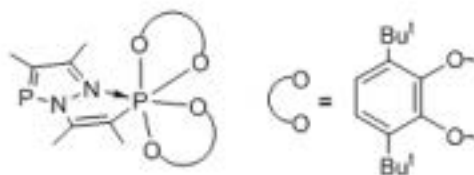


193.21
193.15

$^{31}\text{P}\{^1\text{H}\} \text{CDCl}_3$

-66.68
-66.74

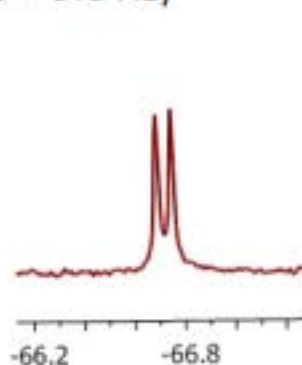
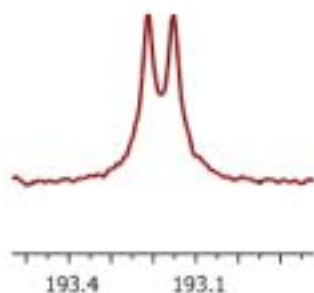


A (d)
193.18

193.18 (d, $J = 9.6 \text{ Hz}$)

B (d)
-66.71

-66.71 (d, $J = 9.6 \text{ Hz}$)



180

130

80

40

0

-20

-70

^1H CDCl_3



F (s)
6.64

4.00

6.6

5.8

5.0

4.2

3.4

2.6

1.8

1.0

2.50
2.50
2.30
2.30
2.26
2.05
2.01

C (d)
2.28
B (d)
2.50
A (d)
2.03
D (s)
2.30

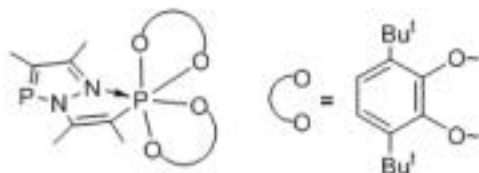
E (s)
1.18

36.40

1.0

153.52
153.43
150.12
149.76
— 143.41
131.16
131.05
129.05
128.24
127.33
127.27
117.76
117.63
117.47
117.27
116.51

$^{13}\text{C}\{^1\text{H}\} \text{CDCl}_3$



33.73
29.85
29.67
29.44
29.28
15.75
15.65
14.54
14.40
14.37
14.23
14.08
14.07
11.44
11.18

F (d) 153.47
K (s) 143.41

E (d) 149.94

H (d) 128.65

G (d) 131.11

I (dd) 128.27

J (s) 116.51

M (s) 33.73

L (m) 29.56

D (dd) 14.23

B (d) 11.31

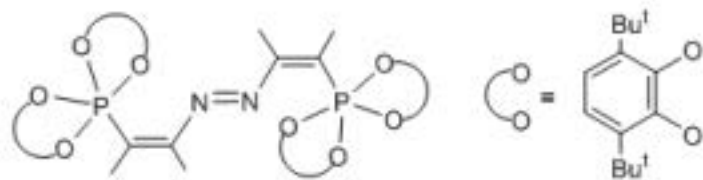
A (d) 15.70

C (d) 14.38

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10

--10.88

$^{31}\text{P}\{^1\text{H}\} \text{CDCl}_3$



180

130

80

40

0

-20

-70

-120

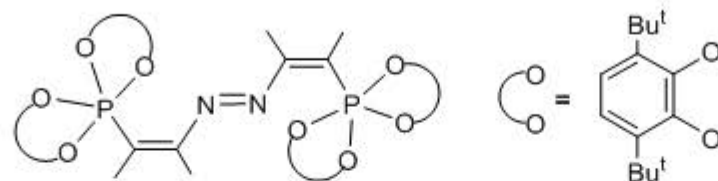
f1 (Mn)

— 6.73

2.18
2.12

1.36
1.28
1.24

$^1\text{H CDCl}_3$



B (m)
6.72

A (d)
2.15

D (s)
1.36

C (s)
1.28

8.00

6.27

6.07
72.04

6.8

6.2

5.6

5.0

4.4

3.8

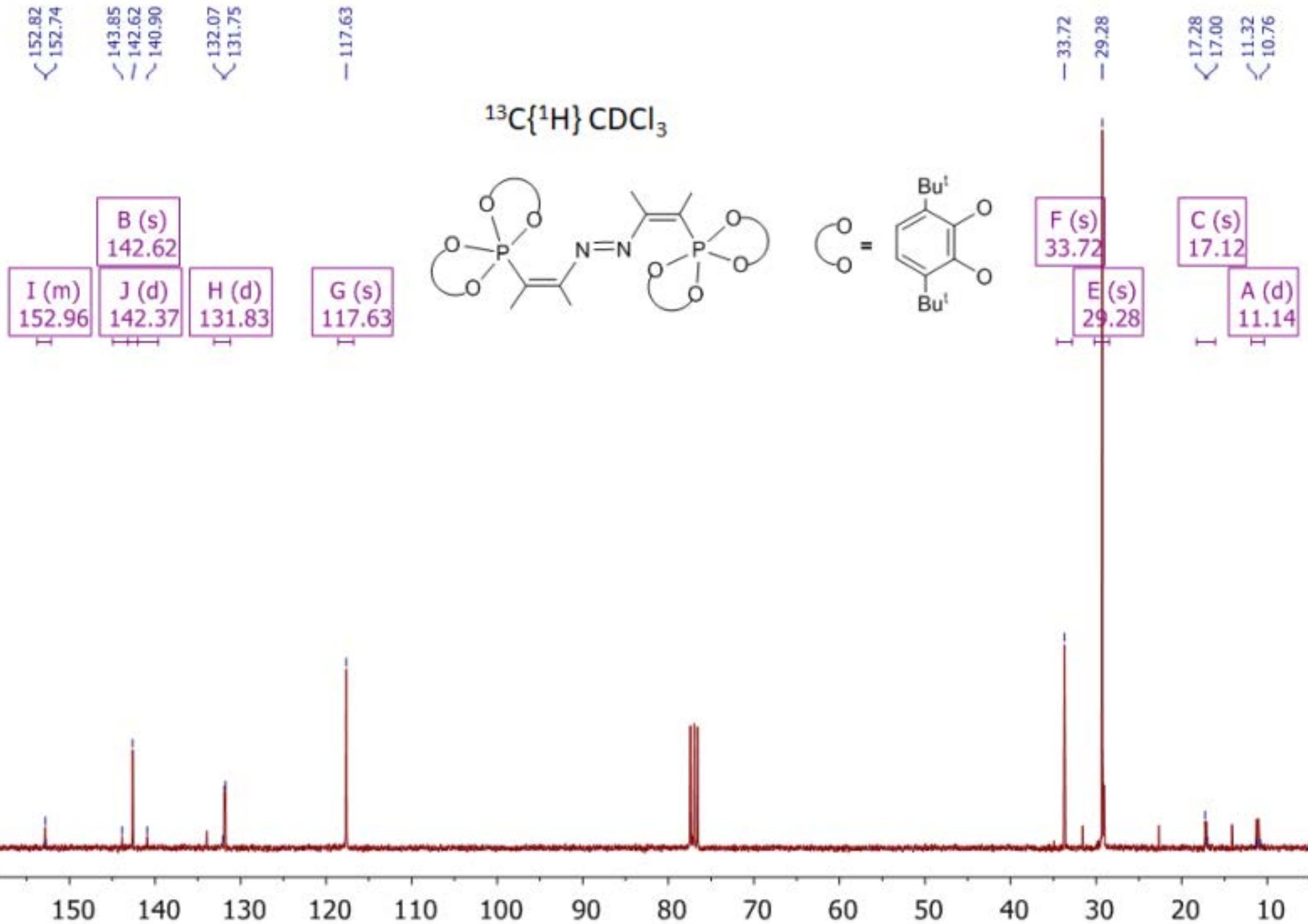
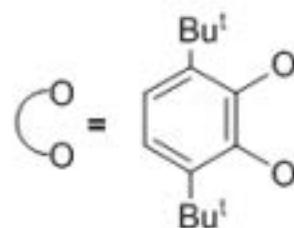
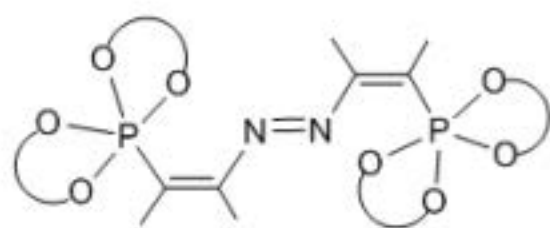
3.2

2.6

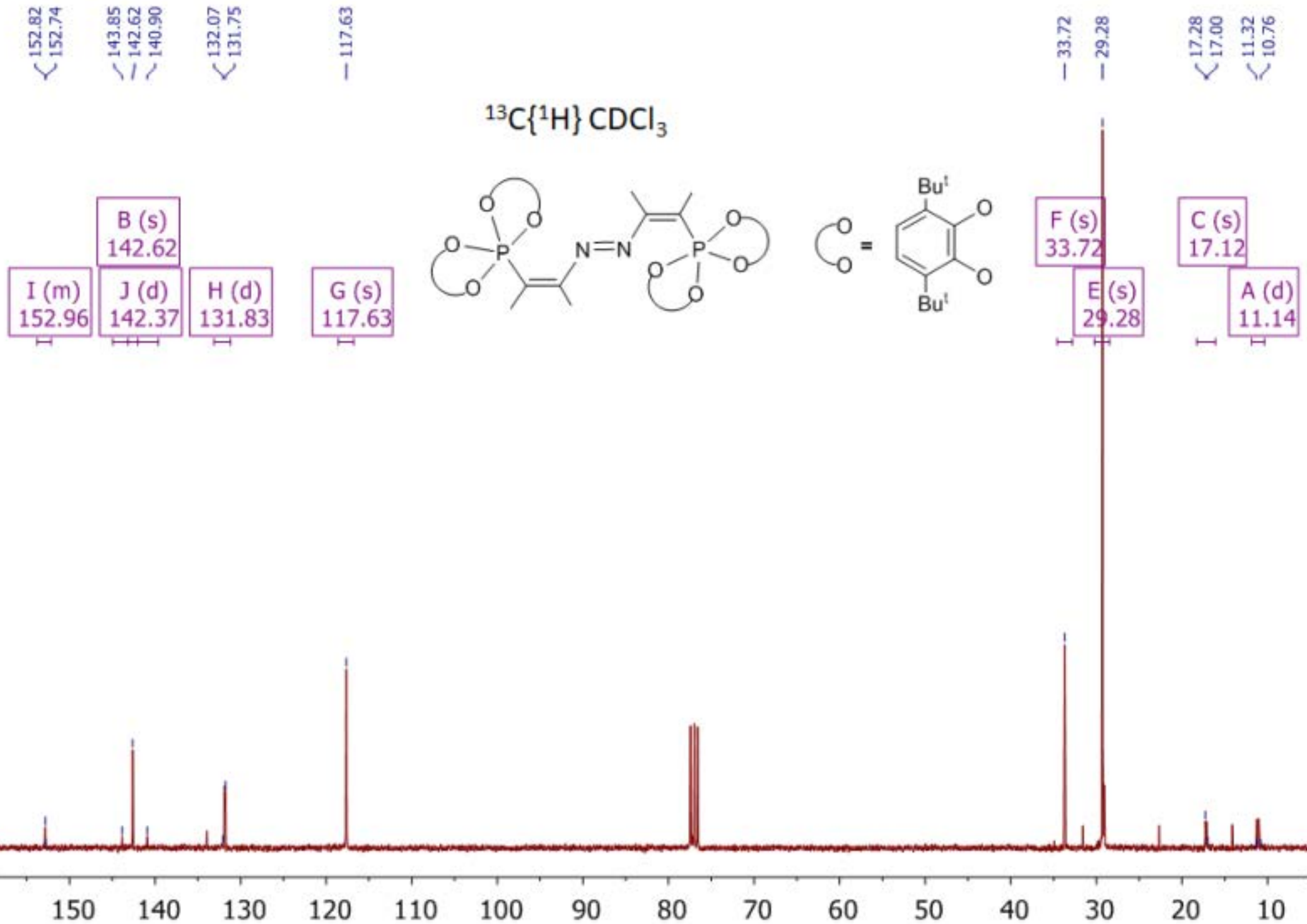
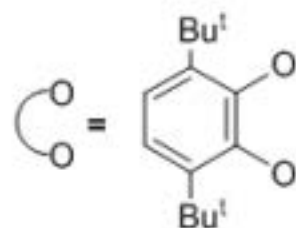
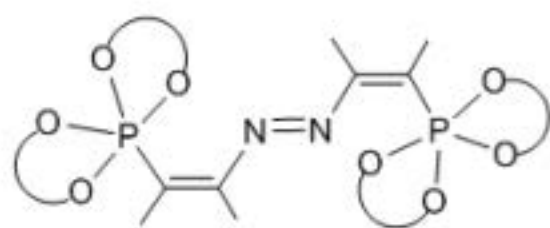
2.0

1.4

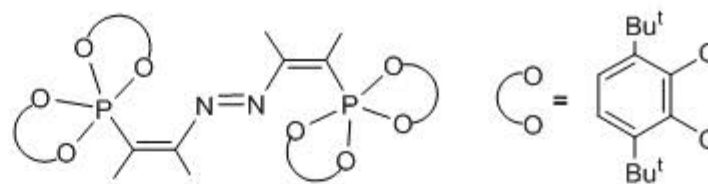
$^{13}\text{C}\{^1\text{H}\} \text{CDCl}_3$



$^{13}\text{C}\{^1\text{H}\} \text{CDCl}_3$



Reaction mixture
DDP (**1**): quinone = 1:3



$^{31}\text{P}\{^1\text{H}\}$ THF

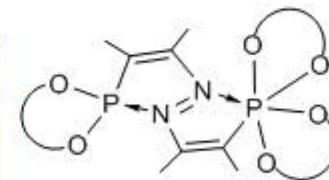
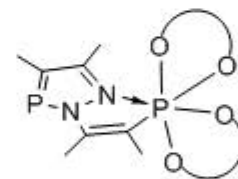
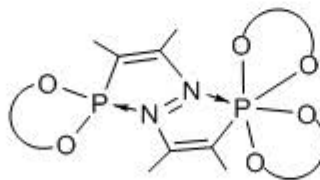
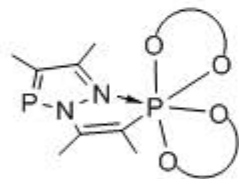
A (d)
193.21

B (s)
51.32

C (s)
-10.83

D (d)
-67.97

E (s)
-85.18



240 200 160 120 80 40 0 -40 -80 -120 -180
f1 (MД)