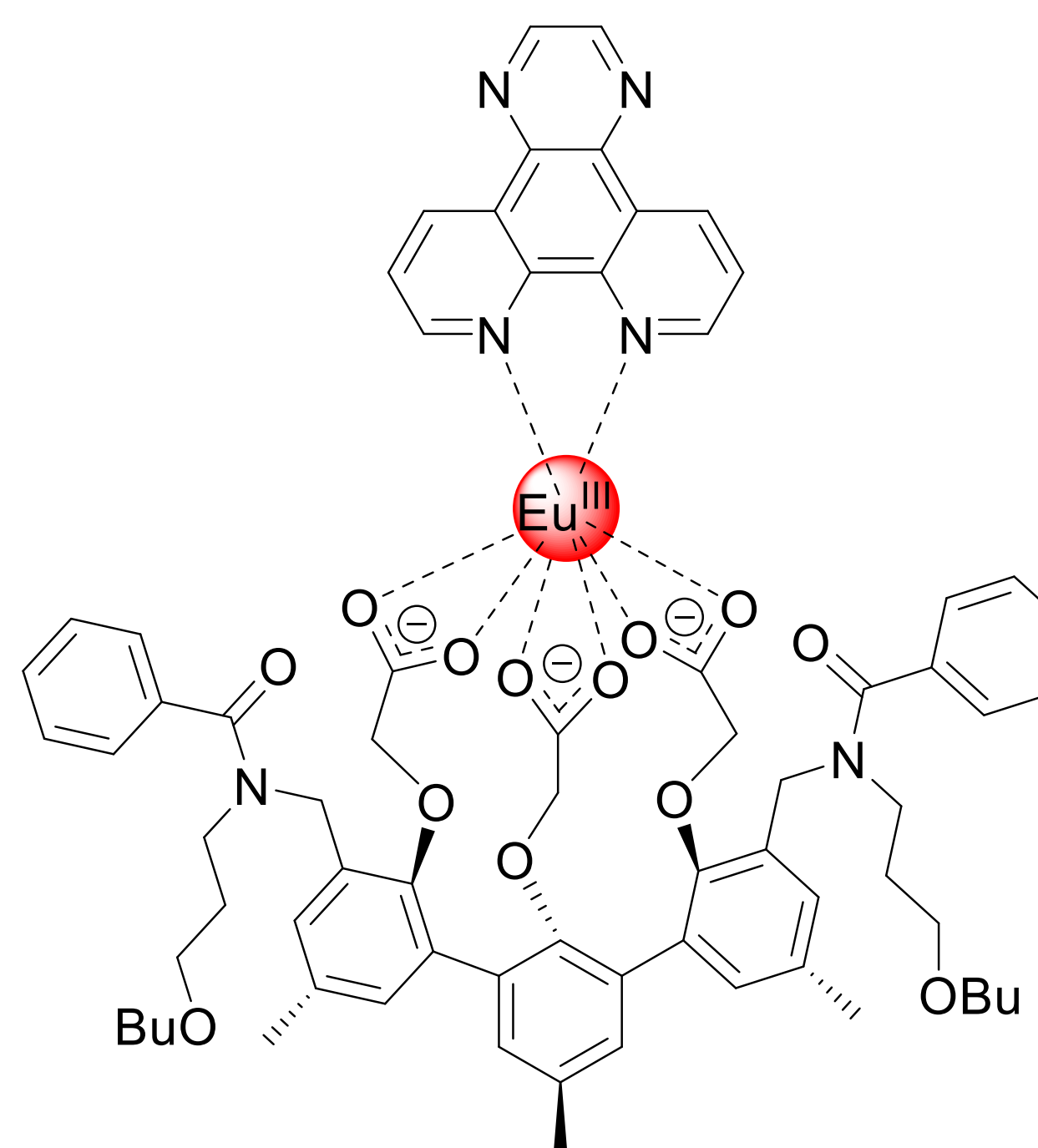
Ref. 81



R' = Me ( $\Phi_{\text{tot}} = 18 \%$  (H<sub>2</sub>O))

R' = CH<sub>2</sub>CH<sub>2</sub>CO<sub>2</sub><sup>-</sup> ( $\Phi_{\text{tot}} = 18 \%$  (H<sub>2</sub>O))

Ref. 81



(CH<sub>2</sub>Cl<sub>2</sub>)  $\tau = 0.71 \text{ ms}$ ,  $\Phi_{\text{tot}} = 6.2 \%$

Ref. 82

Figure S9. Chemical structures of Eu(III) complexes