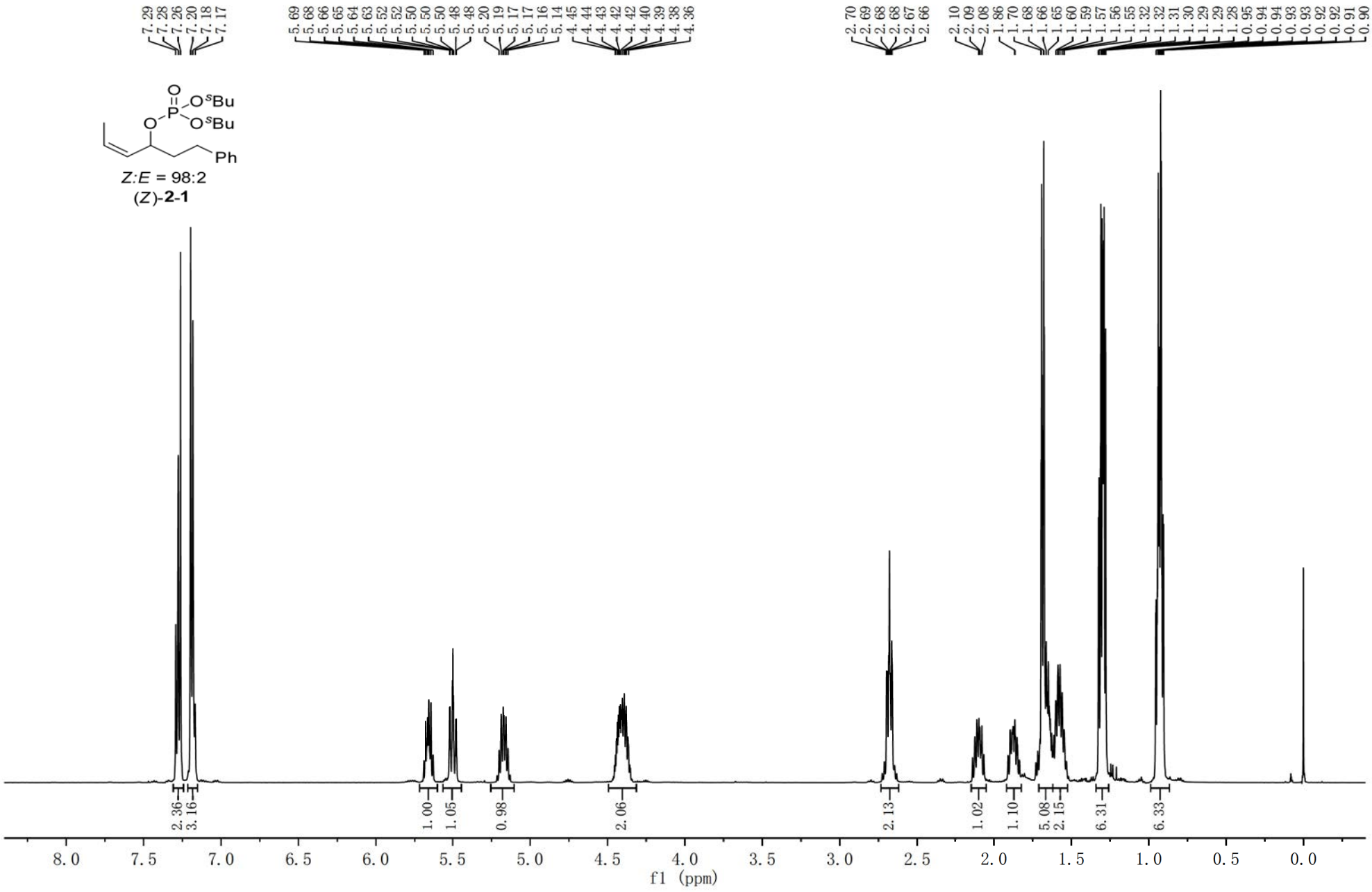
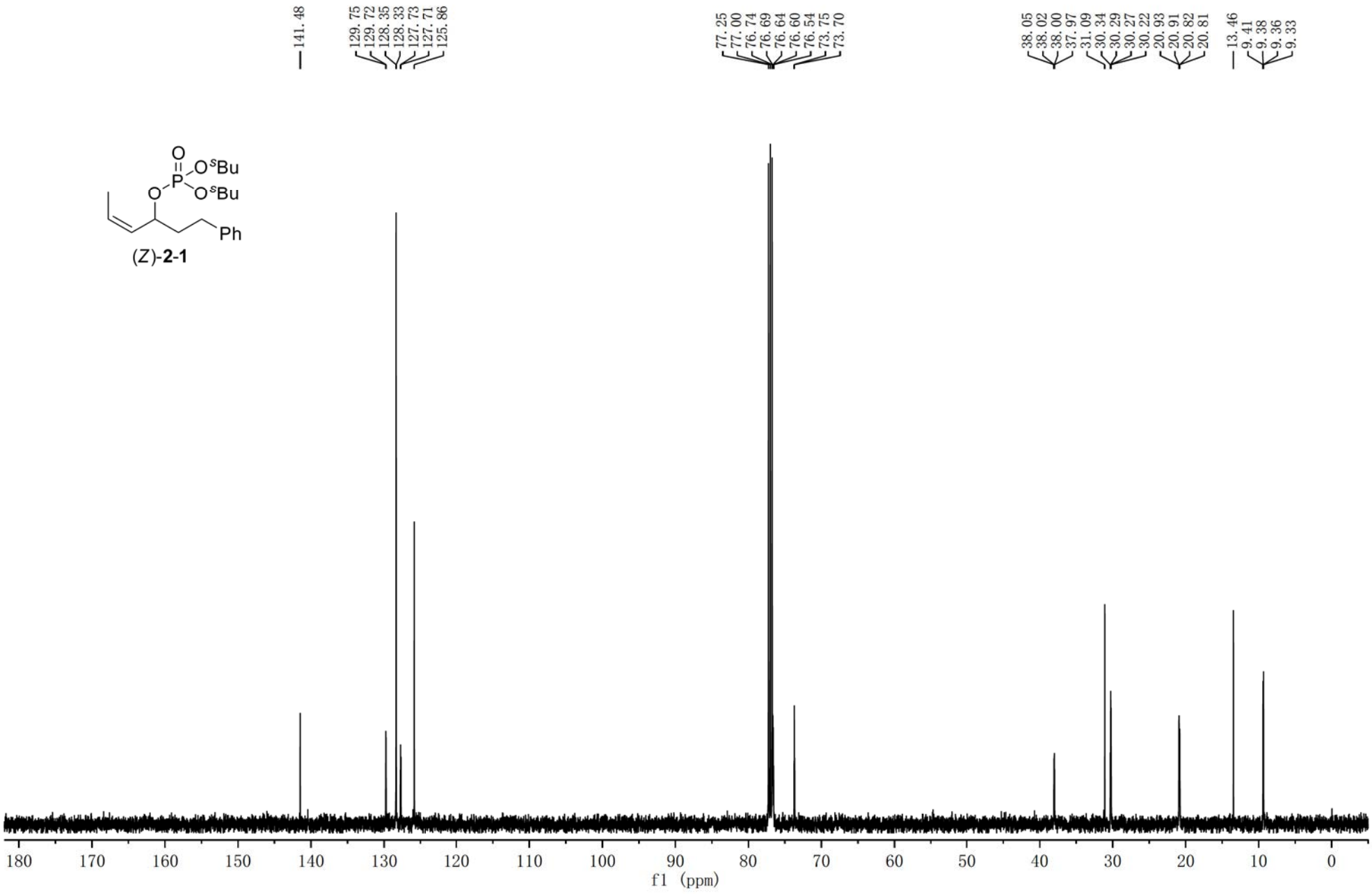
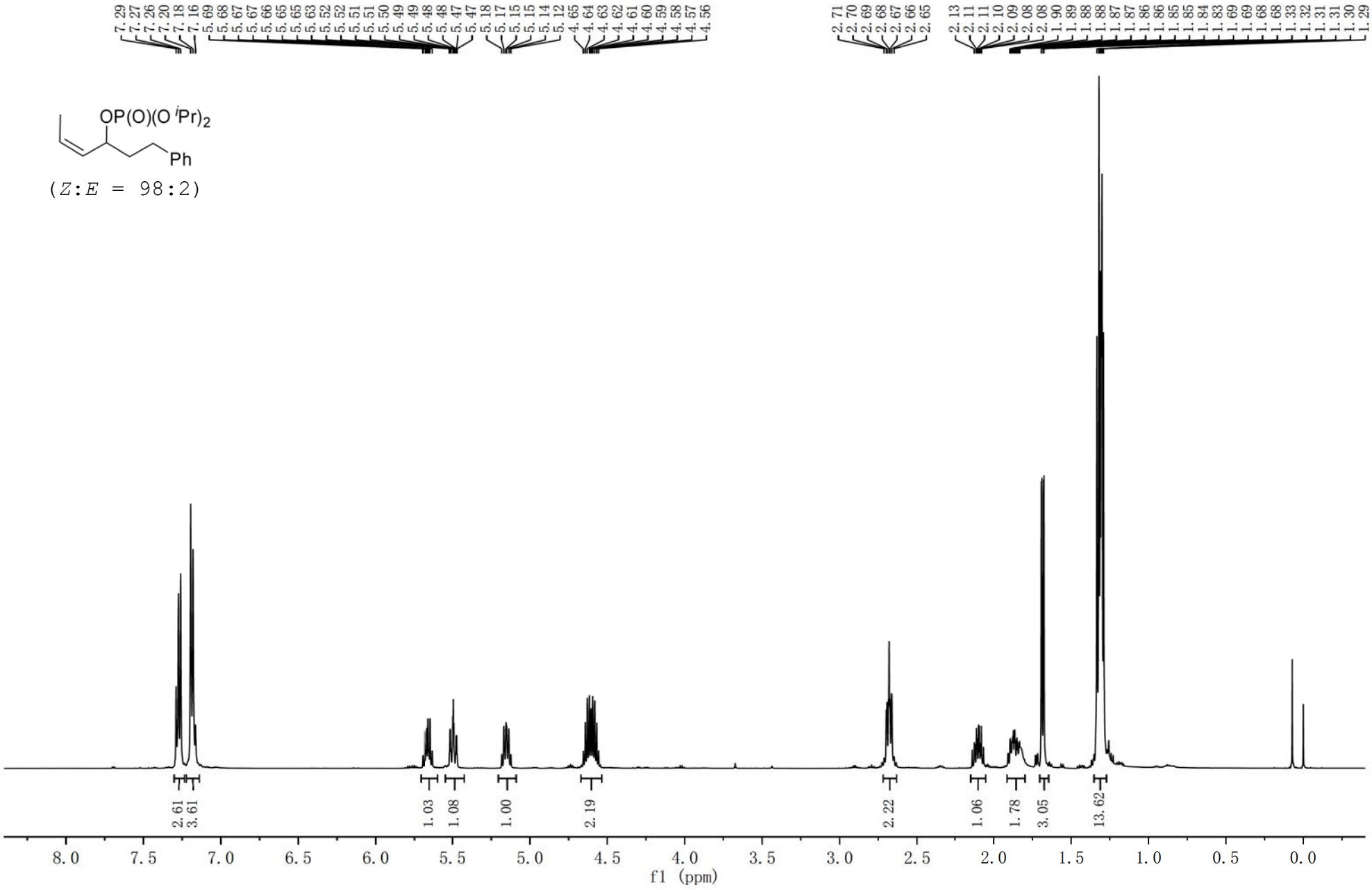
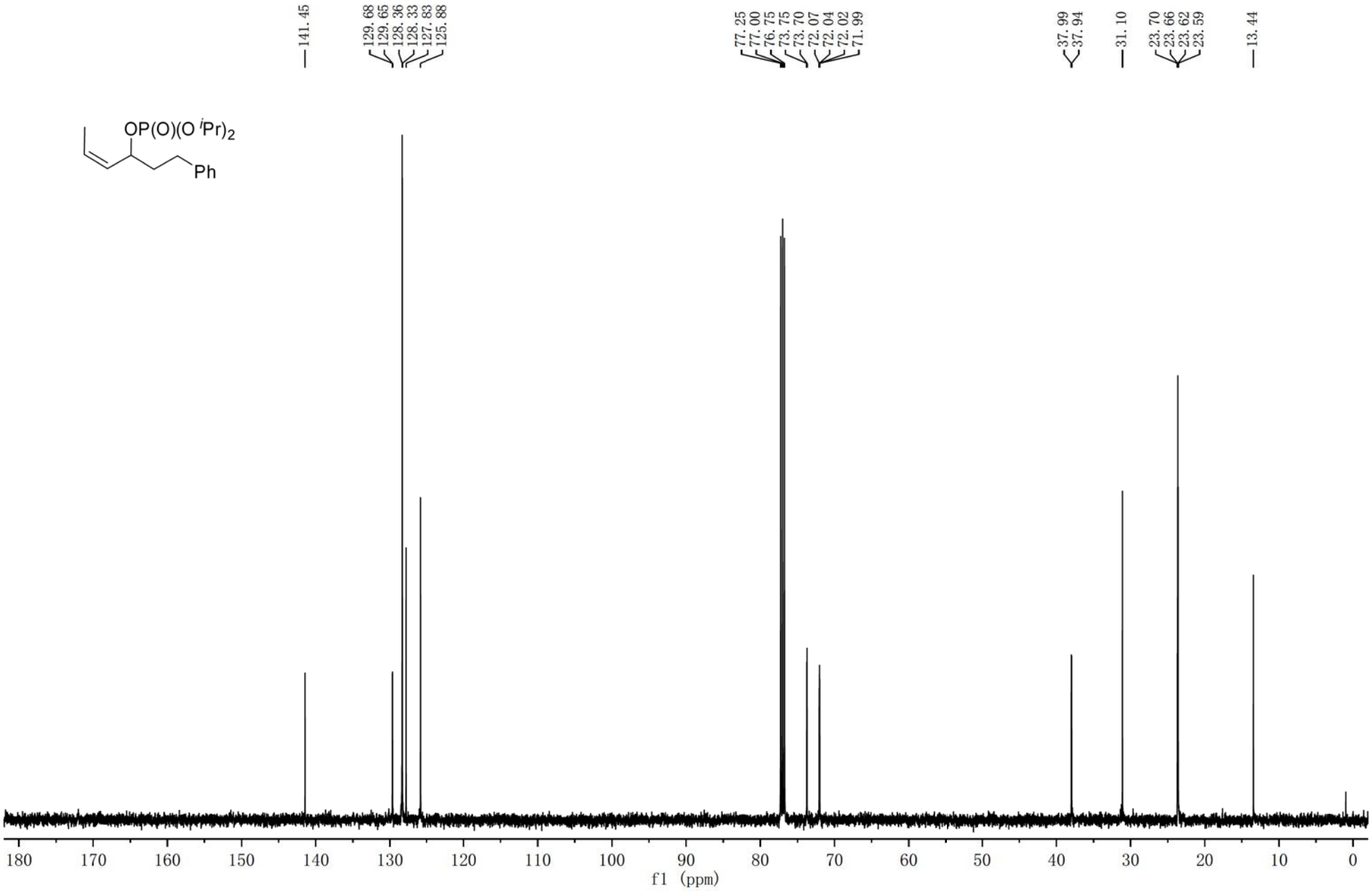
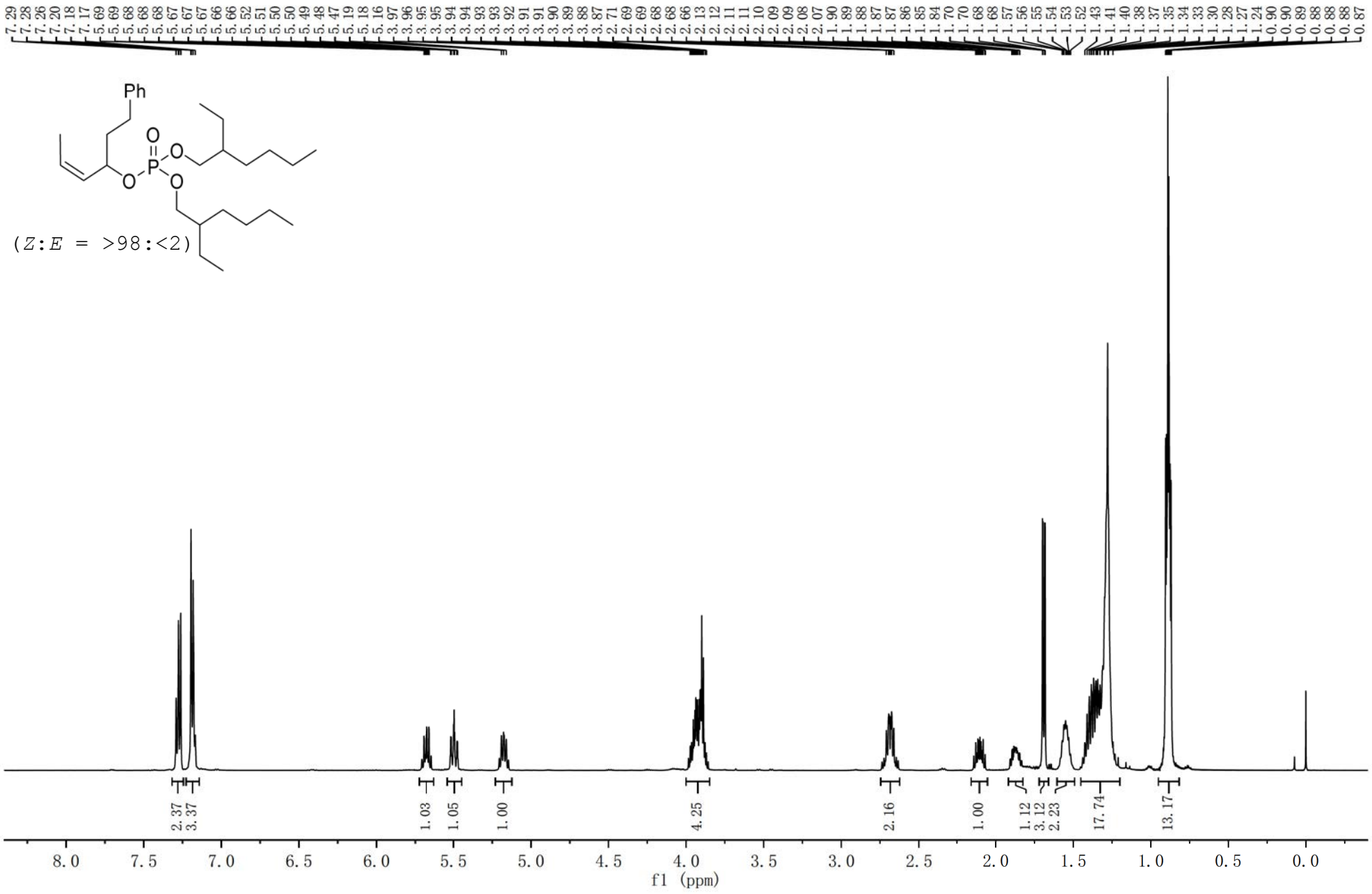
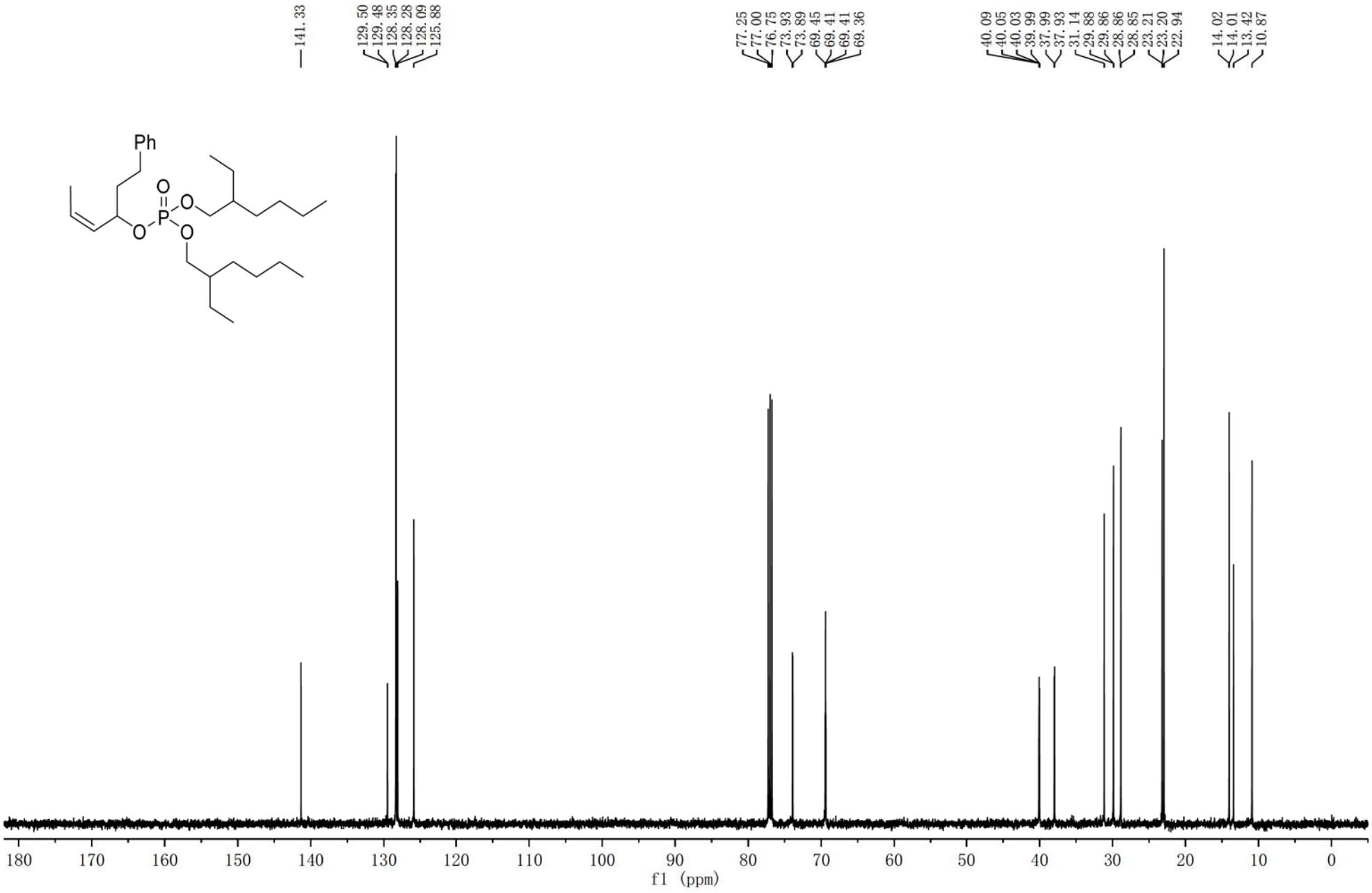

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2.70 2.69 2.68 2.68 2.67 2.66
2.10 2.09 2.08 1.86 1.70 1.68 1.66 1.65 1.60 1.59 1.57 1.56 1.55 1.32 1.32 1.31 1.30 1.29 1.29 1.28 0.95 0.94 0.94 0.93 0.92 0.92 0.91 0.90
O
P
O
O
O
O
Ph
Z:E = 98:2
(Z)-2-1
2.36
3.16
1.00
1.05
0.98
2.06
2.13
1.02
1.10
5.08
2.15
6.31
6.33
8.0
7.5
7.0
6.5
6.0
5.5
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3.0
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1.0
0.5
0.0
f1 (ppm)

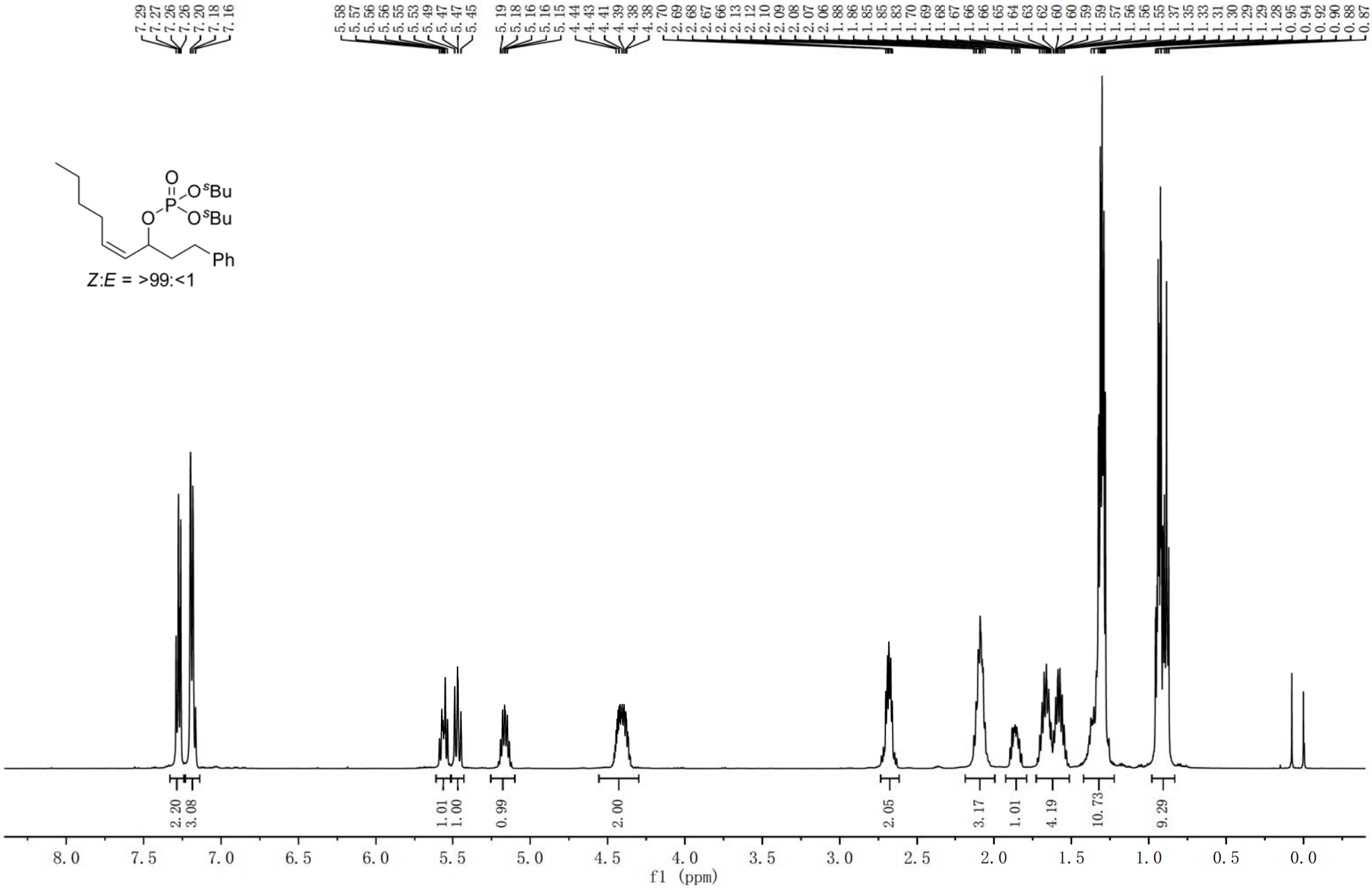

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129.72
128.35
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127.73
127.71
125.86
77.25
77.00
76.74
76.69
76.64
76.60
76.54
73.75
73.70
38.05
38.02
38.00
37.97
31.09
30.34
30.29
30.27
30.22
20.93
20.91
20.82
20.81
13.46
9.41
9.38
9.36
9.33
O
O
sBu
P
O
sBu
Ph
(Z)-2-1
180
170
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150
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130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

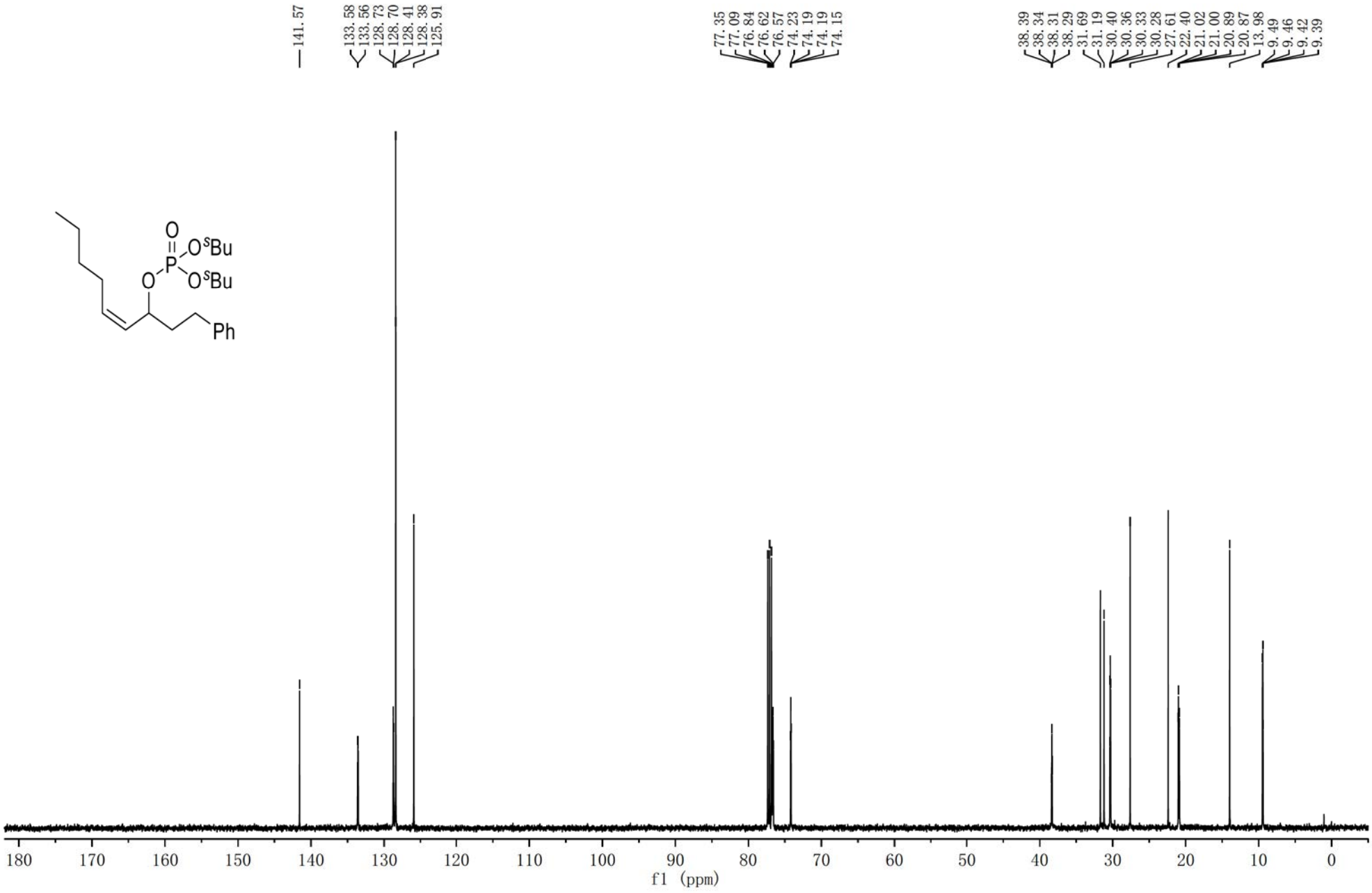

OP(O)(O iPr)2
Ph
(Z:E = 98:2)
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2.71 2.70 2.69 2.68 2.67 2.66 2.65 2.13 2.11 2.11 2.10 2.09 2.08 2.08 1.90 1.89 1.88 1.88 1.87 1.87 1.86 1.86 1.85 1.85 1.84 1.83 1.69 1.69 1.68 1.68 1.33 1.32 1.31 1.31 1.30 1.29
2.61 3.61 1.03 1.08 1.00 2.19 2.22 1.06 1.78 3.05 13.62
8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

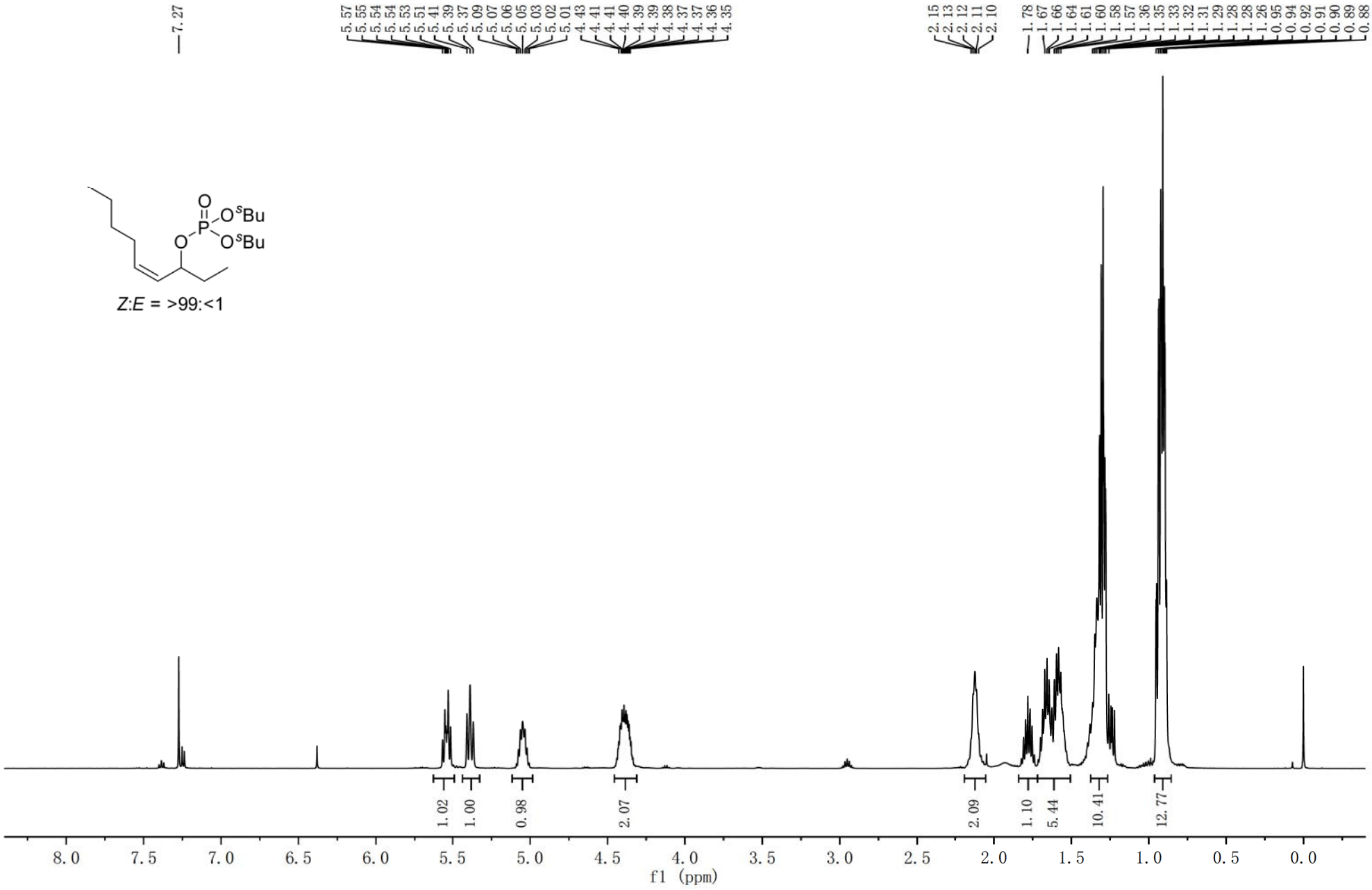

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129.68
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128.36
128.33
127.83
125.88
77.25
77.00
76.75
73.75
73.70
72.07
72.04
72.02
71.99
37.99
37.94
31.10
23.70
23.66
23.62
23.59
13.44
OP(O)(O iPr)2
Ph
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

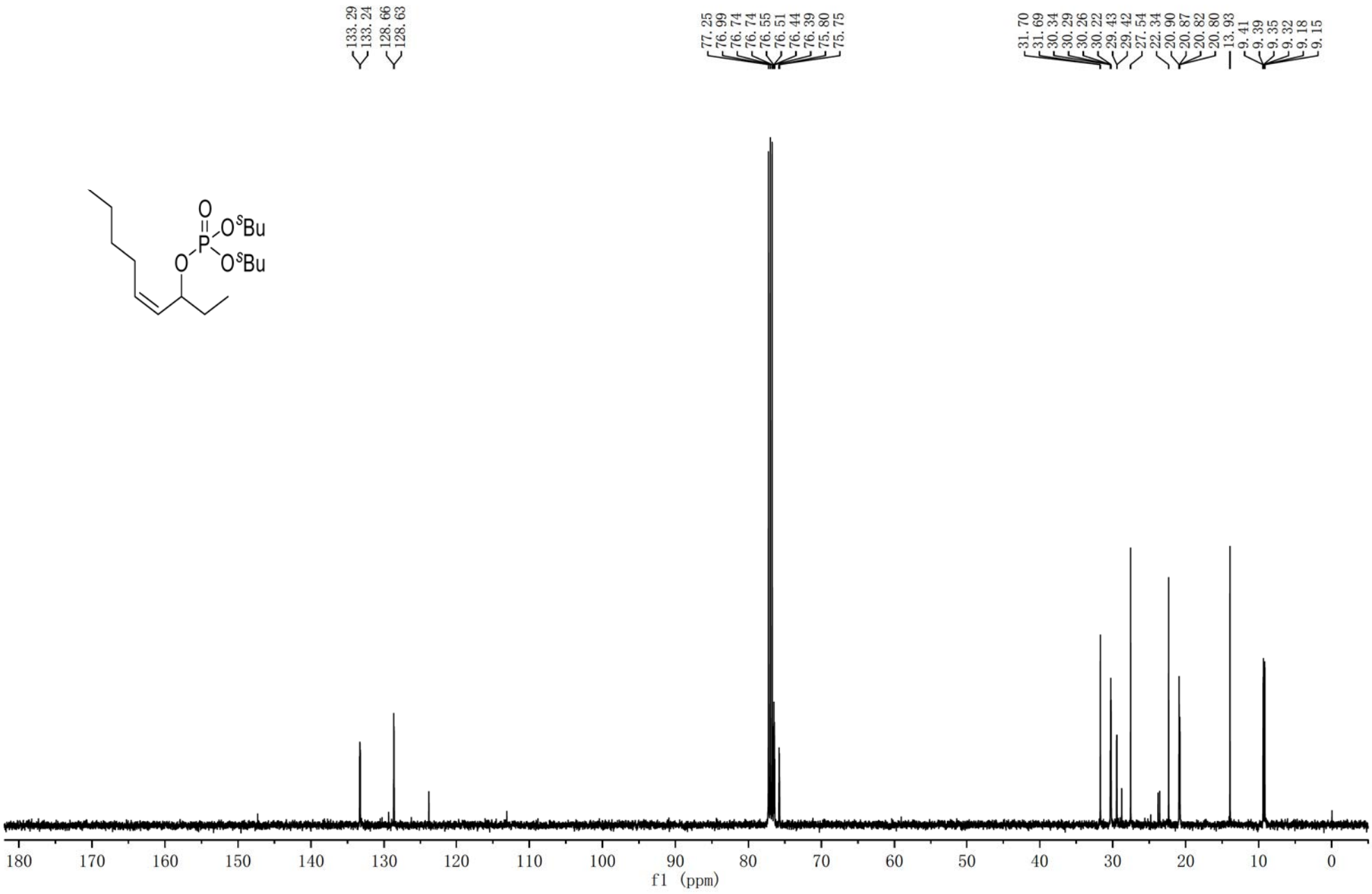

Ph
O
P
O
O
O
(Z:E = >98:<2)
7.29 7.28 7.26 7.20 7.18 7.17 5.69 5.69 5.68 5.68 5.68 5.67 5.67 5.67 5.66 5.66 5.52 5.51 5.50 5.50 5.49 5.48 5.47 5.19 5.18 5.16 3.97 3.96 3.95 3.94 3.94 3.93 3.93 3.92 3.91 3.91 3.90 3.89 3.88 3.87 2.71 2.69 2.69 2.68 2.68 2.66 2.13 2.12 2.11 2.11 2.10 2.09 2.09 2.08 2.07 1.90 1.89 1.88 1.87 1.87 1.86 1.85 1.84 1.70 1.70 1.68 1.68 1.57 1.56 1.55 1.54 1.53 1.52 1.43 1.41 1.40 1.38 1.37 1.35 1.34 1.33 1.30 1.28 1.27 1.24 0.90 0.90 0.89 0.88 0.88 0.88 0.87
2.37
3.37
1.03
1.05
1.00
4.25
2.16
1.00
1.12
3.12
2.23
17.74
13.17
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f1 (ppm)

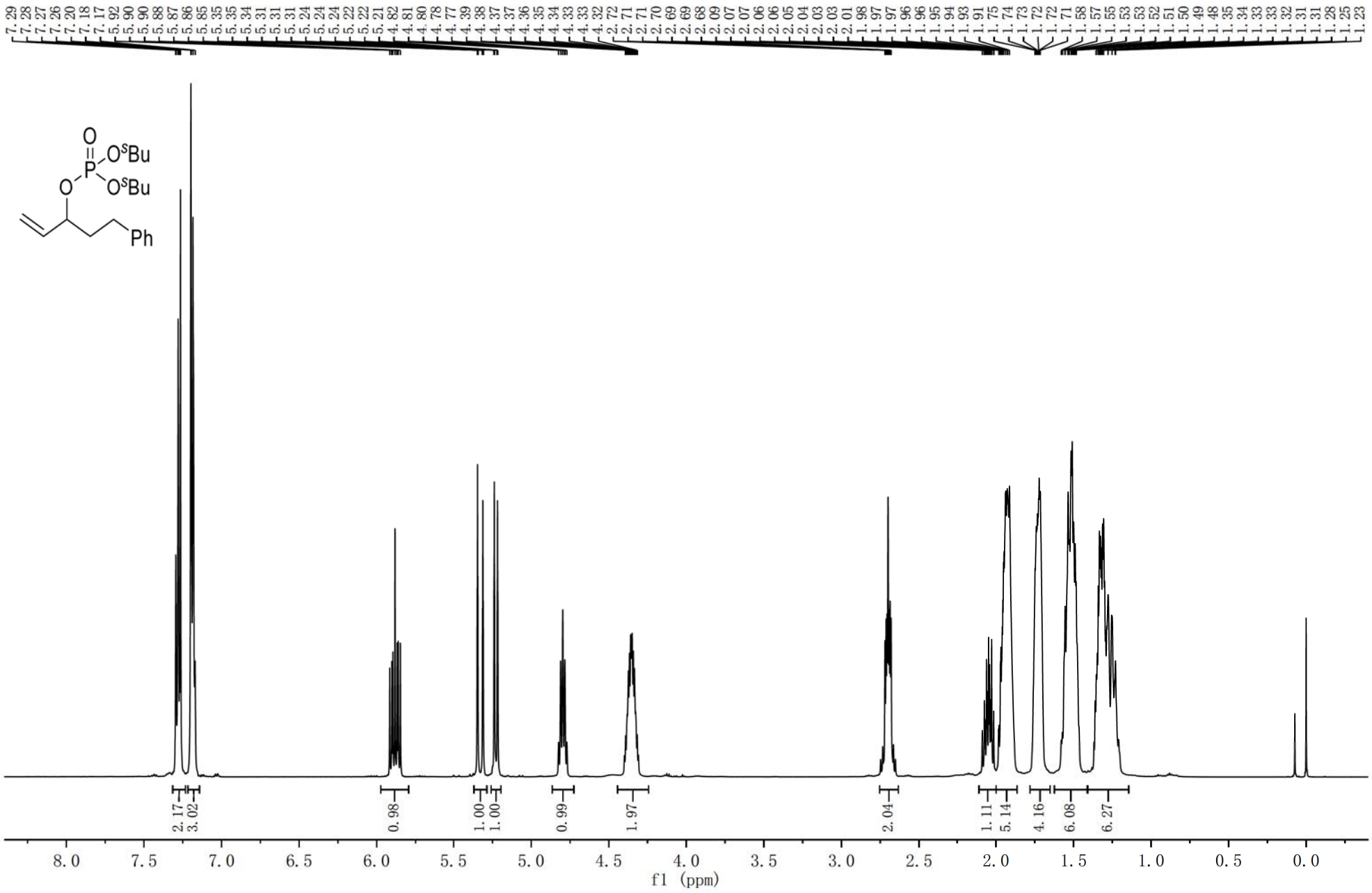

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128.35
128.28
128.09
125.88
77.25
77.00
76.75
73.93
73.89
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69.41
69.41
69.36
40.09
40.05
40.03
39.99
37.99
37.93
31.14
29.88
29.86
28.86
28.85
23.21
23.20
22.94
14.02
14.01
13.42
10.87
Ph
O
P
O
O
O
180
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160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

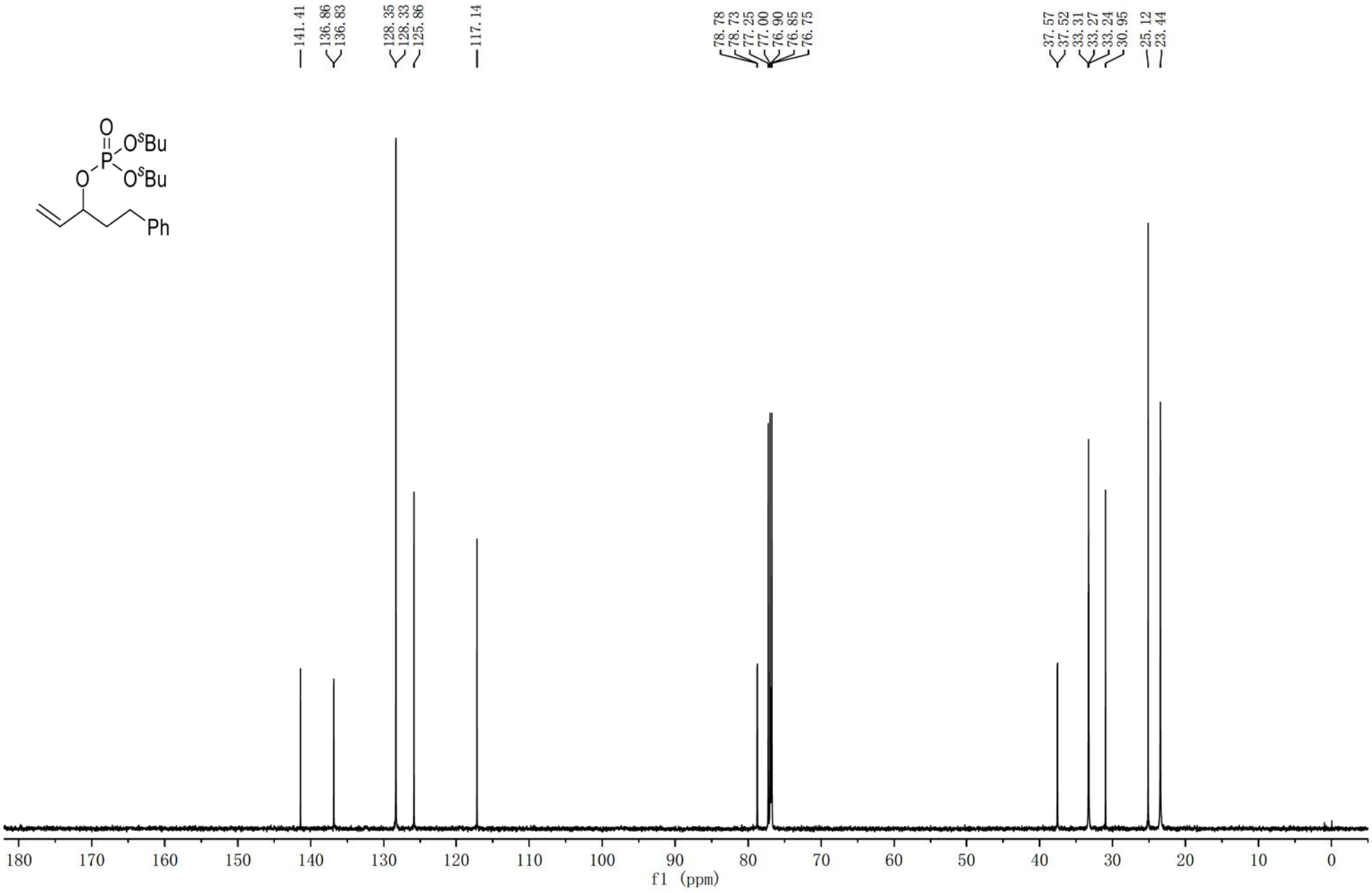

7.29 7.27 7.26 7.26 7.20 7.18 7.16
5.58 5.57 5.56 5.56 5.55 5.53 5.49 5.47 5.47 5.45
5.19 5.18 5.16 5.16 5.15
4.44 4.43 4.41 4.39 4.38 4.38
2.70 2.69 2.68 2.67 2.66 2.13 2.12 2.10 2.09 2.08 2.07 2.06 1.88 1.86 1.85 1.85 1.83 1.70 1.69 1.68 1.67 1.66 1.66 1.65 1.64 1.63 1.62 1.60 1.60 1.59 1.59 1.57 1.56 1.56 1.55 1.37 1.35 1.33 1.31 1.30 1.29 1.29 1.28 0.95 0.94 0.92 0.90 0.88 0.87
O
O^{s}Bu
P
O^{s}Bu
O
Ph
Z:E = >99:<1
2.20 3.08 1.01 1.00 0.99 2.00 2.05 3.17 1.01 4.19 10.73 9.29
8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

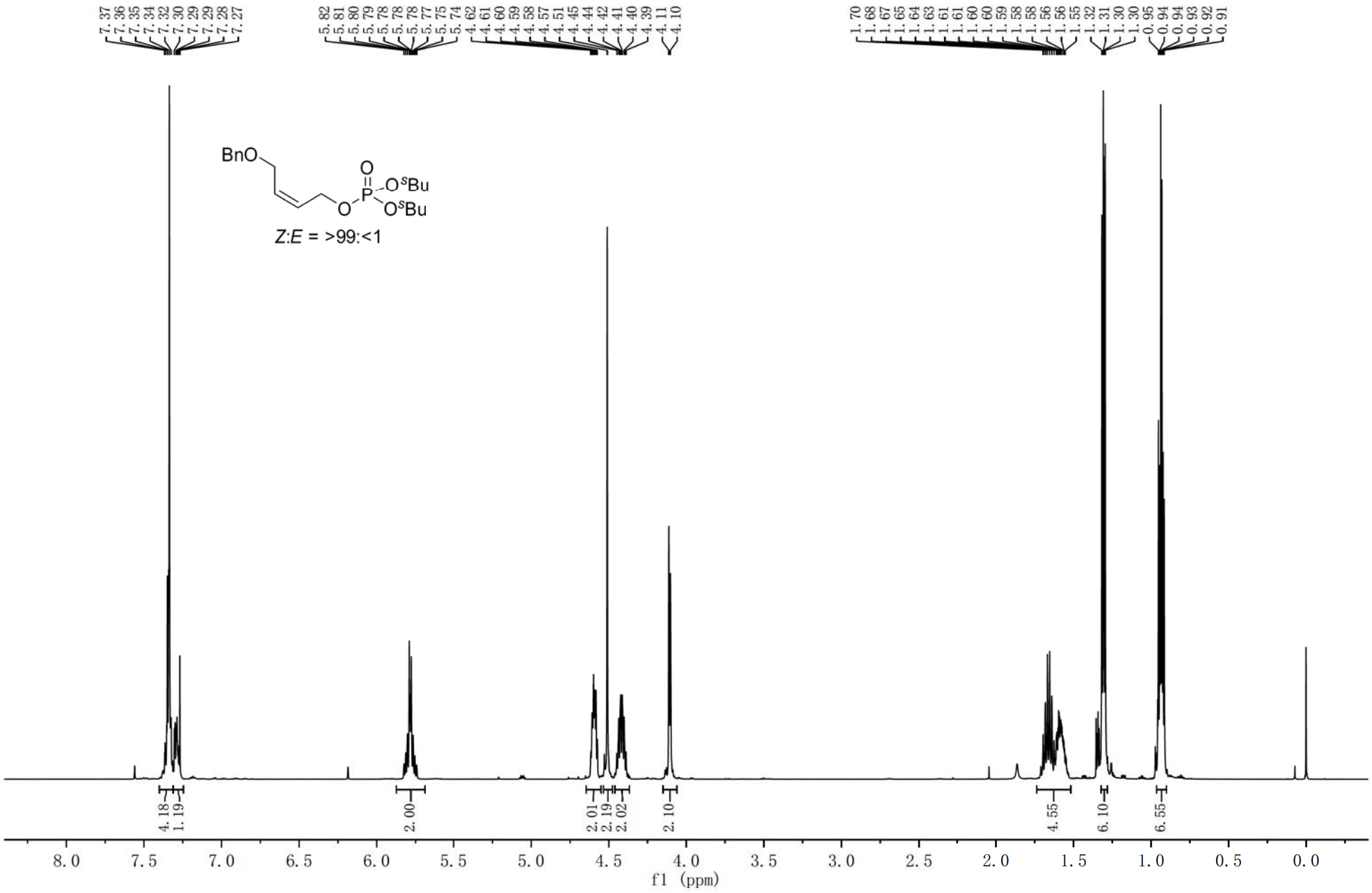

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128.70
128.41
128.38
125.91
77.35
77.09
76.84
76.62
76.57
74.23
74.19
74.19
74.15
38.39
38.34
38.31
38.29
31.69
31.19
30.40
30.36
30.33
30.28
27.61
22.40
21.02
21.00
20.89
20.87
13.98
9.49
9.46
9.42
9.39
O
O
^{s}Bu
P
O
^{s}Bu
Ph
180
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130
120
110
100
90
80
70
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50
40
30
20
10
0
f1 (ppm)

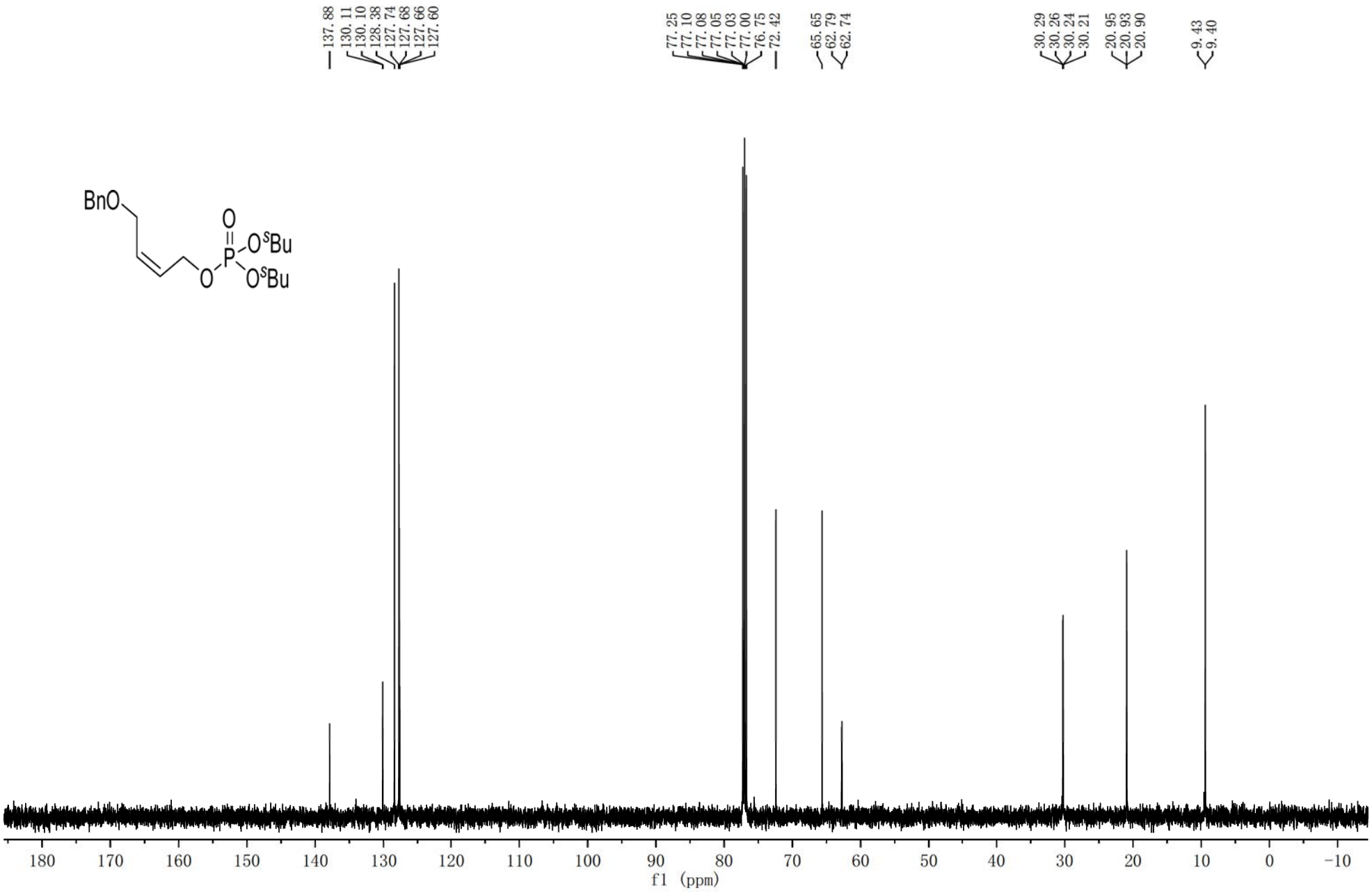

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5.53
5.51
5.41
5.39
5.37
5.09
5.07
5.06
5.05
5.03
5.02
5.01
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4.41
4.41
4.40
4.39
4.39
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2.12
2.11
2.10
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1.67
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1.64
1.61
1.60
1.58
1.57
1.36
1.35
1.33
1.32
1.31
1.29
1.28
1.28
1.26
0.95
0.94
0.92
0.91
0.90
0.89
0.88
O
P
O
O
O
O
Z:E = >99:<1
1.02
1.00
0.98
2.07
2.09
1.10
5.44
10.41
12.77
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)

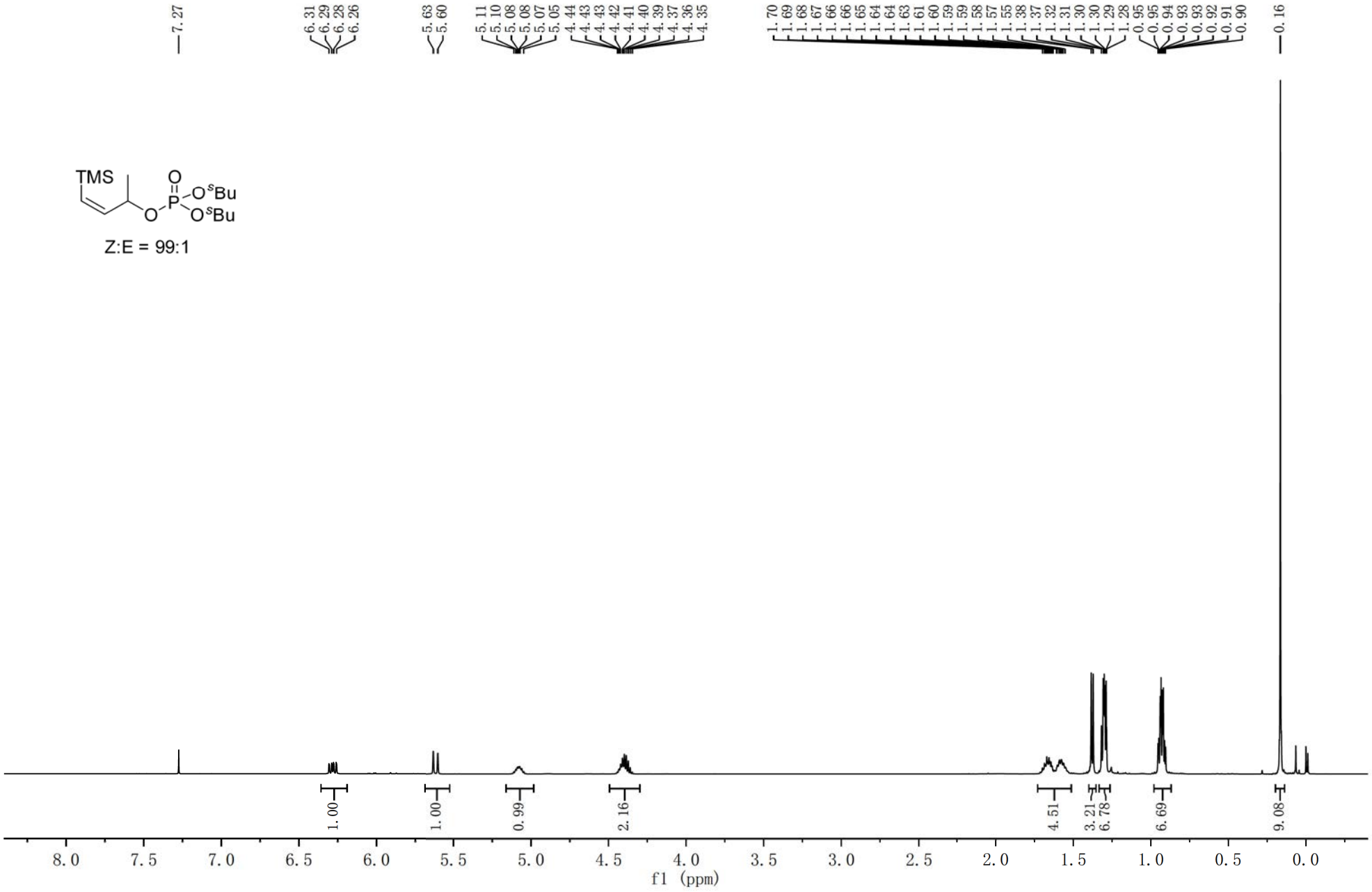

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76.51
76.44
76.39
75.80
75.75
31.70
31.69
30.34
30.29
30.26
30.22
29.43
29.42
27.54
22.34
20.90
20.87
20.82
20.80
13.93
9.41
9.39
9.35
9.32
9.18
9.15
O
O
sBu
P
O
O
sBu
180
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130
120
110
100
90
80
70
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50
40
30
20
10
0
f1 (ppm)

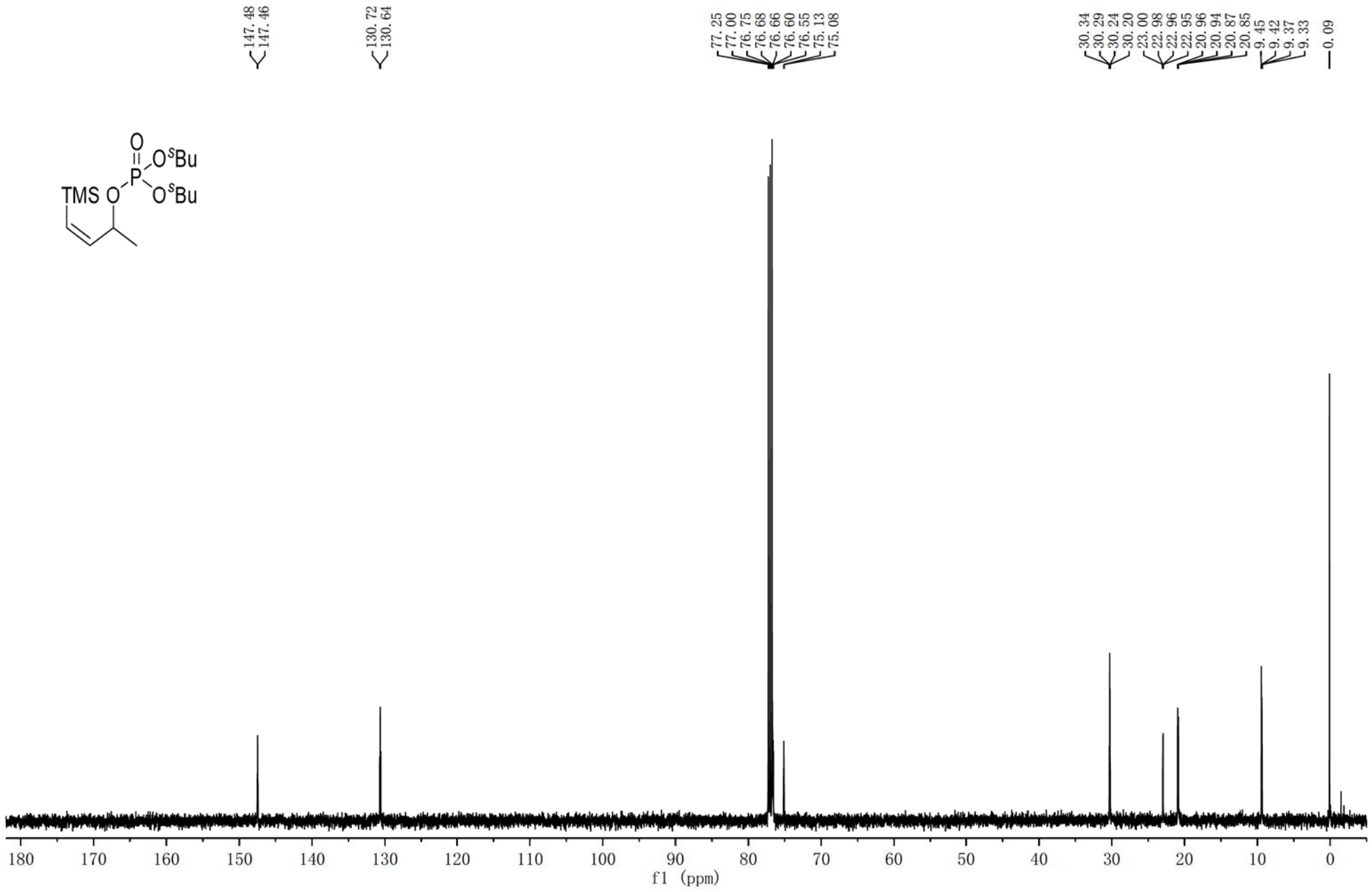

7.29 7.28 7.27 7.26 7.20 7.18 7.17 5.92 5.90 5.90 5.88 5.87 5.86 5.85 5.35 5.35 5.34 5.31 5.31 5.31 5.24 5.24 5.24 5.22 5.22 5.21 4.82 4.81 4.80 4.78 4.77 4.39 4.38 4.37 4.37 4.36 4.35 4.34 4.33 4.33 4.32 2.72 2.71 2.71 2.70 2.69 2.69 2.68 2.09 2.07 2.07 2.06 2.06 2.05 2.04 2.03 2.03 2.01 1.98 1.97 1.97 1.96 1.96 1.95 1.94 1.93 1.91 1.75 1.74 1.73 1.72 1.72 1.71 1.58 1.57 1.55 1.53 1.53 1.52 1.51 1.50 1.49 1.48 1.35 1.34 1.33 1.33 1.32 1.31 1.31 1.28 1.25 1.23
O
P
O
OsBu
OsBu
Ph
2.17
3.02
0.98
1.00
1.00
0.99
1.97
2.04
1.11
5.14
4.16
6.08
6.27
8.0
7.5
7.0
6.5
6.0
5.5
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3.5
3.0
2.5
2.0
1.5
1.0
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0.0
f1 (ppm)

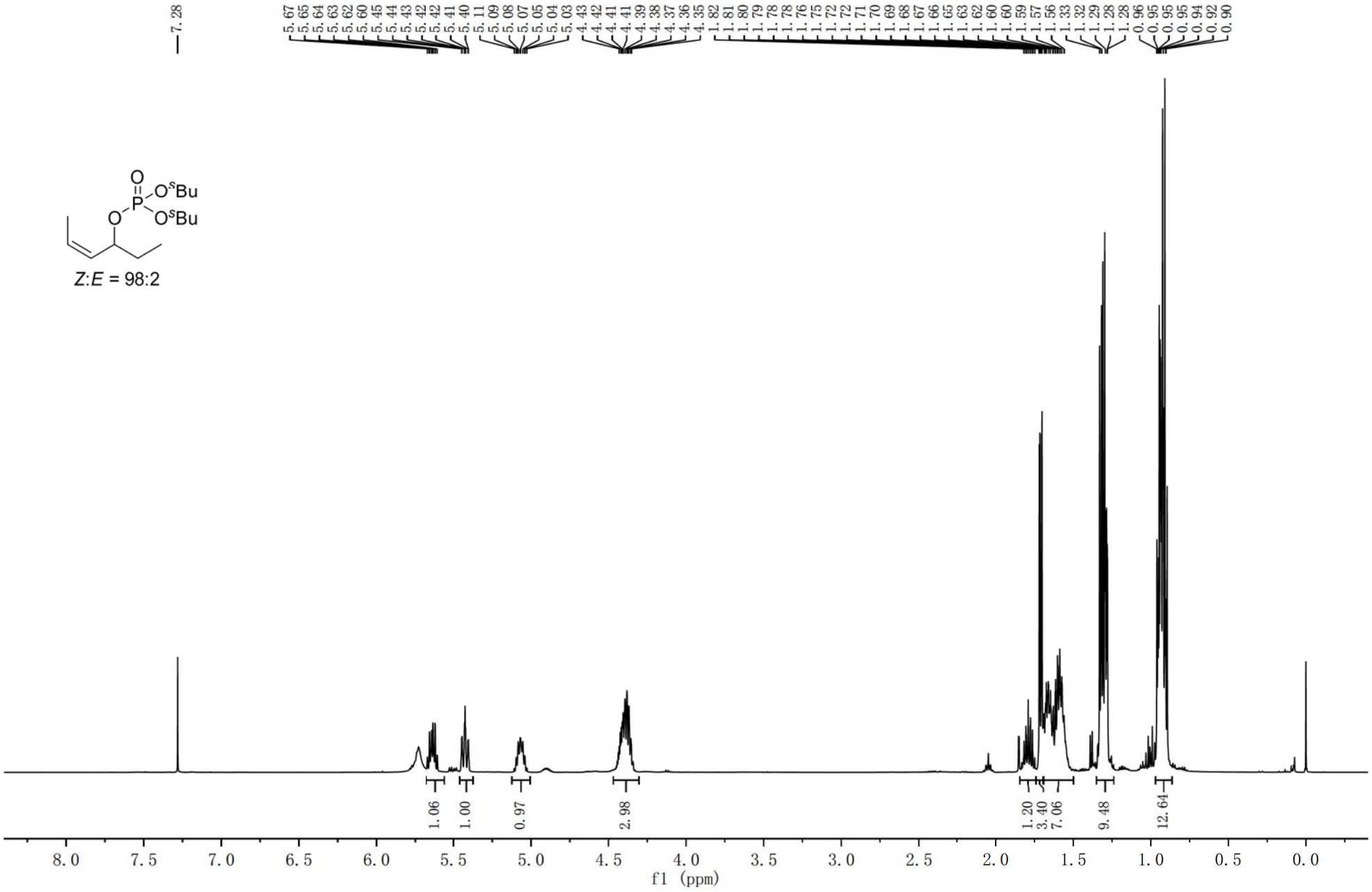

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76.90
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37.52
33.31
33.27
33.24
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25.12
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O
P
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OsBu
Ph
180
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70
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50
40
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10
0
f1 (ppm)

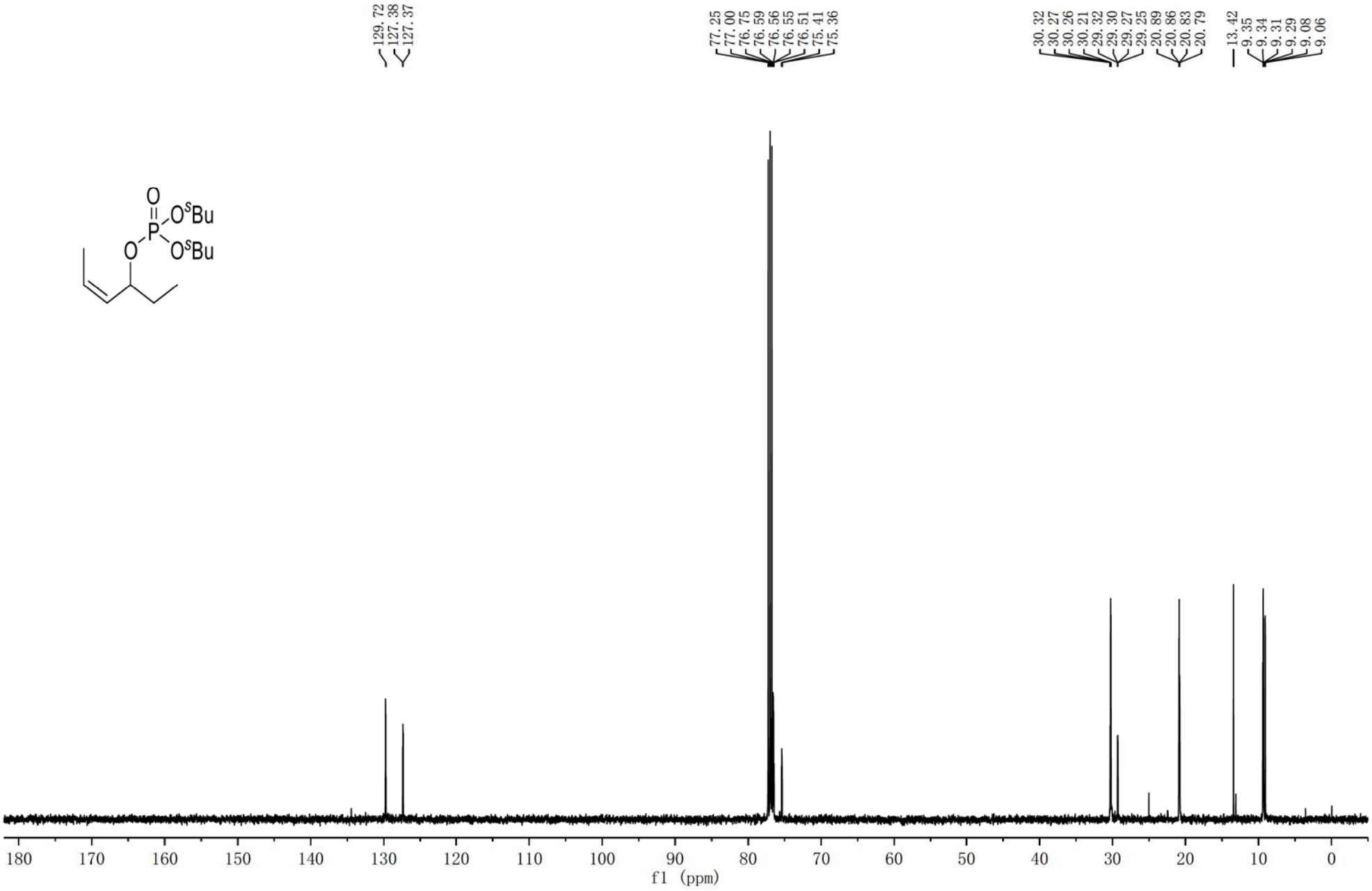

7.37 7.36 7.35 7.34 7.32 7.30 7.29 7.29 7.28 7.27
5.82 5.81 5.80 5.79 5.78 5.78 5.77 5.75 5.74
4.62 4.61 4.60 4.59 4.58 4.57 4.51 4.45 4.44 4.42 4.41 4.40 4.39
4.11 4.10
1.70 1.68 1.67 1.65 1.64 1.63 1.61 1.61 1.60 1.60 1.59 1.58 1.58 1.56 1.56 1.55
1.32 1.31 1.30
0.95 0.94 0.94 0.93 0.92 0.91
BnO
O
P
O
OsBu
OsBu
Z:E = >99:<1
4.18
1.19
2.00
2.01
2.19
2.02
2.10
4.55
6.10
6.55
8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

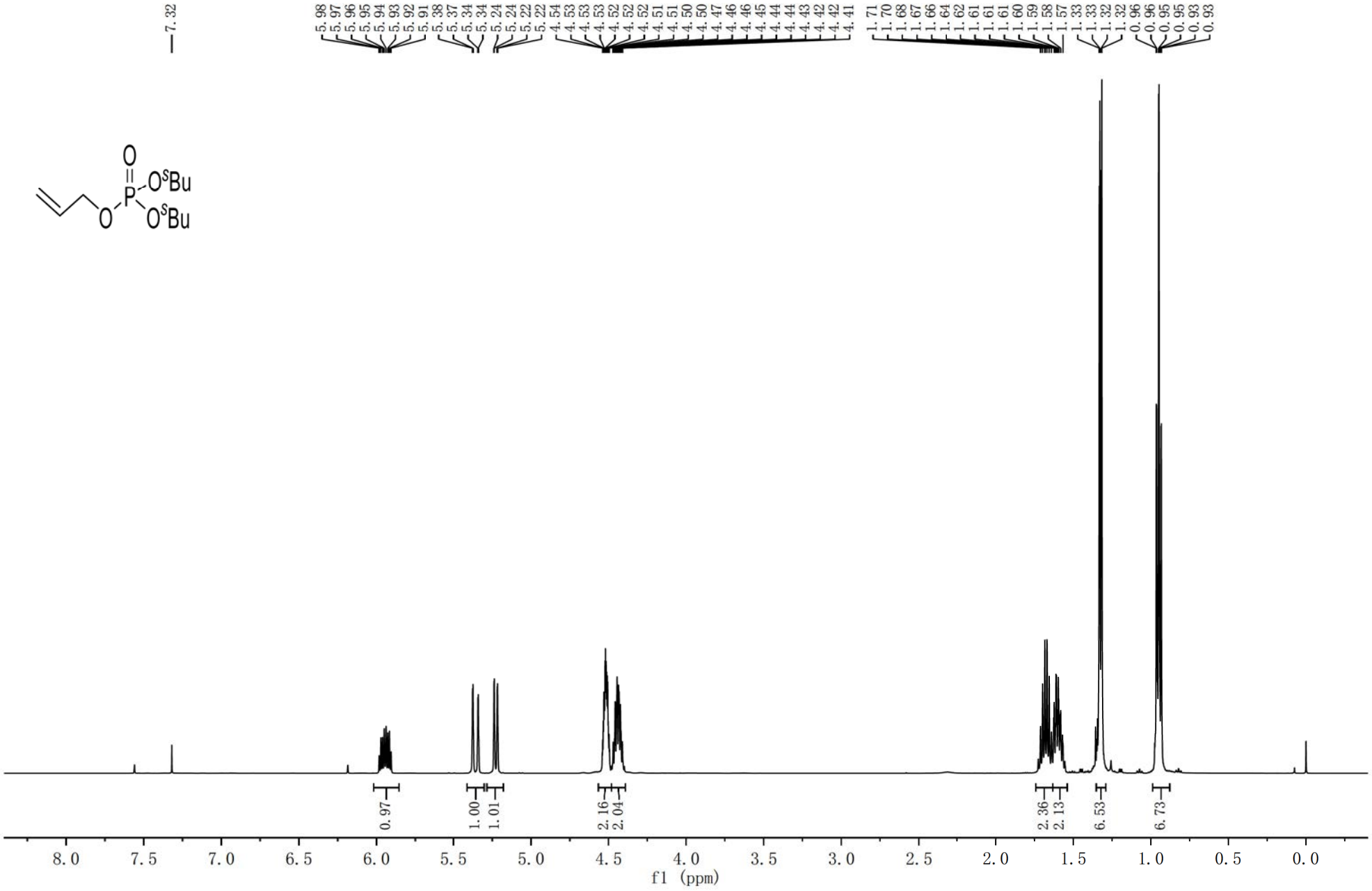

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77.10
77.08
77.05
77.03
77.00
76.75
72.42
65.65
62.79
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30.29
30.26
30.24
30.21
20.95
20.93
20.90
9.43
9.40
BnO
O
O
P
O
sBu
O
sBu
180
170
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120
110
100
90
80
70
60
50
40
30
20
10
0
−10
f1 (ppm)

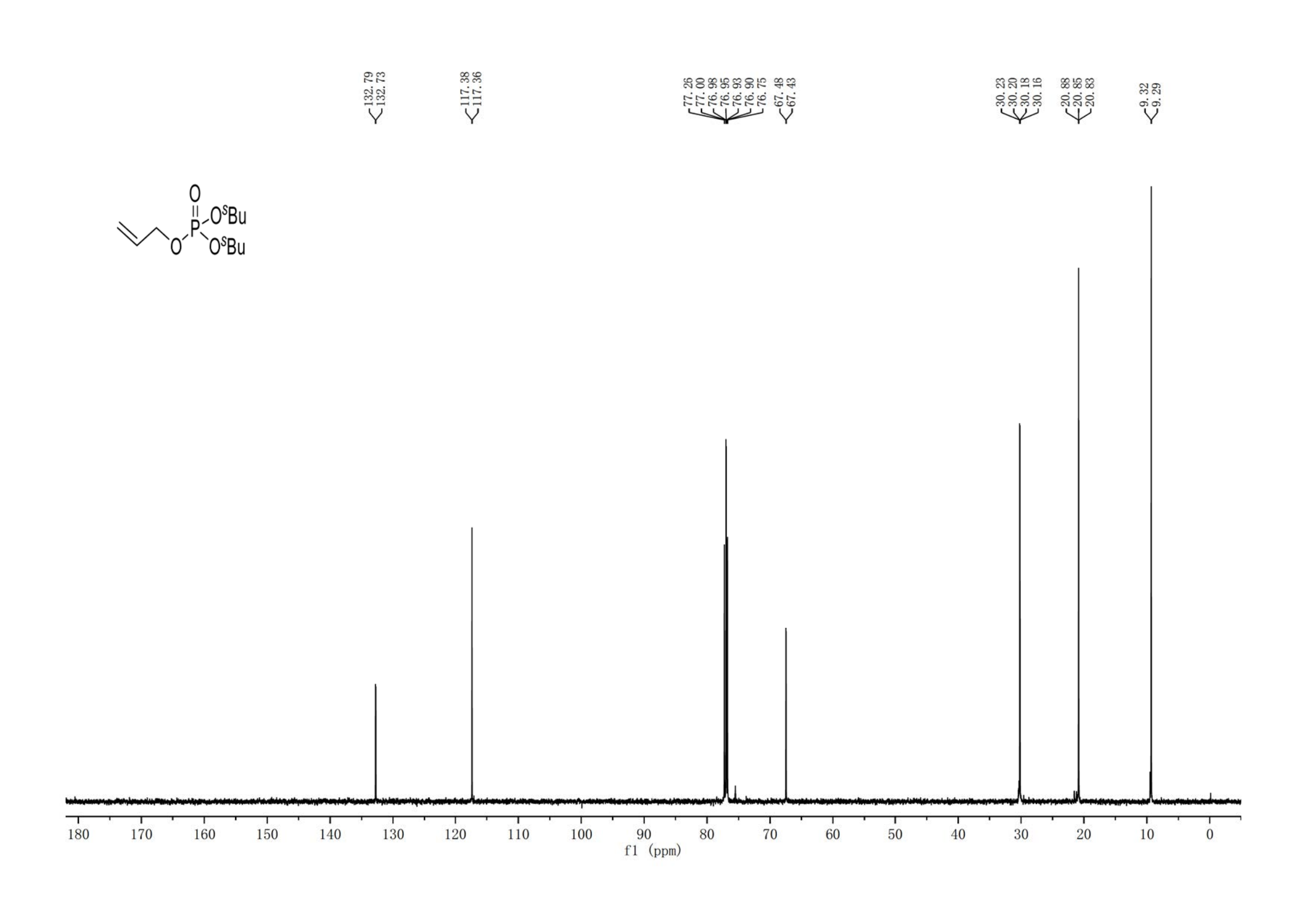

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6.31
6.29
6.28
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5.63
5.60
5.11
5.10
5.08
5.08
5.07
5.05
4.44
4.43
4.43
4.42
4.41
4.40
4.39
4.37
4.36
4.35
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1.69
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1.38
1.37
1.32
1.31
1.30
1.29
1.28
0.95
0.94
0.93
0.93
0.92
0.91
0.90
0.16
TMS
O
P
O
O
O
sBu
sBu
Z:E = 99:1
1.00
1.00
0.99
2.16
4.51
3.21
6.78
6.69
9.08
8.0
7.5
7.0
6.5
6.0
5.5
5.0
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3.0
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2.0
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1.0
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0.0
f1 (ppm)

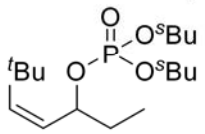

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77.00
76.75
76.68
76.66
76.60
76.55
75.13
75.08
30.34
30.29
30.24
30.20
23.00
22.98
22.96
22.95
20.96
20.94
20.87
20.85
9.45
9.42
9.37
9.33
0.09
O
P
O
sBu
TMS O
O
sBu
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


7.28
5.67 5.65 5.64 5.63 5.62 5.60 5.45 5.44 5.43 5.42 5.42 5.41 5.40 5.11 5.09 5.08 5.07 5.05 5.04 5.03 4.43 4.42 4.41 4.41 4.39 4.38 4.37 4.36 4.35 1.82 1.81 1.80 1.79 1.78 1.78 1.76 1.75 1.72 1.72 1.71 1.70 1.69 1.68 1.67 1.66 1.65 1.63 1.62 1.60 1.60 1.59 1.57 1.56 1.33 1.32 1.29 1.28 1.28 0.96 0.95 0.95 0.95 0.94 0.92 0.90
O
O^sBu
O^sBu
Z:E = 98:2
1.06
1.00
0.97
2.98
1.20
3.40
7.06
9.48
12.64
8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)


129.72
127.38
127.37
77.25
77.00
76.75
76.59
76.56
76.55
76.51
75.41
75.36
30.32
30.27
30.26
30.21
29.32
29.30
29.27
29.25
20.89
20.86
20.83
20.79
13.42
9.35
9.34
9.31
9.29
9.08
9.06
O
O
P
O
O
O
O
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

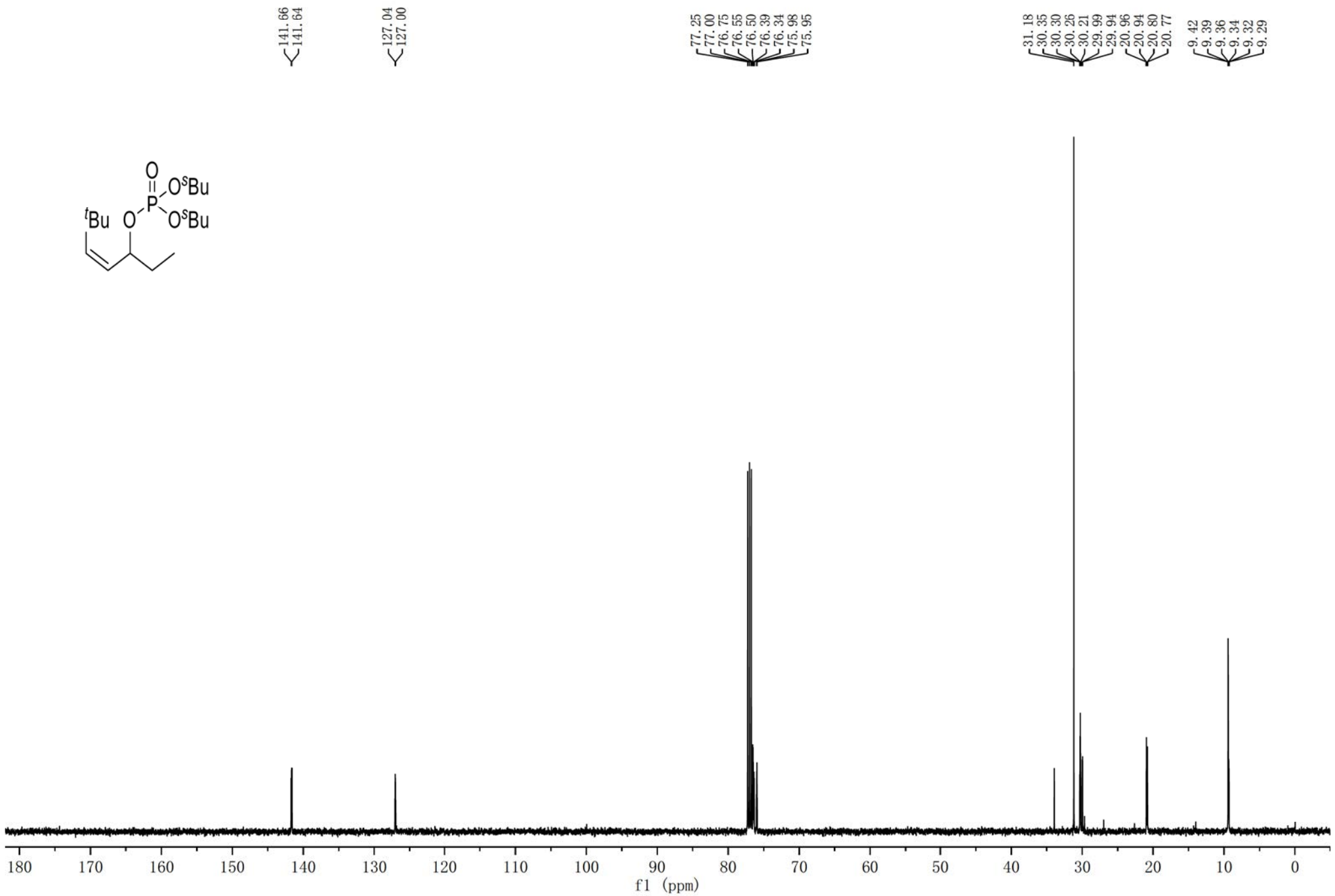

7.32
5.98 5.97 5.96 5.95 5.94 5.93 5.92 5.91
5.38 5.37 5.34 5.34 5.24 5.22 5.22
4.54 4.53 4.53 4.53 4.52 4.52 4.52 4.51 4.51 4.50 4.50 4.47 4.46 4.46 4.45 4.44 4.44 4.43 4.42 4.42 4.41
1.71 1.70 1.68 1.67 1.66 1.64 1.62 1.61 1.61 1.61 1.60 1.59 1.58 1.57
1.33 1.32 1.32
0.96 0.96 0.95 0.95 0.93 0.93
O
O^sBu
O^sBu
O
0.97
1.00
1.01
2.16
2.04
2.36
2.13
6.53
6.73
8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

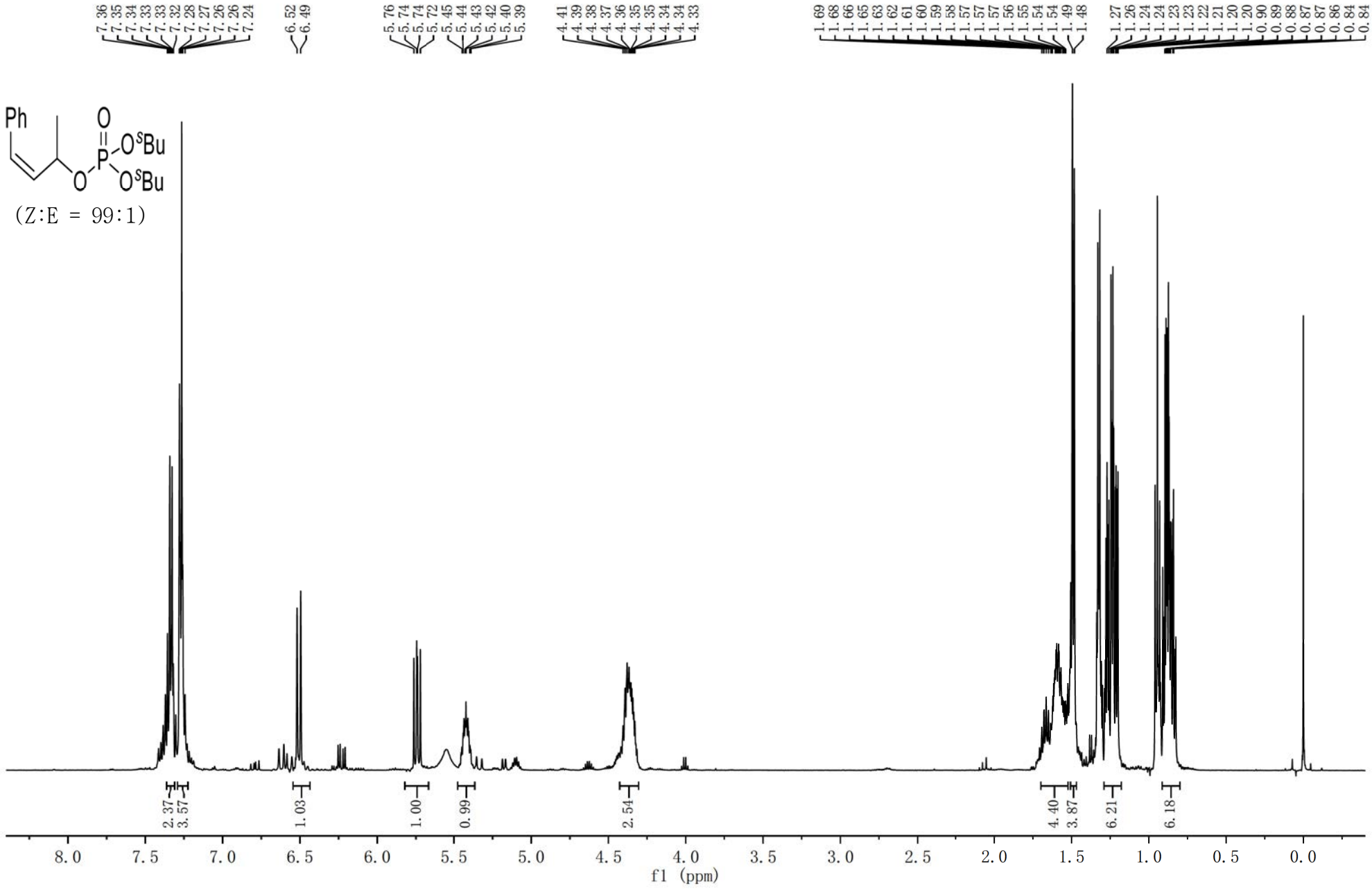

132.79
132.73
117.38
117.36
77.26
77.00
76.98
76.95
76.93
76.90
76.75
67.48
67.43
30.23
30.20
30.18
30.16
20.88
20.85
20.83
9.32
9.29
O
O
P
OsBu
OsBu
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

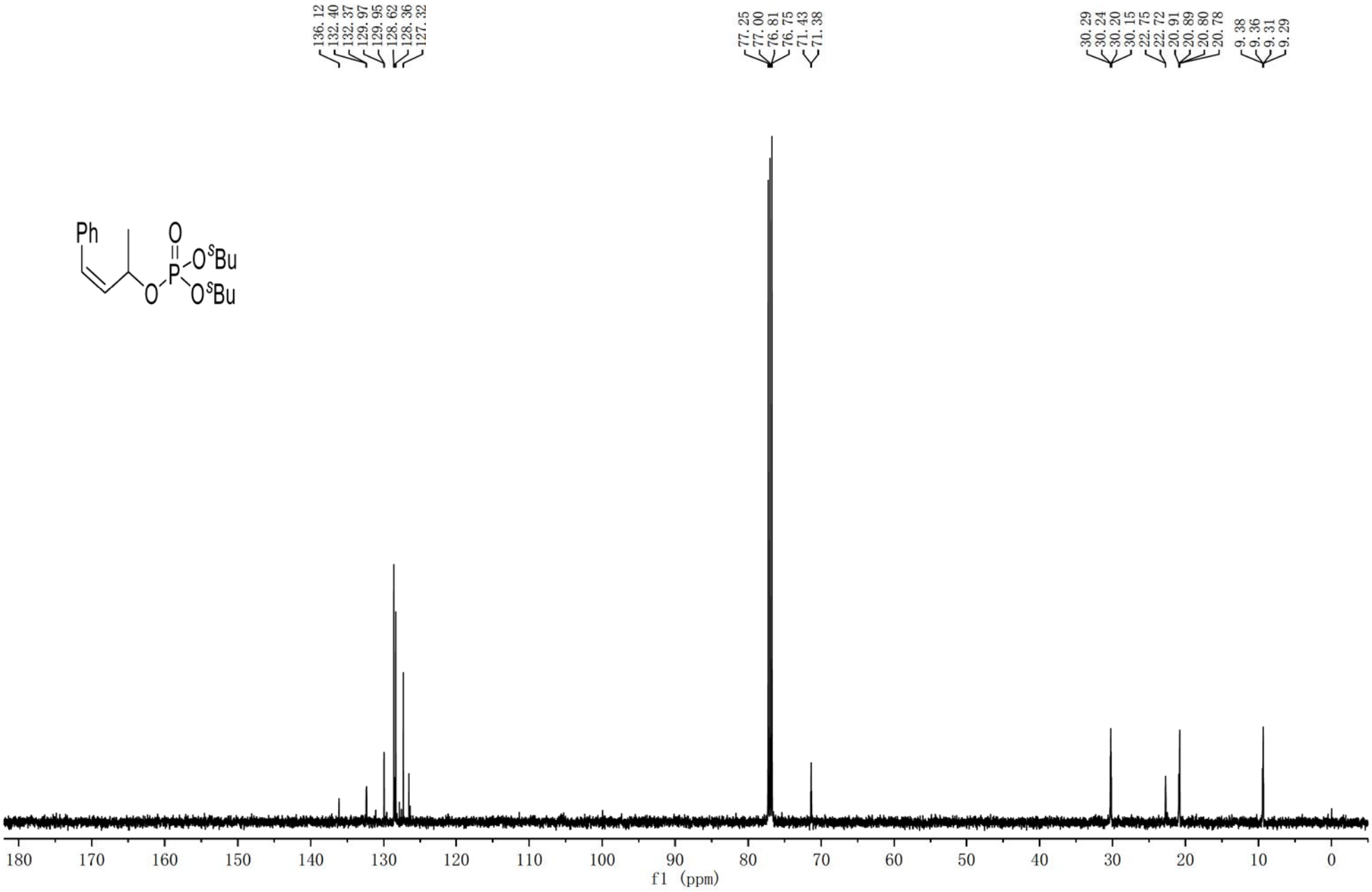

O
O^{s}Bu
P
^{t}Bu O
O^{s}Bu

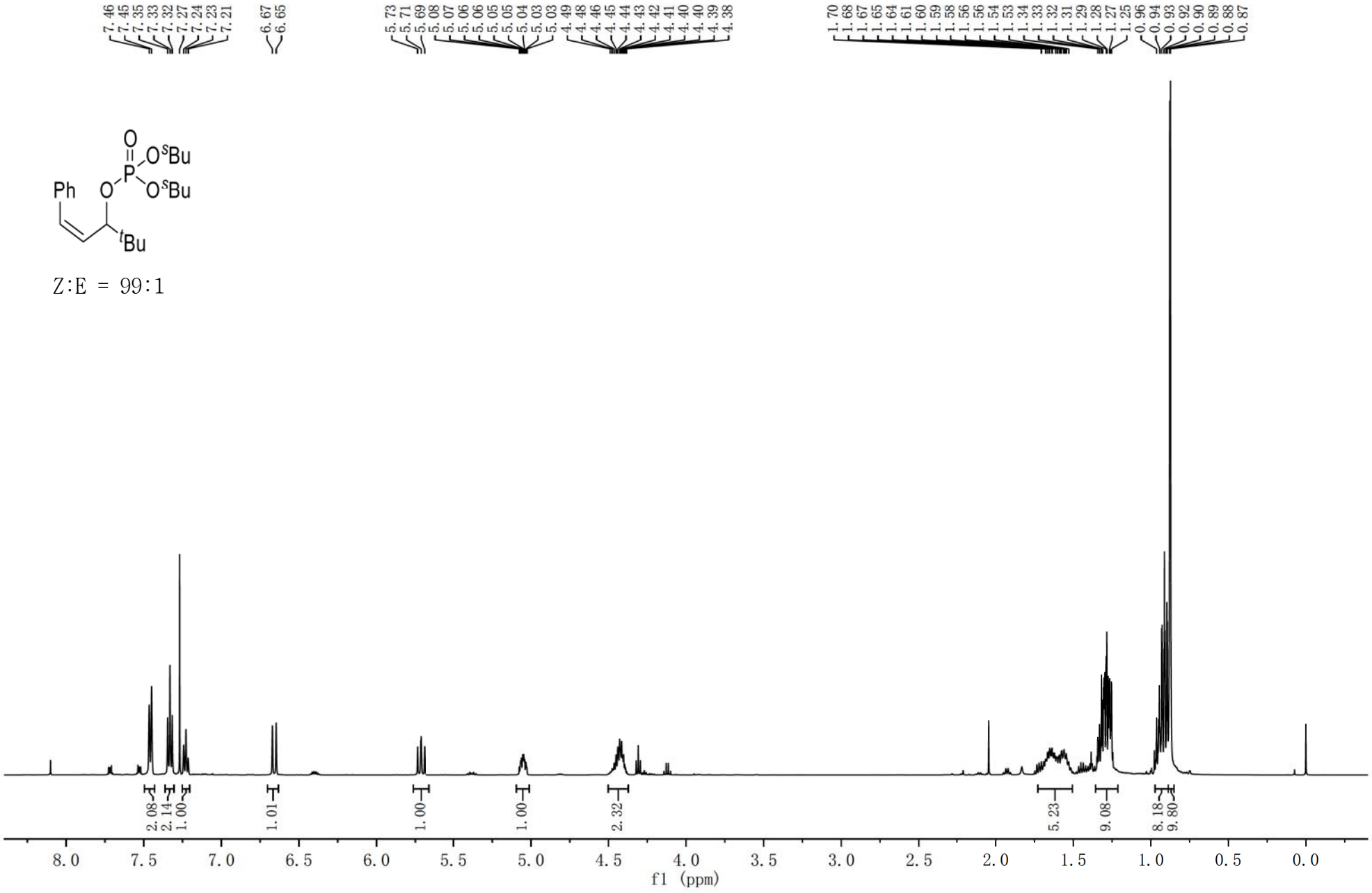
Z:*E* = >99:<1

7.28
5.43 5.43 5.43 5.40 5.40 5.40 5.38 5.37 5.36 5.35 5.34 5.34 5.33 5.22 5.22 5.20 5.20 5.20 5.18 5.18 4.44 4.43 4.43 4.42 4.42 4.41 4.40 4.39 4.38 4.36 4.35
1.79 1.77 1.76 1.75 1.73 1.72 1.70 1.69 1.67 1.66 1.65 1.63 1.62 1.60 1.59 1.58 1.56 1.55 1.32 1.32 1.31 1.30 1.29 1.29 1.14 0.97 0.95 0.95 0.94 0.94 0.92 0.92 0.91 0.91
1.05 0.94 1.00 2.05 1.07 5.29 6.32 9.09 9.55
8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

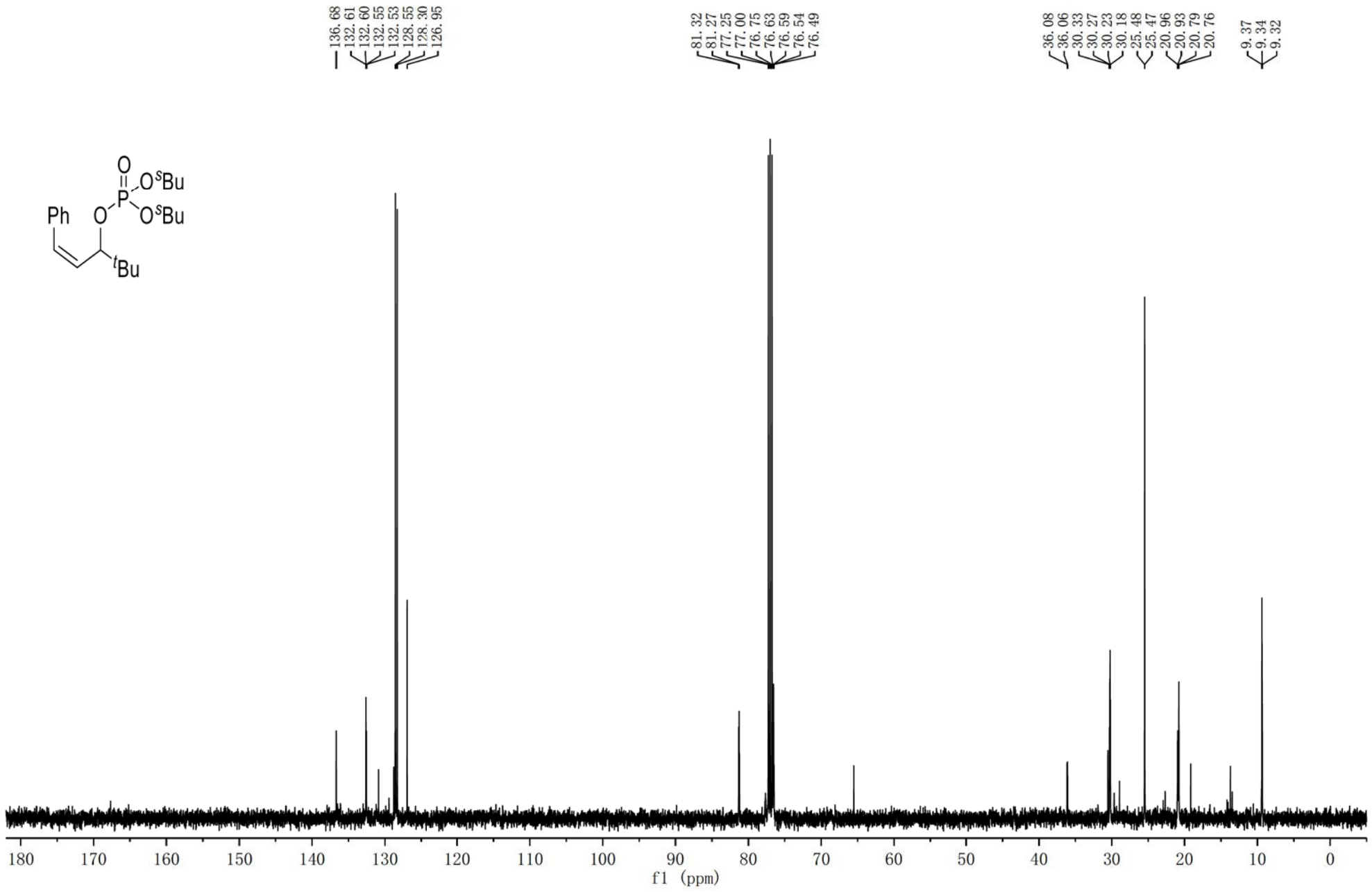

141.66
141.64
127.04
127.00
77.25
77.00
76.75
76.55
76.50
76.39
76.34
75.98
75.95
31.18
30.35
30.30
30.26
30.21
29.99
29.94
20.96
20.94
20.80
20.77
9.42
9.39
9.36
9.34
9.32
9.29
O
OsBu
tBu
O
P
OsBu
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

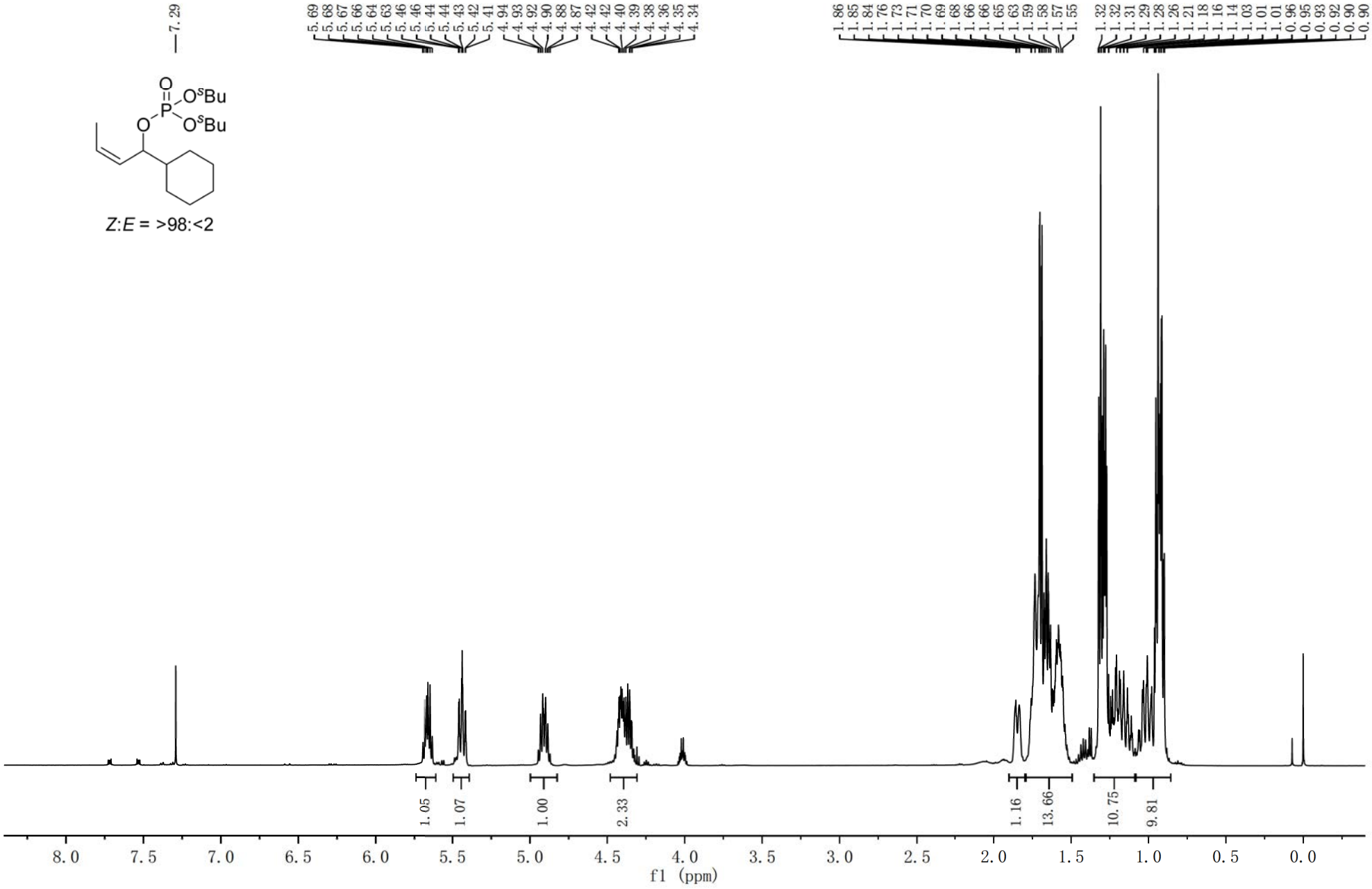

7.36 7.35 7.34 7.33 7.33 7.32 7.28 7.27 7.26 7.26 7.24
6.52 6.49
5.76 5.74 5.74 5.72 5.45 5.44 5.43 5.42 5.40 5.39
4.41 4.39 4.38 4.37 4.36 4.35 4.34 4.34 4.33
1.69 1.68 1.66 1.65 1.63 1.62 1.61 1.60 1.59 1.58 1.57 1.57 1.57 1.56 1.55 1.54 1.54 1.49 1.48
1.27 1.26 1.24 1.24 1.23 1.22 1.21 1.20 0.90 0.89 0.88 0.87 0.87 0.86 0.84 0.84
Ph
O
P
O
O
sBu
O
sBu
(Z:E = 99:1)
2.37
3.57
1.03
1.00
0.99
2.54
4.40
3.87
6.21
6.18
8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

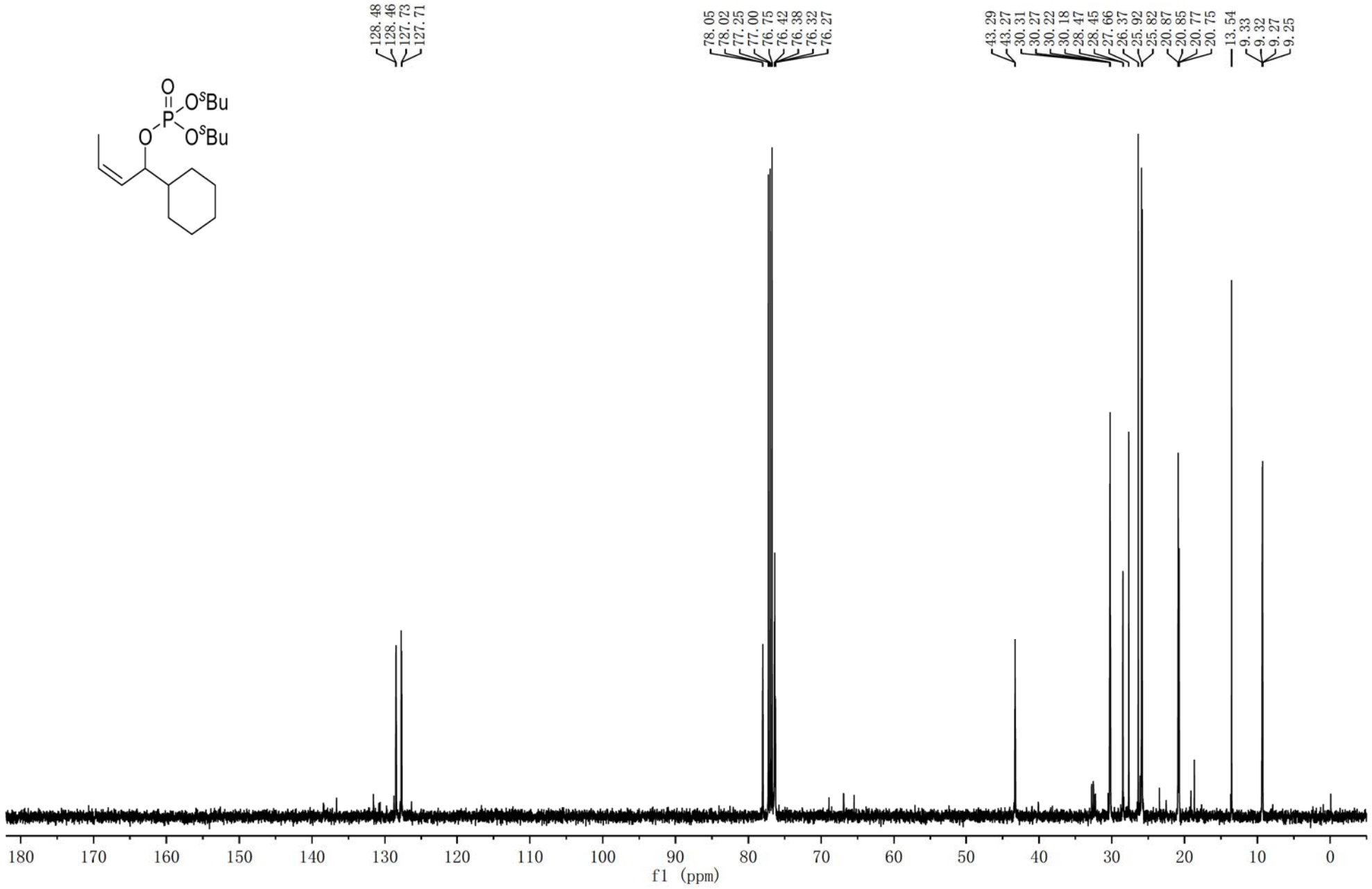

136.12
132.40
132.37
129.97
129.95
128.62
128.36
127.32
77.25
77.00
76.81
76.75
71.43
71.38
30.29
30.24
30.20
30.15
22.75
22.72
20.91
20.89
20.80
20.78
9.38
9.36
9.31
9.29
Ph
O
P
O
O
O
O
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

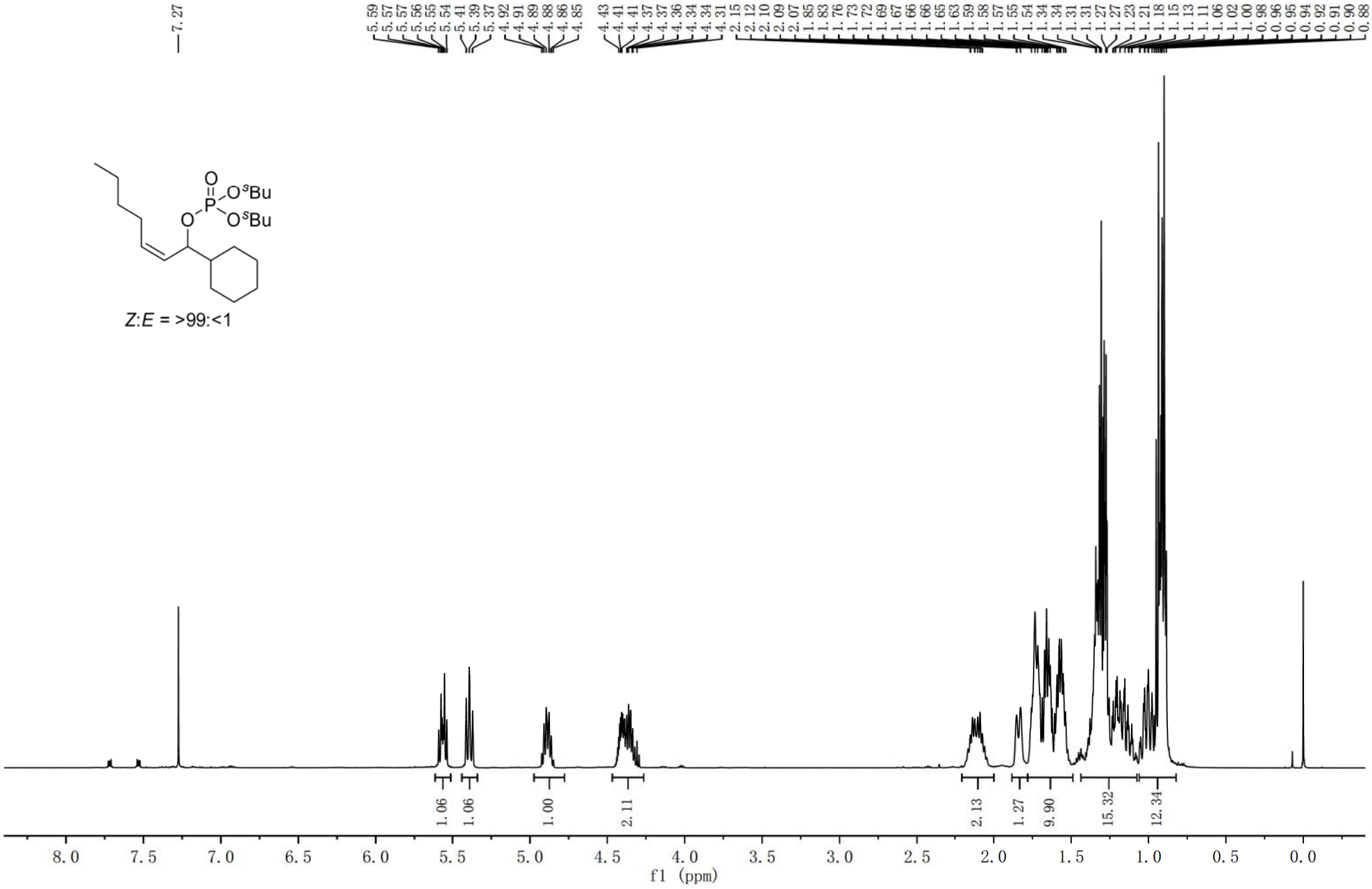

7.46
7.45
7.35
7.33
7.32
7.27
7.24
7.23
7.21
6.67
6.65
5.73
5.71
5.69
5.08
5.07
5.06
5.06
5.05
5.05
5.04
5.03
5.03
4.49
4.48
4.46
4.45
4.44
4.43
4.42
4.41
4.40
4.40
4.39
4.38
1.70
1.68
1.67
1.65
1.64
1.61
1.60
1.59
1.58
1.56
1.56
1.54
1.53
1.34
1.33
1.32
1.31
1.29
1.28
1.27
1.25
0.96
0.94
0.93
0.92
0.90
0.89
0.88
0.87
O
O^{s}Bu
P
Ph
O
O^{s}Bu
^{t}Bu
2.08
2.14
1.00
1.01
1.00
1.00
2.32
5.23
9.08
8.18
9.80
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)

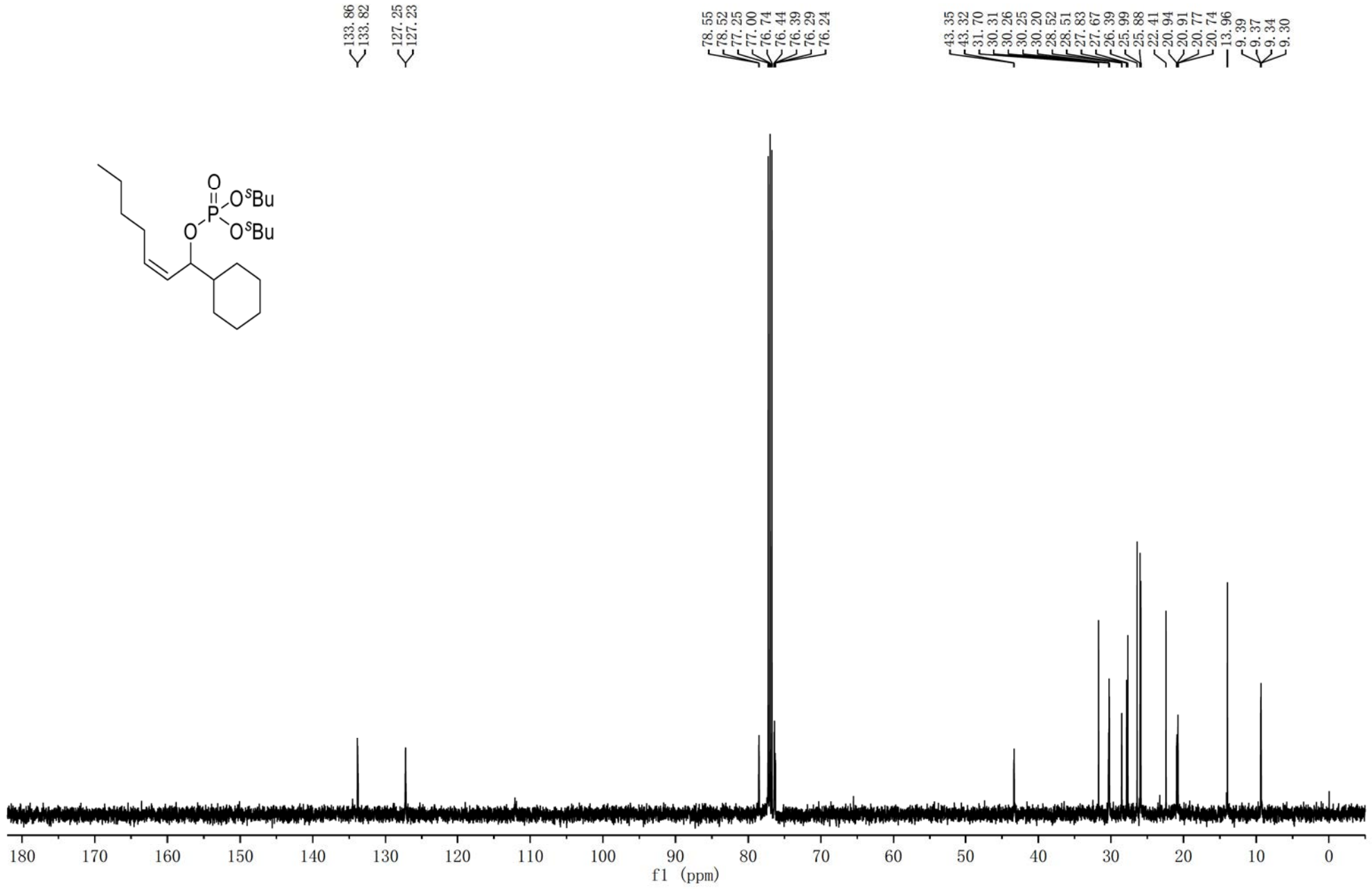
Z:E = 99:1

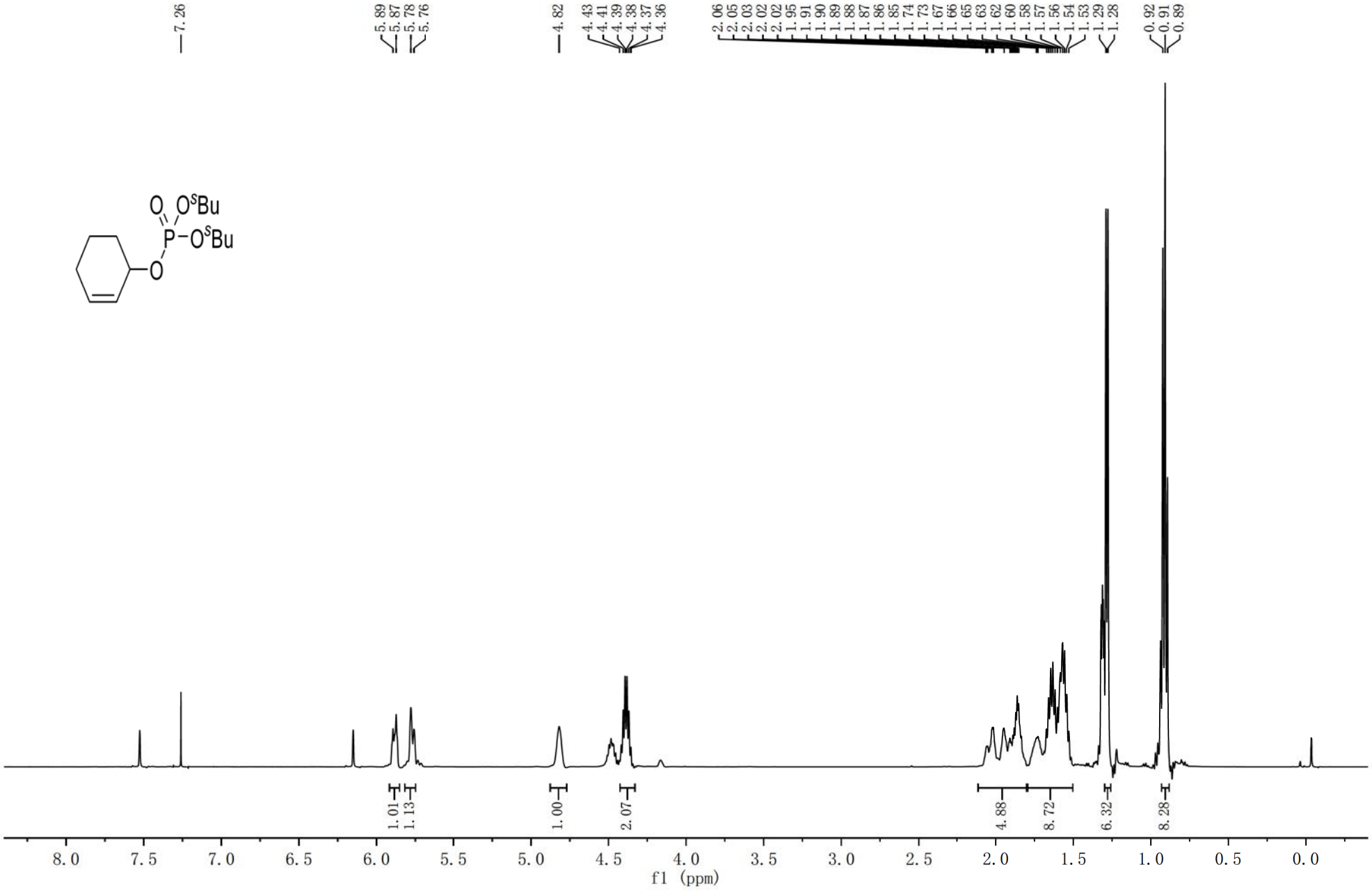

136.68
132.61
132.60
132.55
132.53
128.55
128.30
126.95
81.32
81.27
77.25
77.00
76.75
76.63
76.59
76.54
76.49
36.08
36.06
30.33
30.27
30.23
30.18
25.48
25.47
20.96
20.93
20.79
20.76
9.37
9.34
9.32
Ph
O
P
O
O
sBu
O
sBu
tBu
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

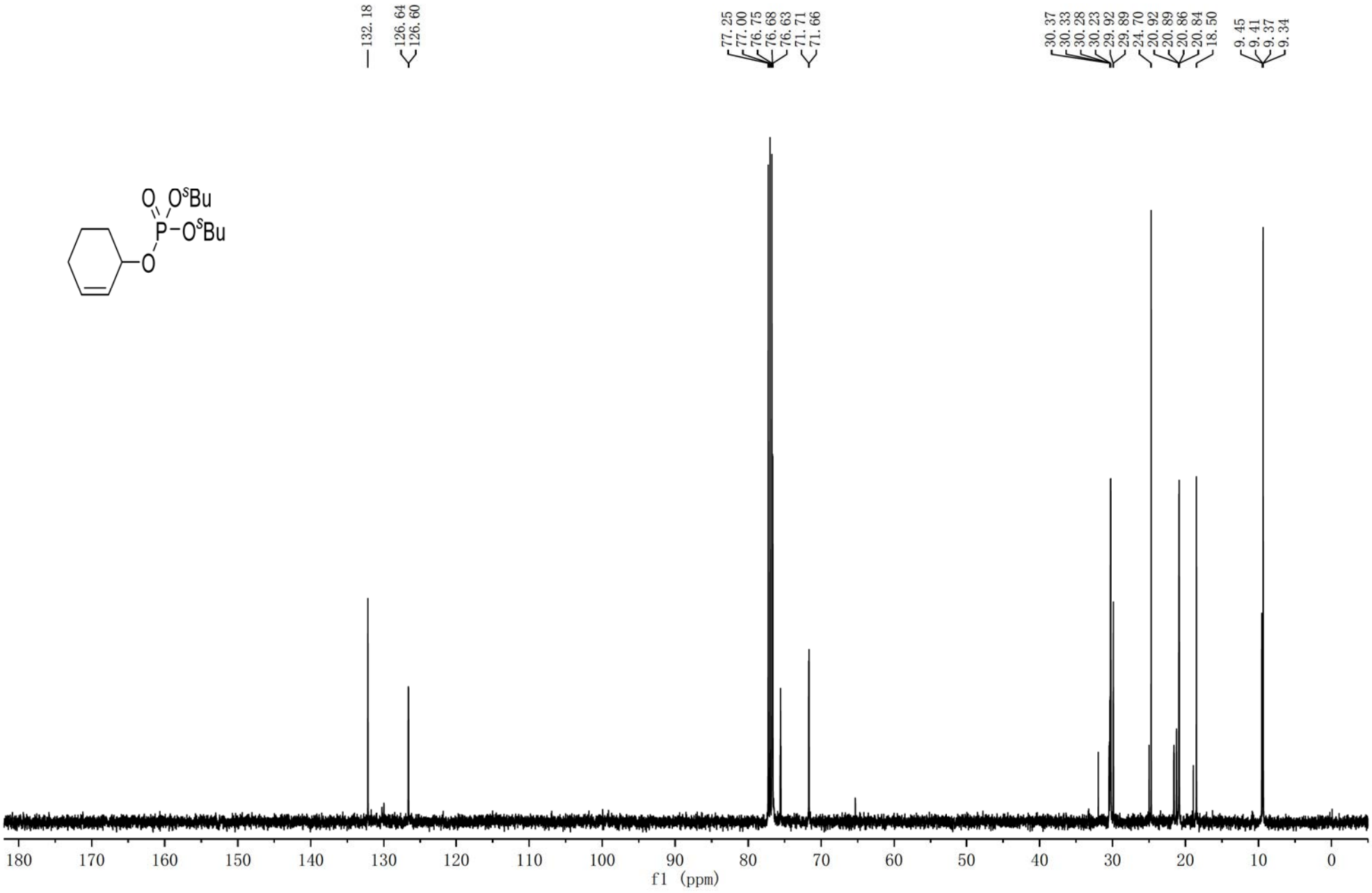

7.29
5.69 5.68 5.67 5.66 5.64 5.63 5.46 5.46 5.44 5.44 5.43 5.42 5.41
4.94 4.93 4.92 4.90 4.88 4.87
4.42 4.42 4.40 4.39 4.38 4.36 4.35 4.34
1.86 1.85 1.84 1.76 1.73 1.71 1.70 1.69 1.68 1.66 1.66 1.65 1.63 1.59 1.58 1.57 1.55
1.32 1.32 1.31 1.29 1.28 1.26 1.21 1.18 1.16 1.14 1.03 1.01 1.01 0.96 0.95 0.93 0.92 0.90 0.90
O
O^{s}Bu
P
O
O^{s}Bu
Z:E = >98:<2
1.05
1.07
1.00
2.33
1.16
13.66
10.75
9.81
8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

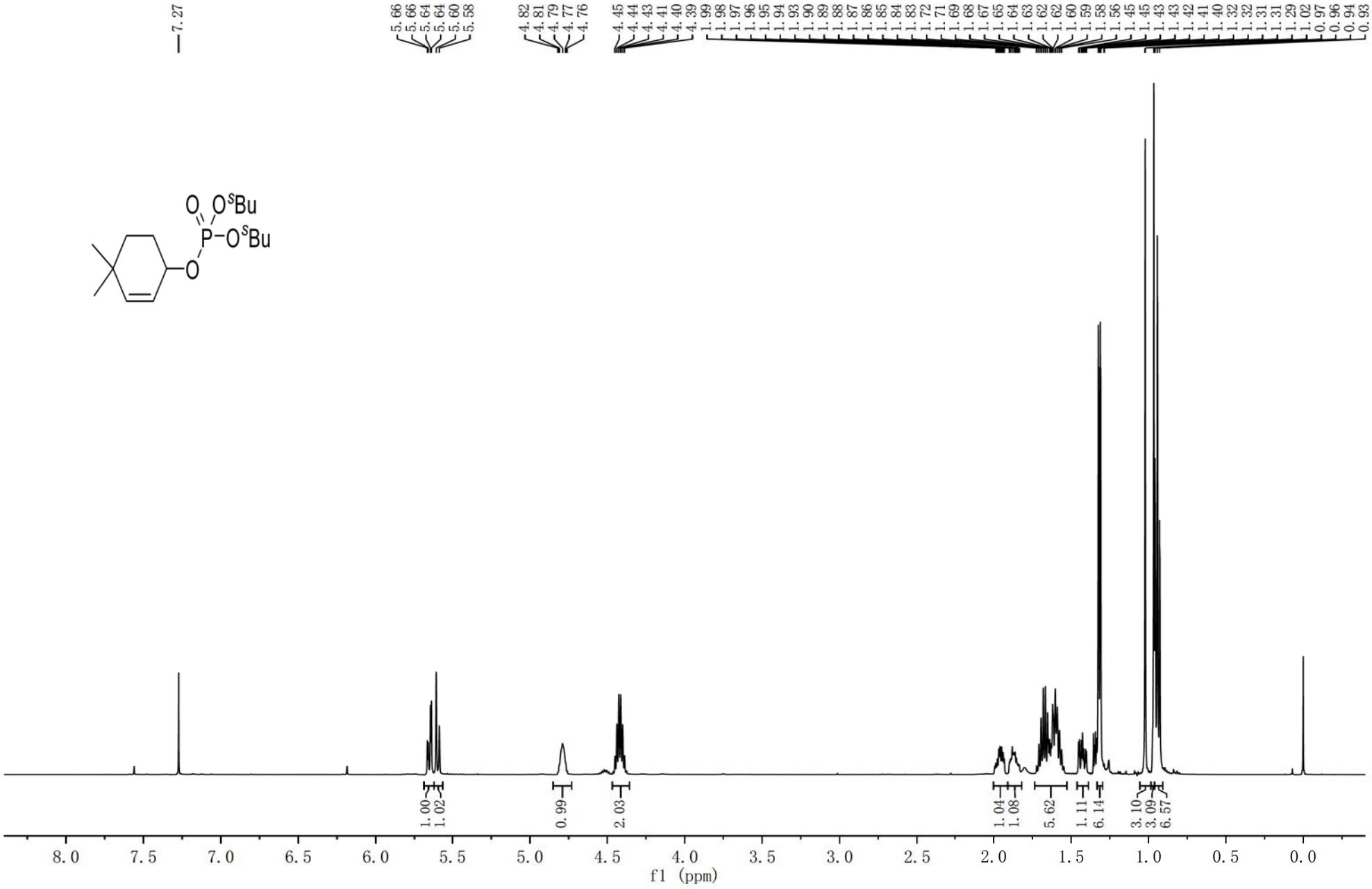

128.48
128.46
127.73
127.71
78.05
78.02
77.25
77.00
76.75
76.42
76.38
76.32
76.27
43.29
43.27
30.31
30.27
30.22
30.18
28.47
28.45
27.66
26.37
25.92
25.82
20.87
20.85
20.77
20.75
13.54
9.33
9.32
9.27
9.25
O
O^{s}Bu
P
O
O^{s}Bu
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

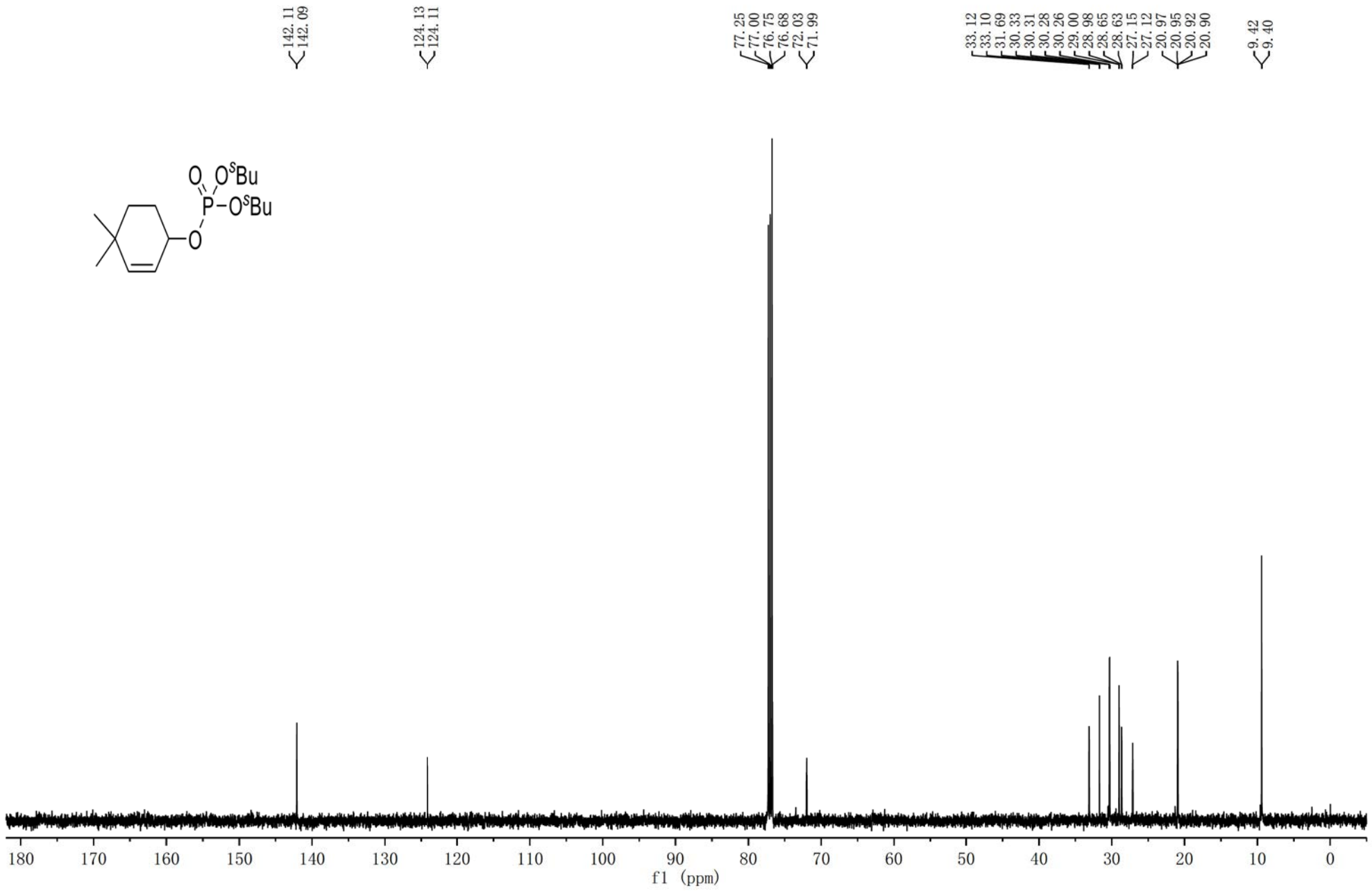

7.27
5.59 5.57 5.57 5.56 5.55 5.54 5.41 5.39 5.37 4.92 4.91 4.89 4.88 4.86 4.85
4.43 4.41 4.41 4.37 4.37 4.36 4.34 4.34 4.31
2.15 2.12 2.10 2.09 2.07 1.85 1.83 1.76 1.73 1.72 1.69 1.67 1.66 1.66 1.65 1.63 1.59 1.58 1.57 1.55 1.54 1.34 1.34 1.31 1.31 1.27 1.27 1.23 1.21 1.18 1.15 1.13 1.11 1.06 1.02 1.00 0.98 0.96 0.95 0.94 0.92 0.91 0.90 0.88
O
O
sBu
P
O
O
sBu
Z:E = >99:<1
1.06
1.06
1.00
2.11
2.13
1.27
9.90
15.32
12.34
8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

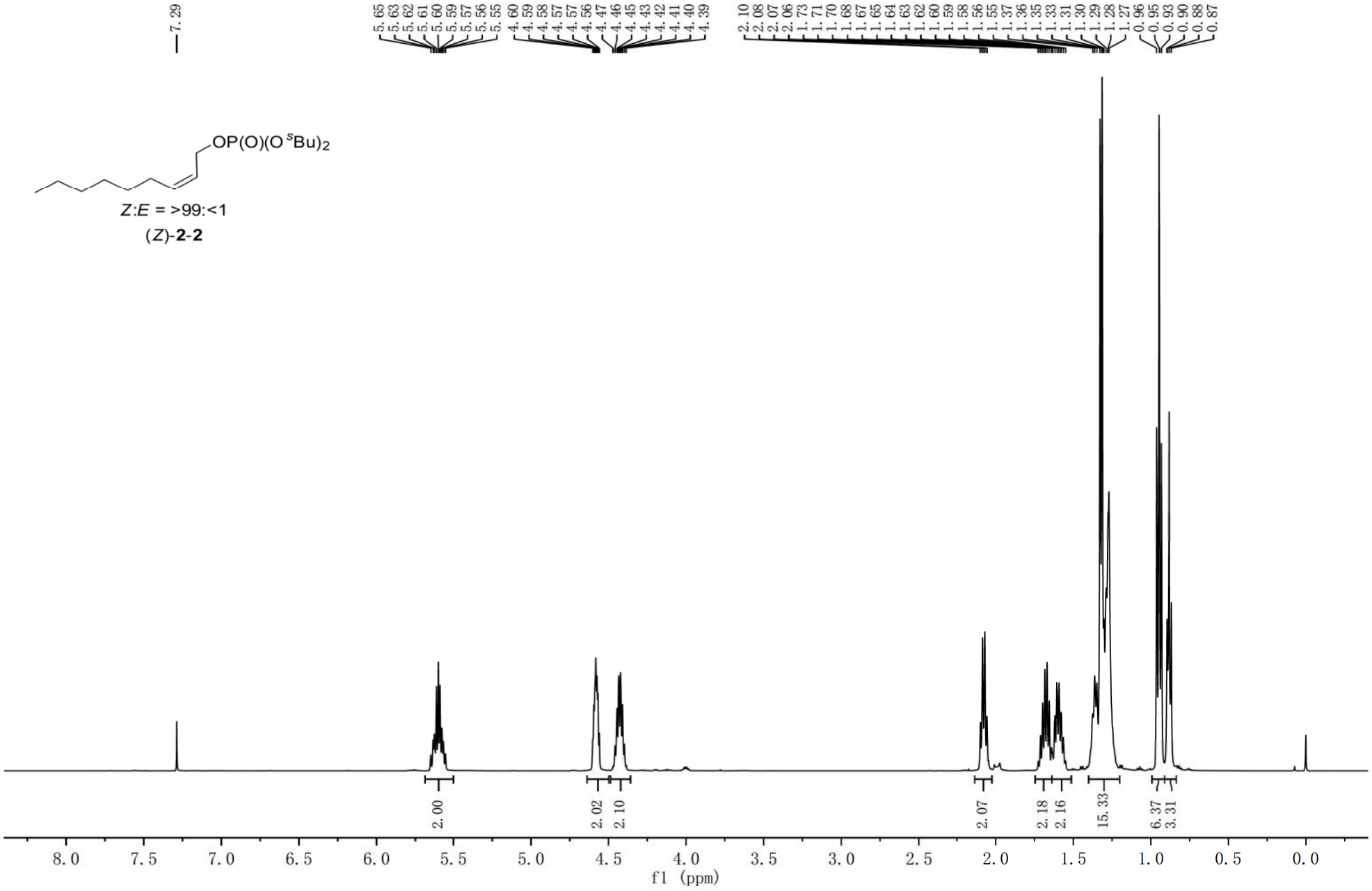

133.86
133.82
127.25
127.23
78.55
78.52
77.25
77.00
76.74
76.44
76.39
76.29
76.24
43.35
43.32
31.70
30.31
30.26
30.25
30.20
28.52
28.51
27.83
27.67
26.39
25.99
25.88
22.41
20.94
20.91
20.77
20.74
13.96
9.39
9.37
9.34
9.30
O
O
P
O
O
O
180
170
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150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

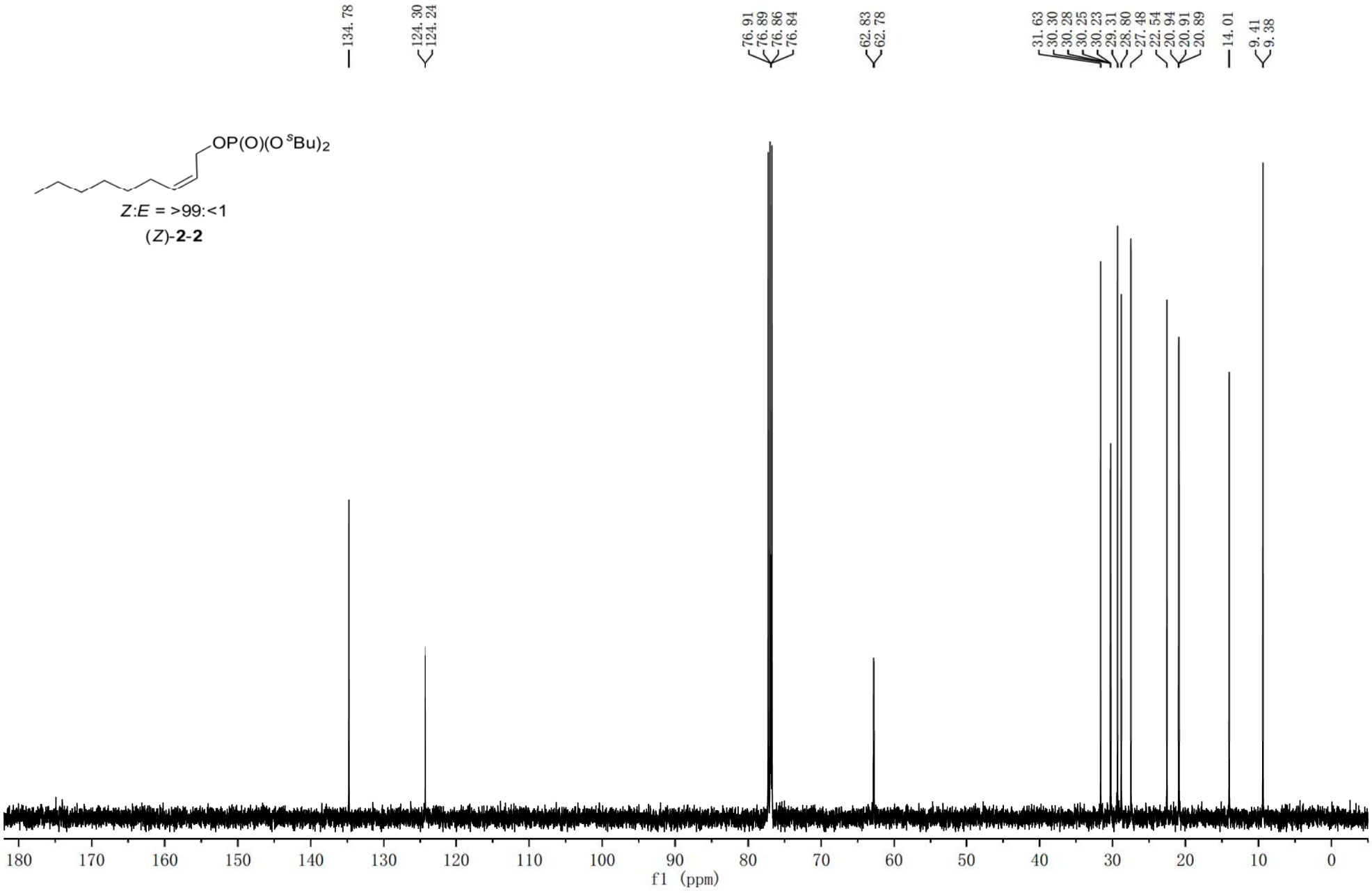

7.26
5.89
5.87
5.78
5.76
4.82
4.43
4.41
4.39
4.38
4.37
4.36
2.06
2.05
2.03
2.02
2.02
1.95
1.91
1.90
1.89
1.88
1.87
1.86
1.85
1.74
1.73
1.67
1.66
1.65
1.63
1.62
1.60
1.58
1.57
1.56
1.54
1.53
1.29
1.28
0.92
0.91
0.89
O
O
SBu
P
O
SBu
O
1.01
1.13
1.00
2.07
4.88
8.72
6.32
8.28
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)

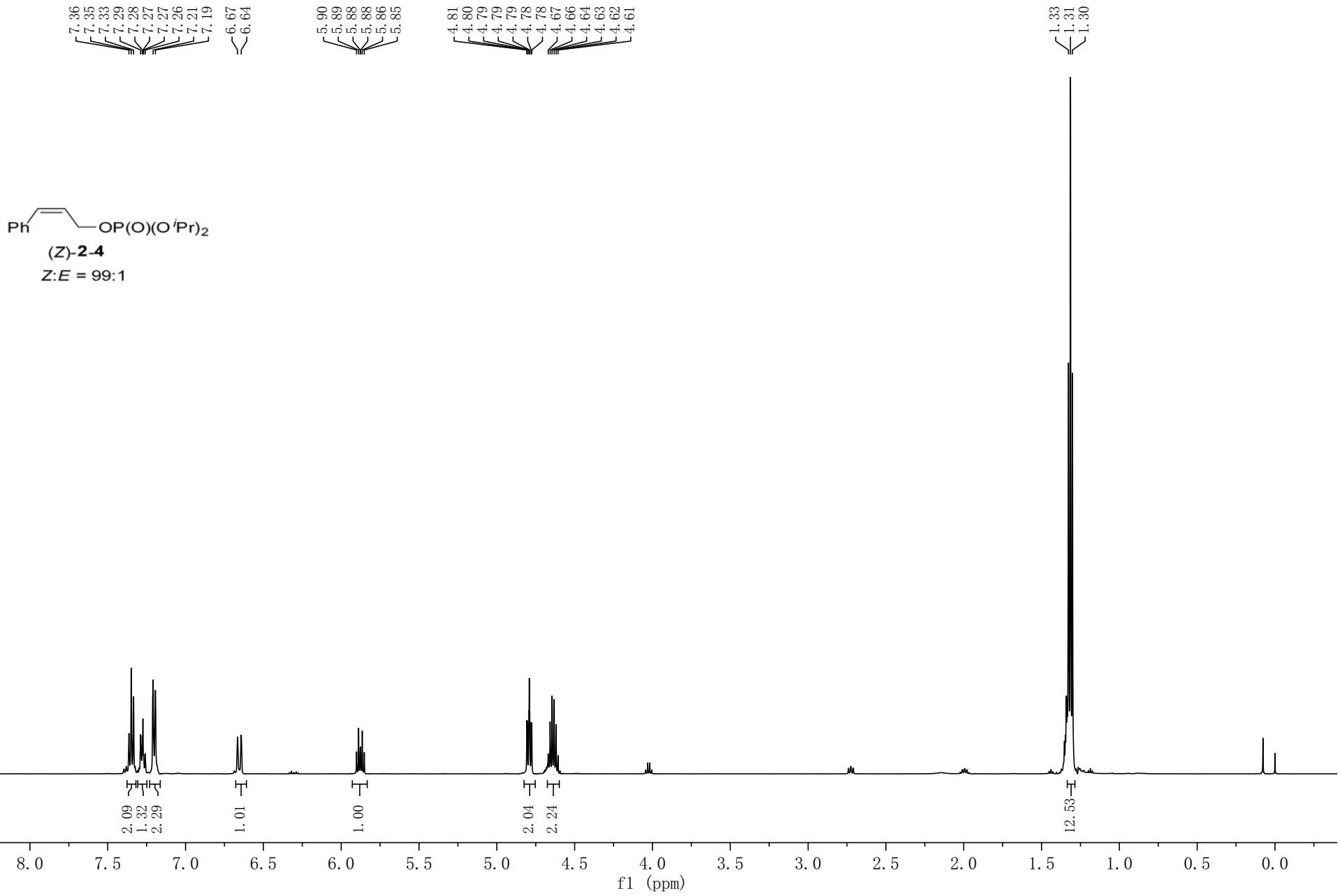

132.18
126.64
126.60
77.25
77.00
76.75
76.68
76.63
71.71
71.66
30.37
30.33
30.28
30.23
29.92
29.89
24.70
20.92
20.89
20.86
20.84
18.50
9.45
9.41
9.37
9.34
O
O
OSBu
P
OSBu
O
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

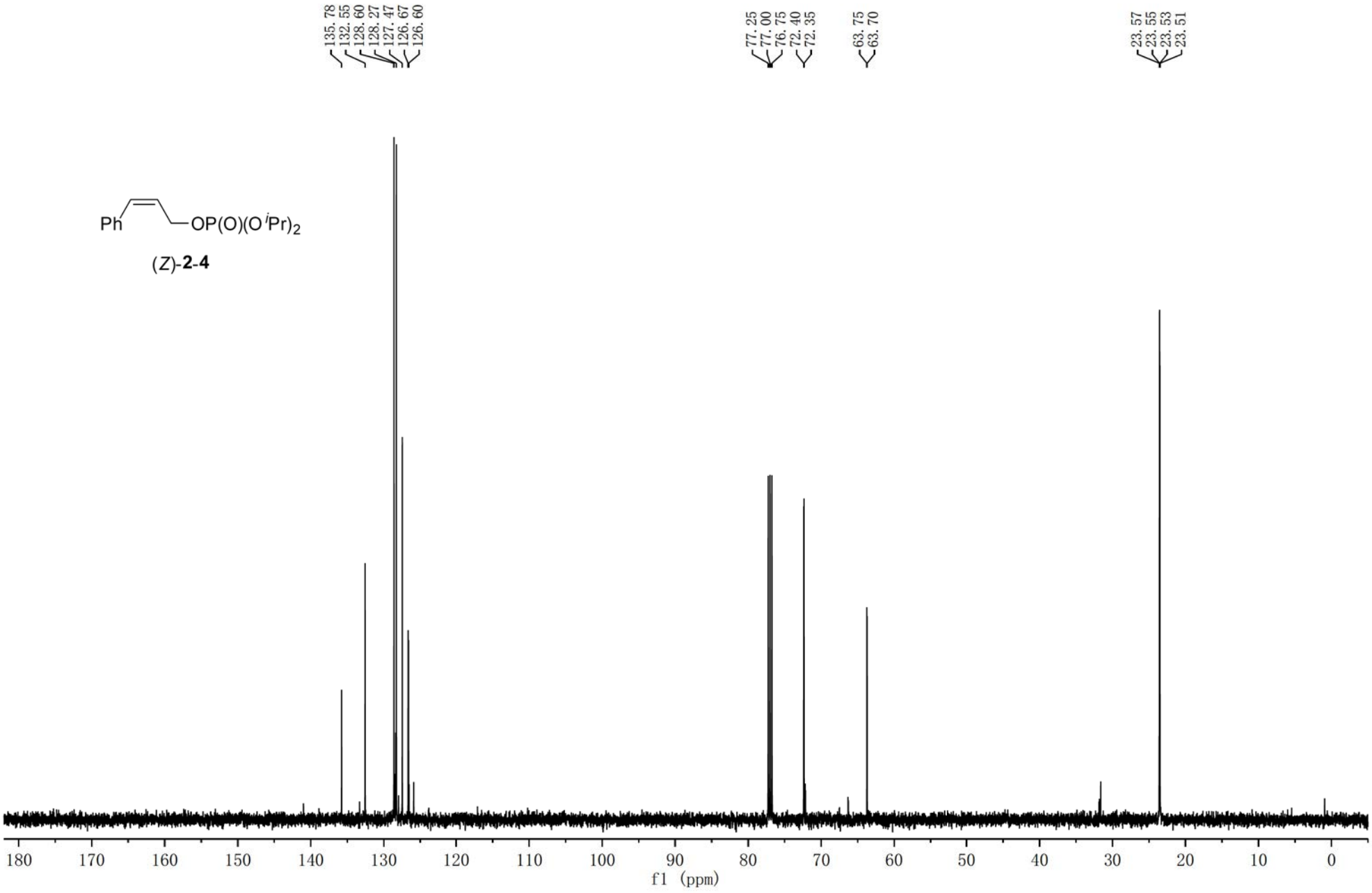

7.27
5.66
5.66
5.64
5.64
5.60
5.58
4.82
4.81
4.79
4.77
4.76
4.45
4.44
4.43
4.41
4.40
4.39
1.99
1.98
1.97
1.96
1.95
1.94
1.93
1.90
1.89
1.88
1.87
1.86
1.85
1.84
1.83
1.72
1.71
1.69
1.68
1.67
1.65
1.64
1.63
1.62
1.62
1.60
1.59
1.58
1.56
1.45
1.45
1.43
1.43
1.42
1.41
1.40
1.32
1.31
1.31
1.29
1.02
0.97
0.96
0.94
0.93
O
O
SBu
P
O
SBu
O
1.00
1.02
0.99
2.03
1.04
1.08
5.62
1.11
6.14
3.10
3.09
6.57
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)

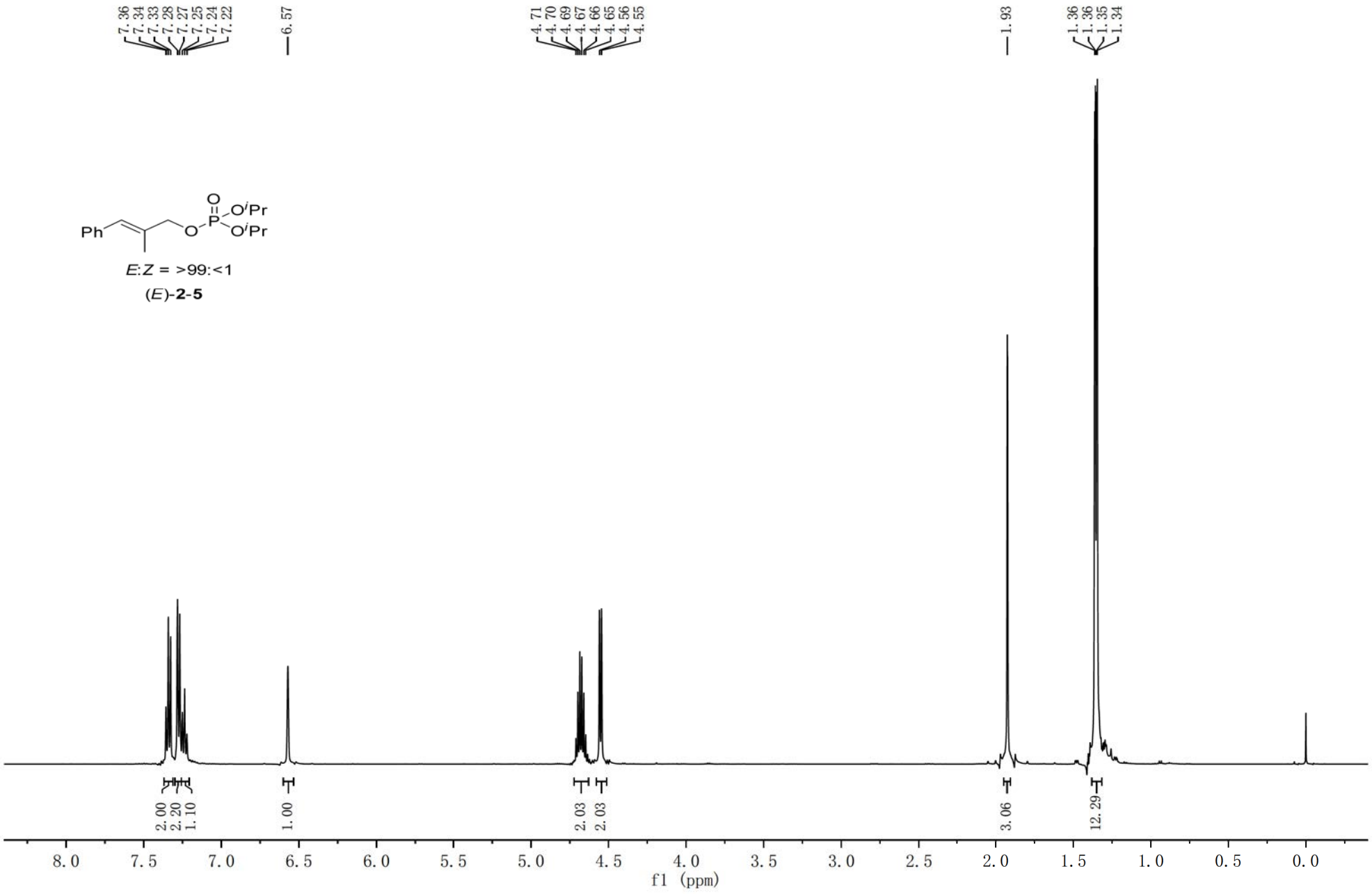

142.11
142.09
124.13
124.11
77.25
77.00
76.75
76.68
72.03
71.99
33.12
33.10
31.69
30.33
30.31
30.28
30.26
29.00
28.98
28.65
28.63
27.15
27.12
20.97
20.95
20.92
20.90
9.42
9.40
O
O
^{S}Bu
P
O
^{S}Bu
O
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

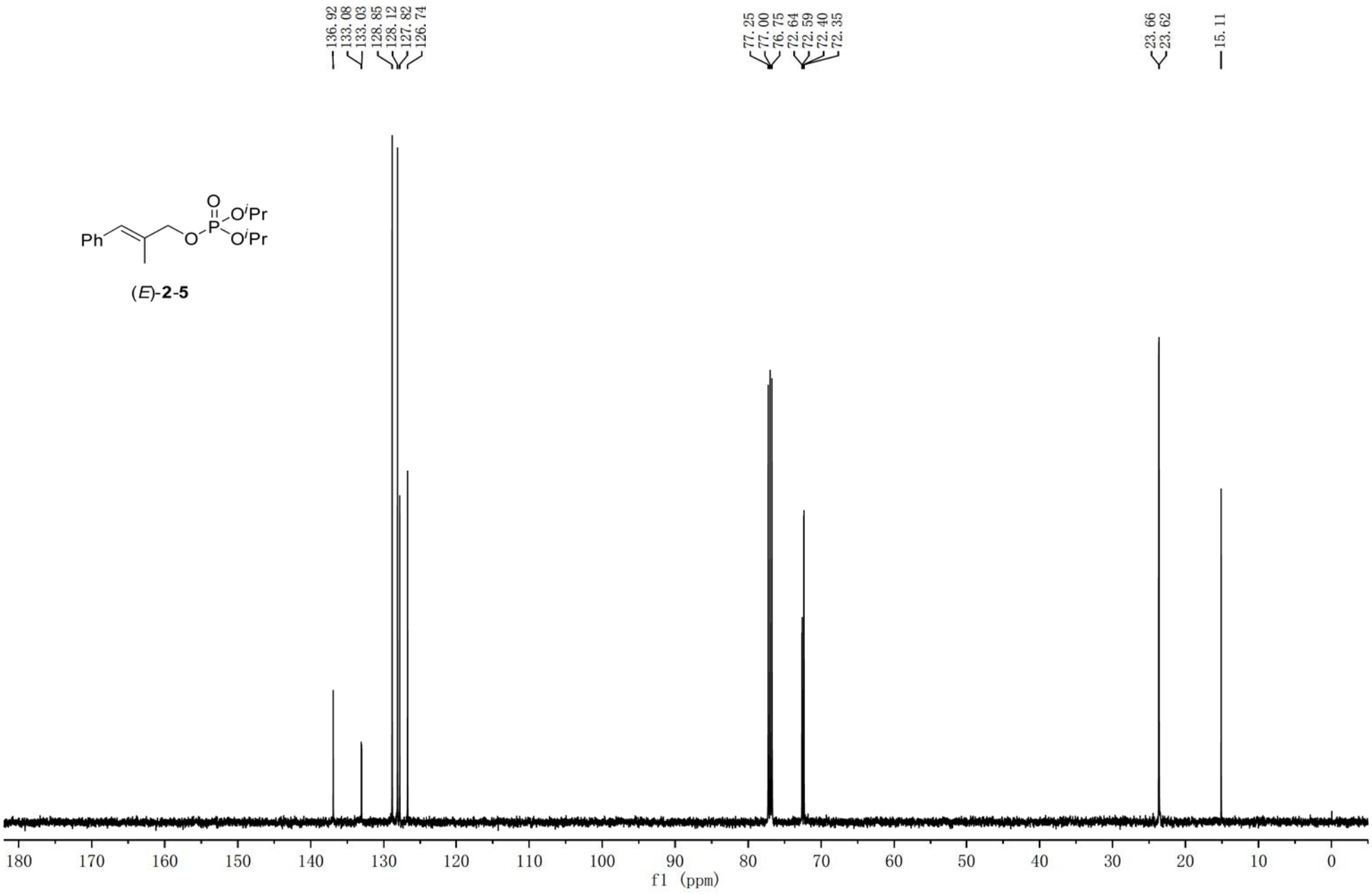

7.29
5.65 5.63 5.62 5.61 5.60 5.59 5.57 5.56 5.55
4.60 4.59 4.58 4.57 4.57 4.56 4.47 4.46 4.45 4.43 4.42 4.41 4.40 4.39
2.10 2.08 2.07 2.06 1.73 1.71 1.70 1.68 1.67 1.65 1.64 1.63 1.62 1.60 1.59 1.58 1.56 1.55 1.37 1.36 1.35 1.33 1.31 1.30 1.29 1.28 1.27
0.96 0.95 0.93 0.90 0.88 0.87
OP(O)(O sBu)2
Z:E = >99:<1
(Z)-2-2
2.00
2.02
2.10
2.07
2.18
2.16
15.33
6.37
3.31
8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

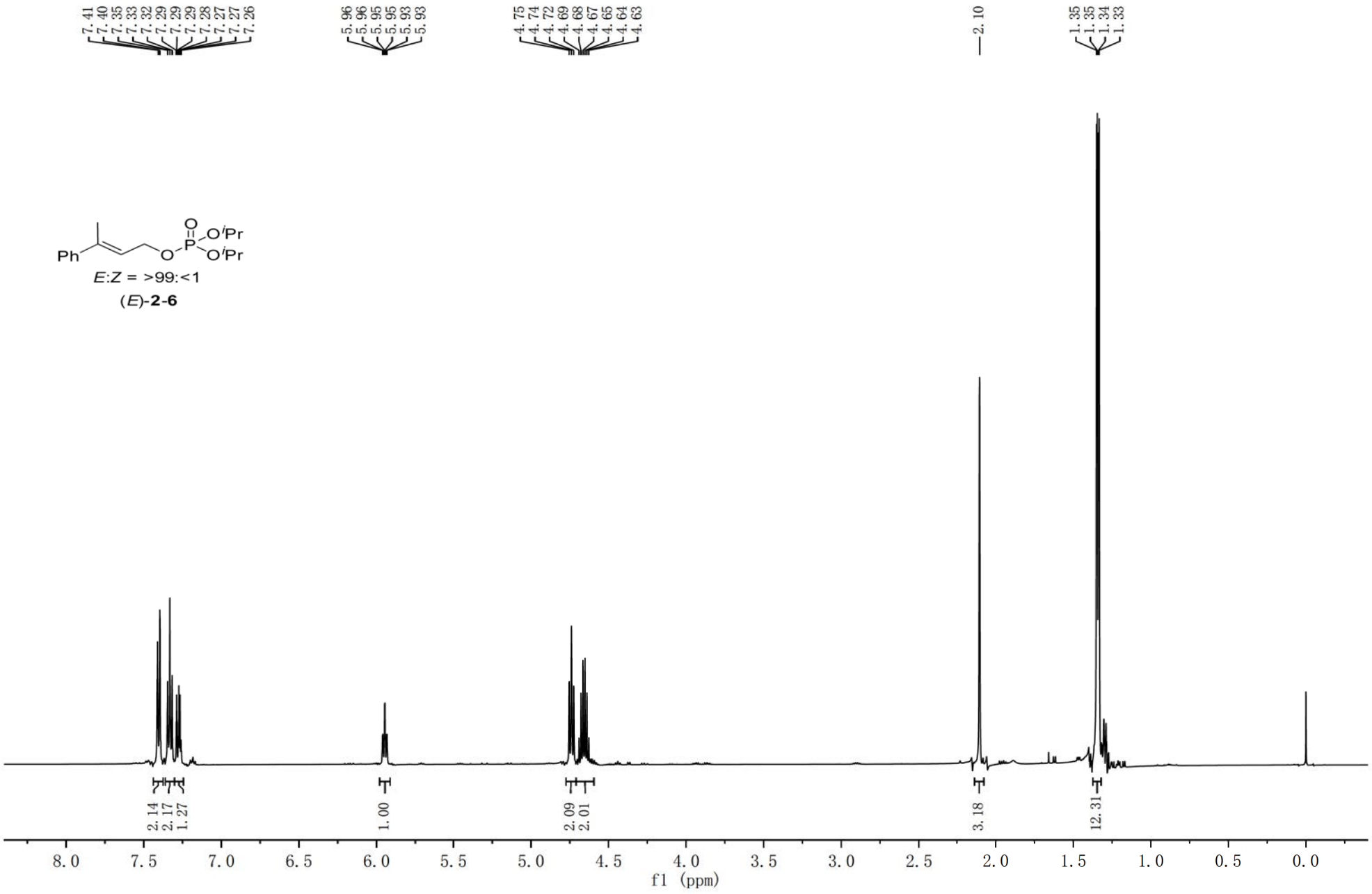

134.78
124.30
124.24
76.91
76.89
76.86
76.84
62.83
62.78
31.63
30.30
30.28
30.25
30.23
29.31
28.80
27.48
22.54
20.94
20.91
20.89
14.01
9.41
9.38
OP(O)(O sBu)2
Z:E = >99:<1
(Z)-2-2
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

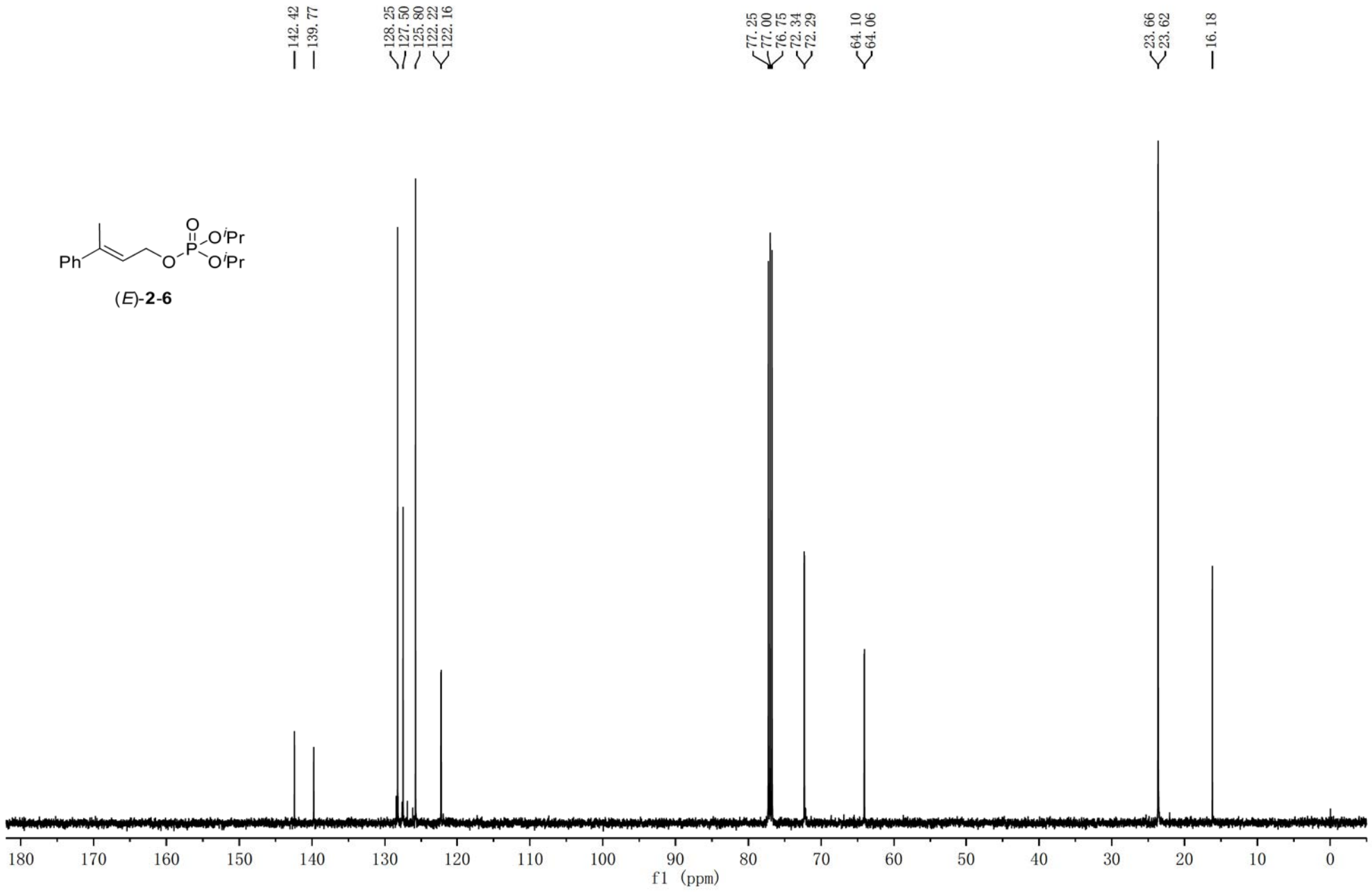

7.36
7.35
7.33
7.29
7.28
7.27
7.27
7.26
7.21
7.19
6.67
6.64
5.90
5.89
5.88
5.88
5.86
5.85
4.81
4.80
4.79
4.79
4.79
4.78
4.78
4.67
4.66
4.64
4.63
4.62
4.61
1.33
1.31
1.30
Ph
OP(O)(O iPr)2
(Z)-2-4
Z:E = 99:1
2.09
1.32
2.29
1.01
1.00
2.04
2.24
12.53
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)

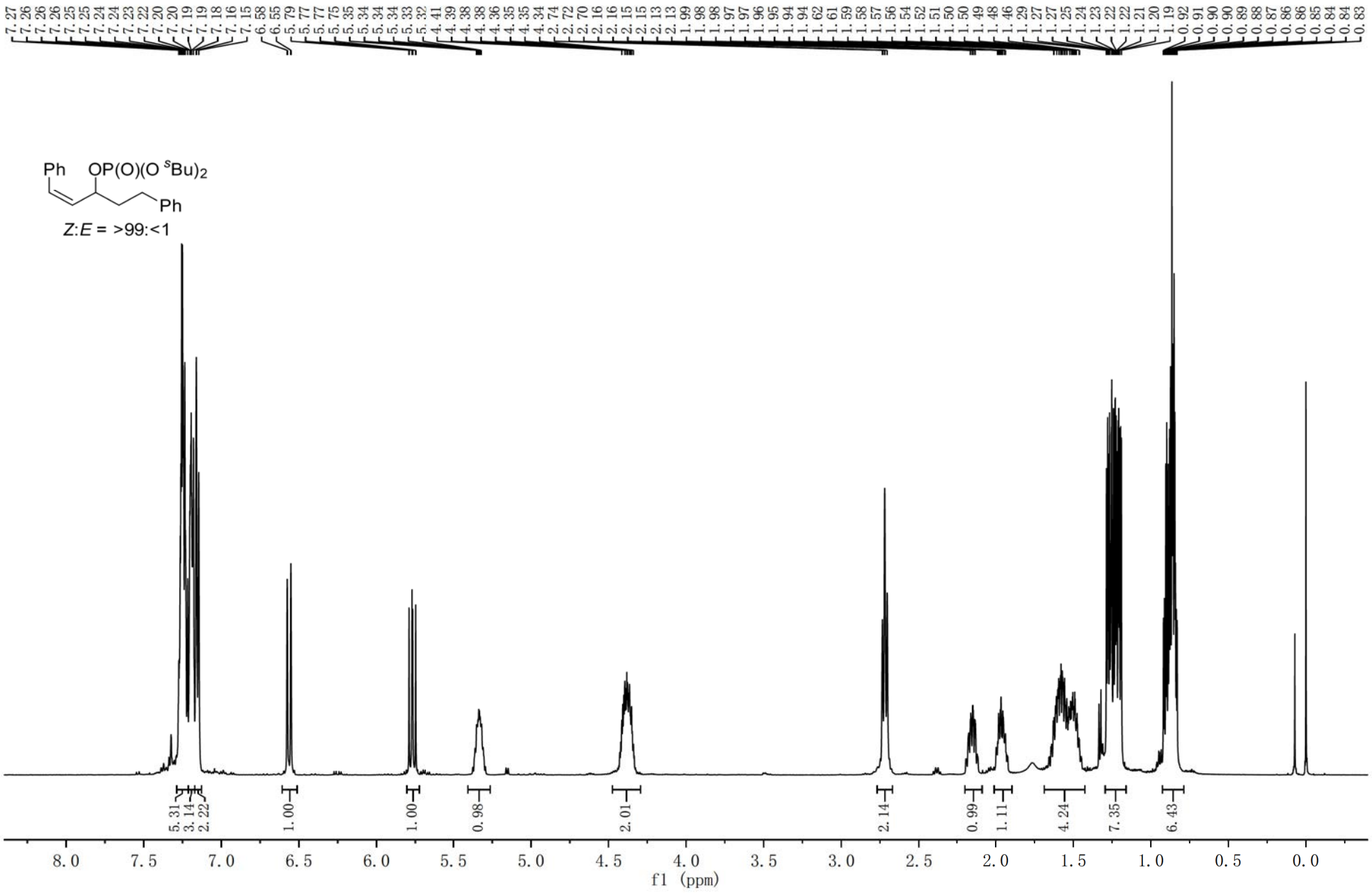

135.78
132.55
128.60
128.27
127.47
126.67
126.60
77.25
77.00
76.75
72.40
72.35
63.75
63.70
23.57
23.55
23.53
23.51
Ph
OP(O)(O iPr)2
(Z)-2-4
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

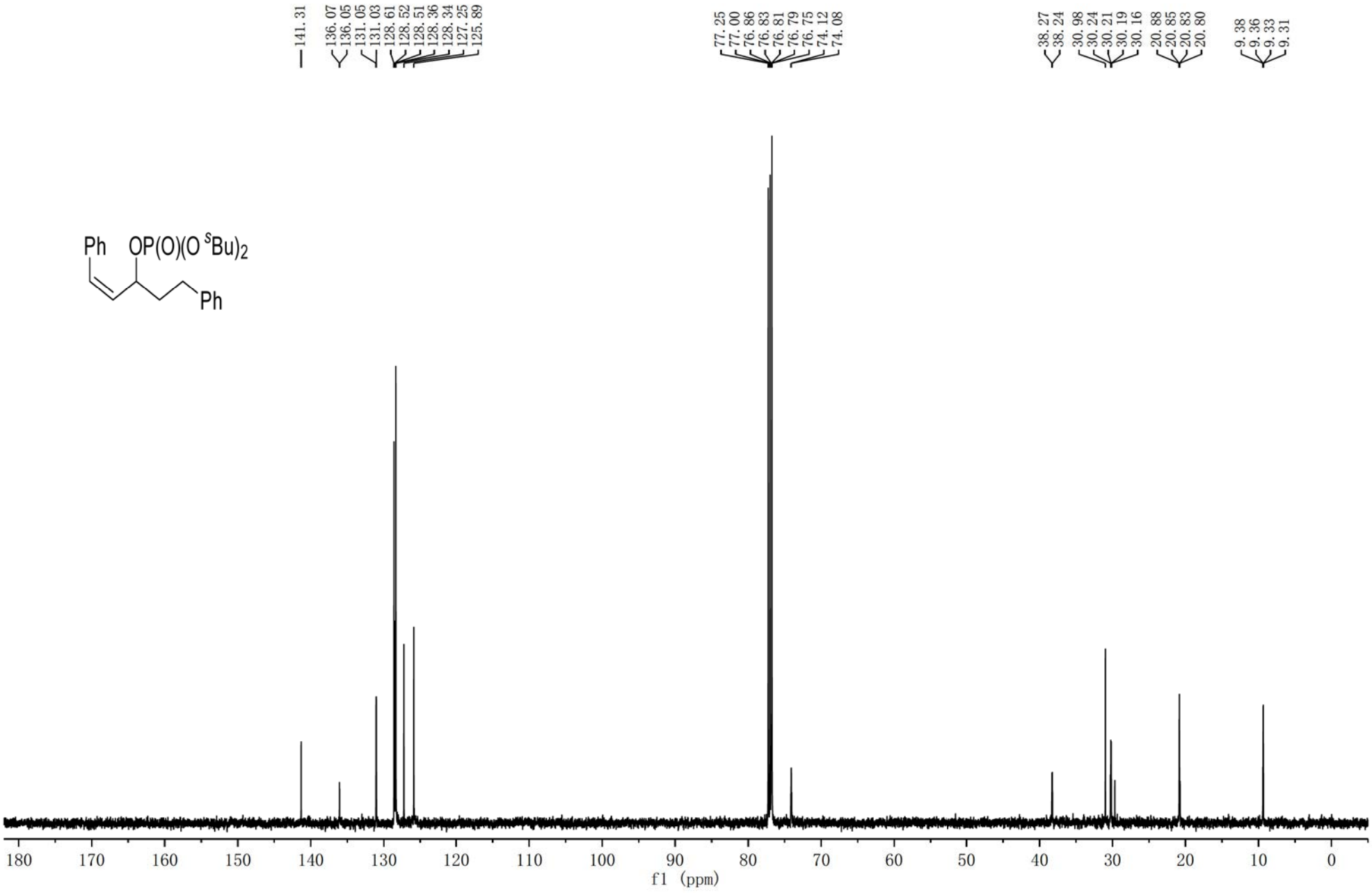

7.36
7.34
7.33
7.28
7.27
7.25
7.24
7.22
6.57
4.71
4.70
4.69
4.67
4.66
4.65
4.56
4.55
1.93
1.36
1.36
1.35
1.34
Ph
O
P
O
O^{i}Pr
O^{i}Pr
E:Z = >99:<1
(E)-2-5
2.00
2.20
1.10
1.00
2.03
2.03
3.06
12.29
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)

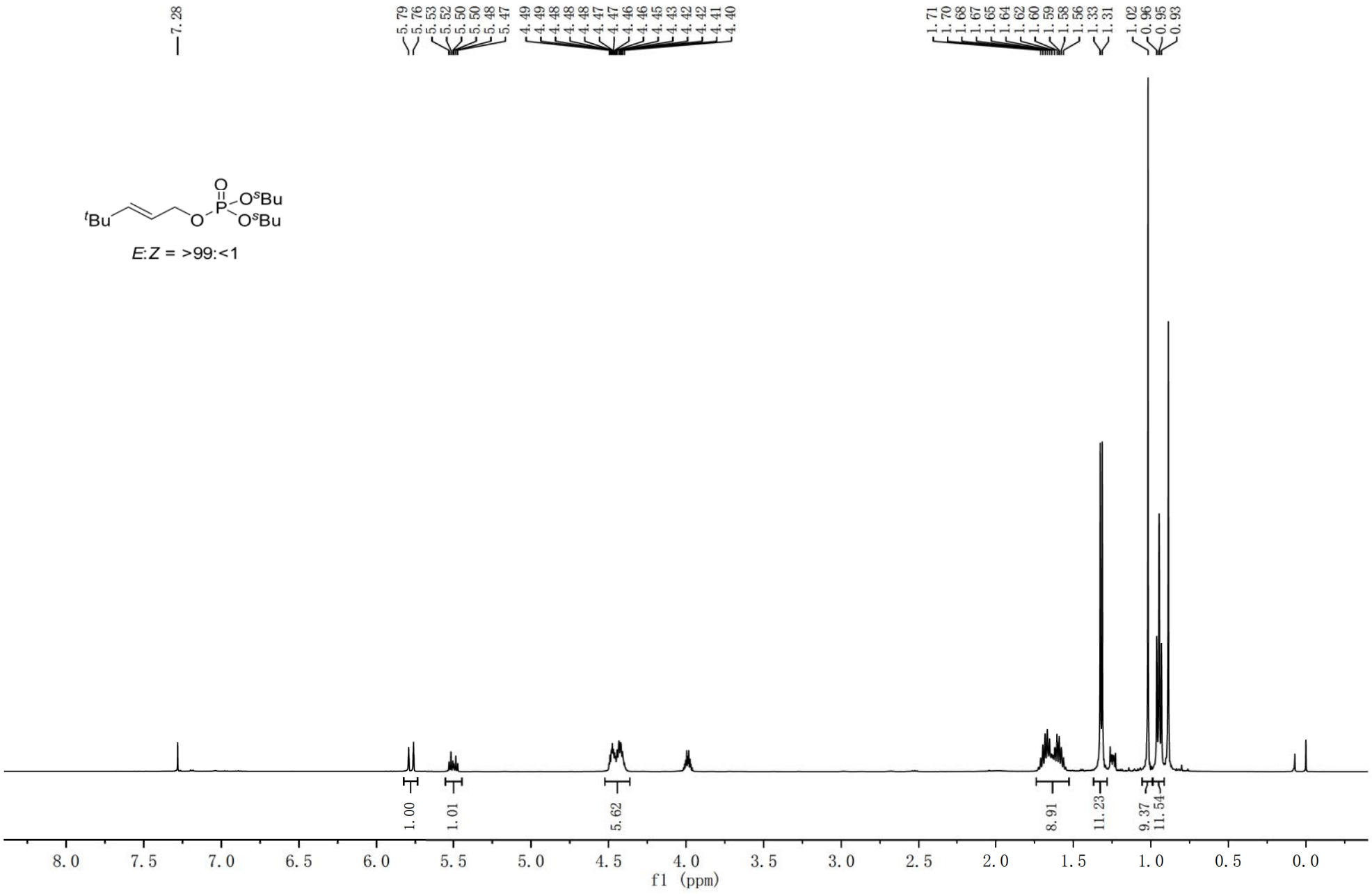

136.92
133.08
133.03
128.85
128.12
127.82
126.74
77.25
77.00
76.75
72.64
72.59
72.40
72.35
23.66
23.62
15.11
O
O^{i}Pr
P
O^{i}Pr
Ph
O
(E)-2-5
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

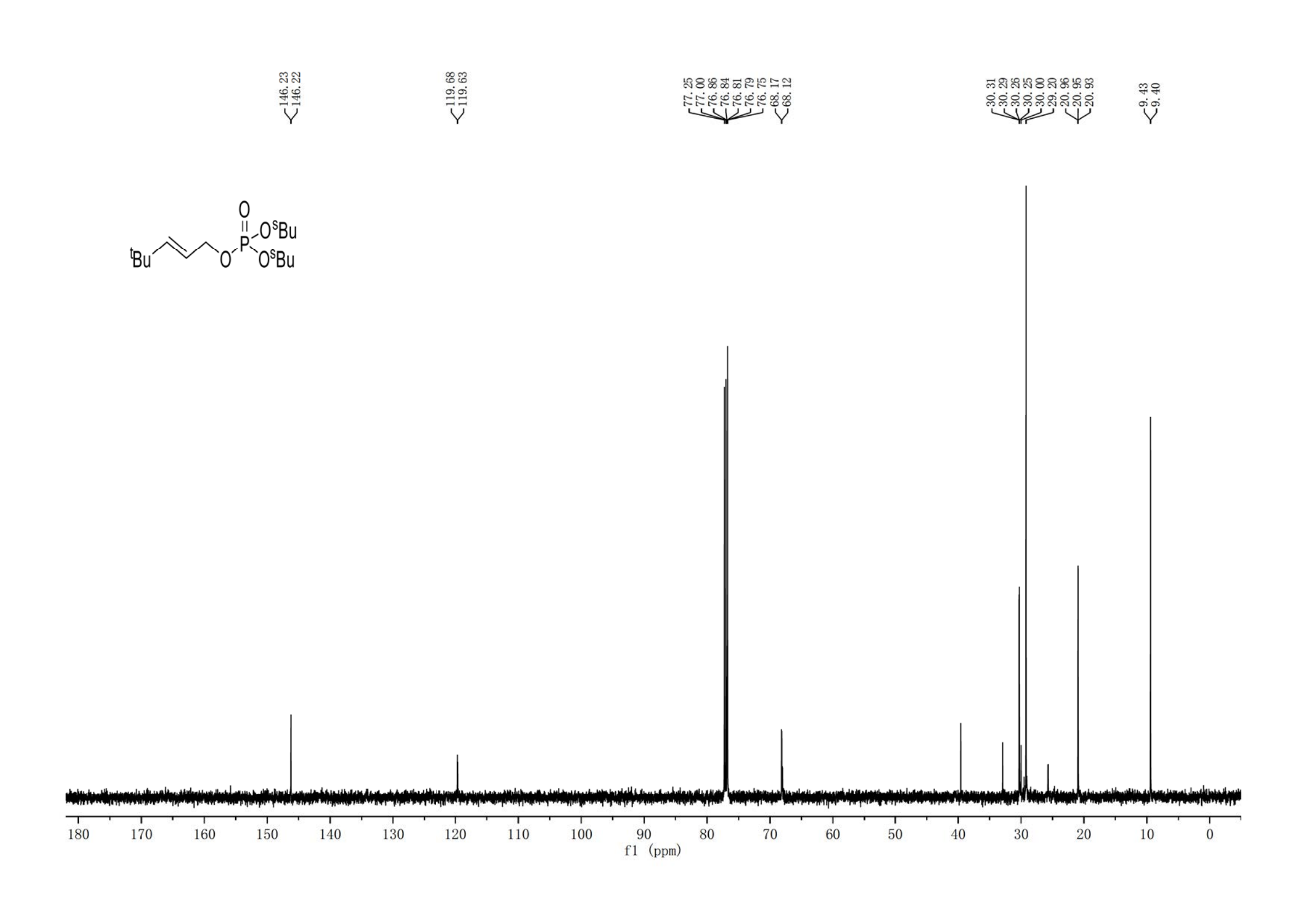

7.41
7.40
7.35
7.33
7.32
7.29
7.29
7.29
7.28
7.27
7.27
7.26
5.96
5.96
5.95
5.95
5.93
5.93
4.75
4.74
4.72
4.69
4.68
4.67
4.65
4.64
4.63
2.10
1.35
1.35
1.34
1.33
Ph
O
P
O
O
iPr
iPr
E:Z = >99:<1
(E)-2-6
2.14
2.17
1.27
1.00
2.09
2.01
3.18
12.31
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)

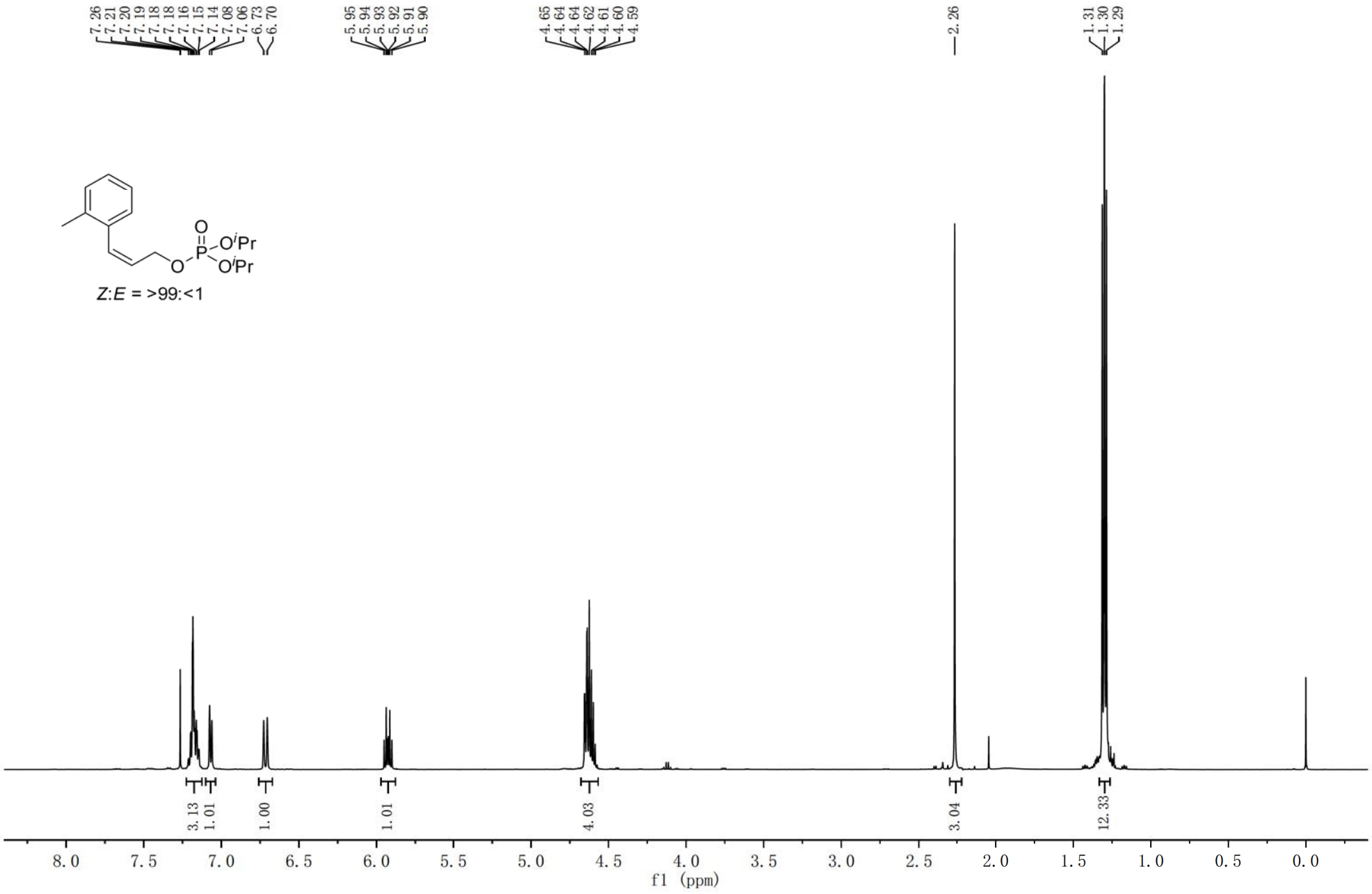

142.42
139.77
128.25
127.50
125.80
122.22
122.16
77.25
77.00
76.75
72.34
72.29
64.10
64.06
23.66
23.62
16.18
Ph
O
P
O
O^{i}Pr
O^{i}Pr
(E)-2-6
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

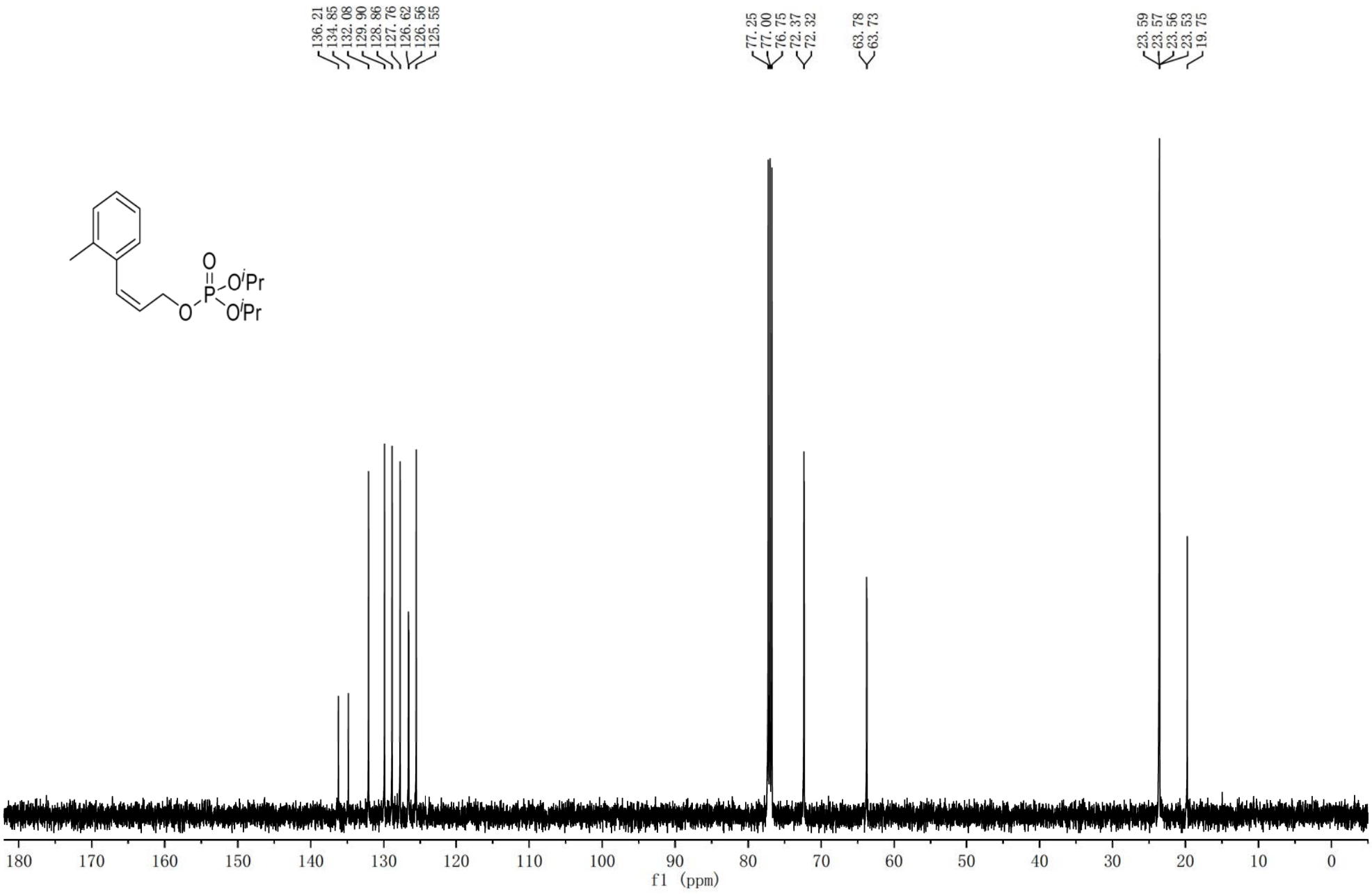

Ph OP(O)(O sBu)2
Ph
Z:E = >99:<1
f1 (ppm)

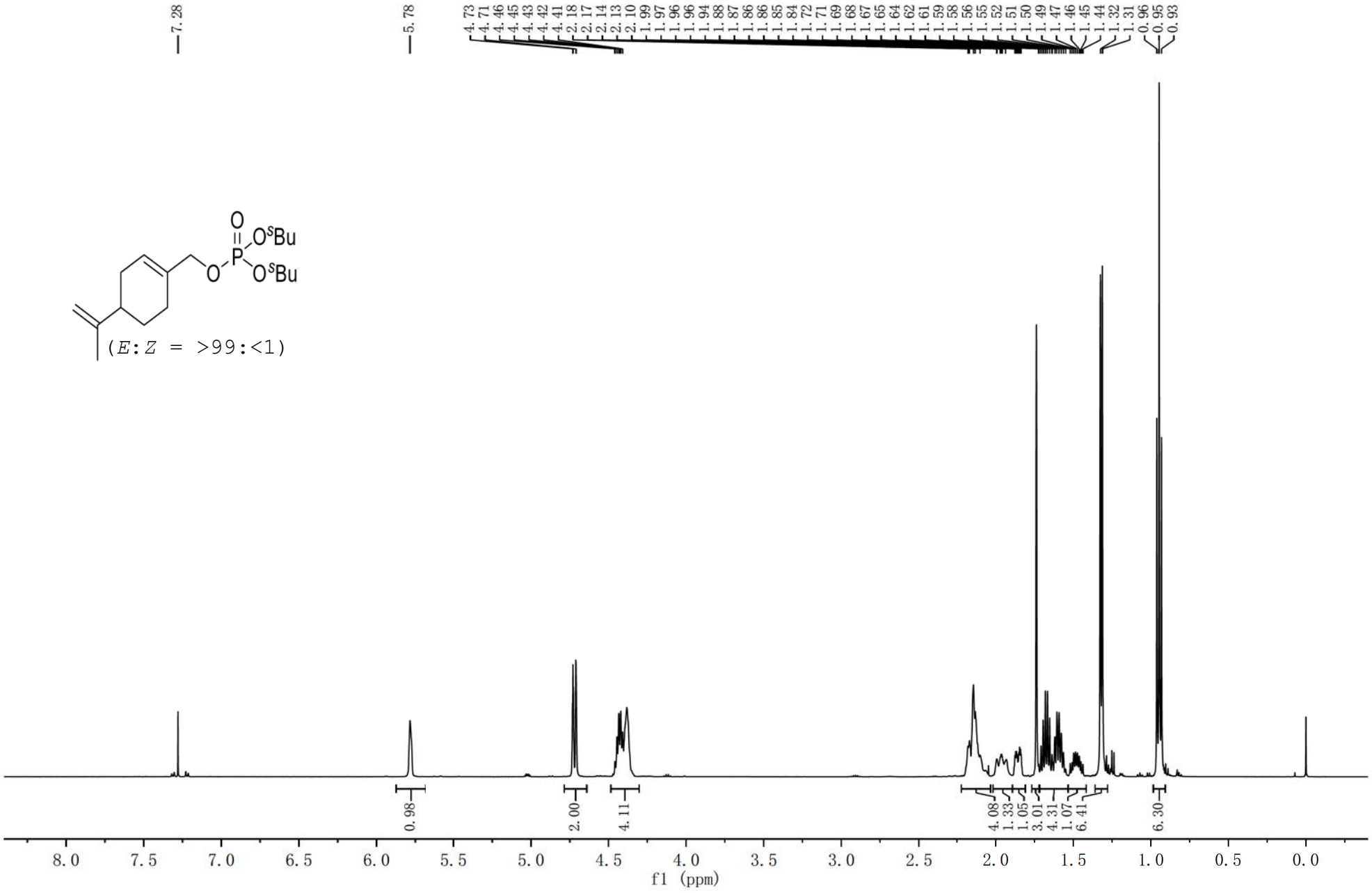

141.31
136.07
136.05
131.05
131.03
128.61
128.52
128.51
128.36
128.34
127.25
125.89
77.25
77.00
76.86
76.83
76.81
76.79
76.75
74.12
74.08
38.27
38.24
30.98
30.24
30.21
30.19
30.16
20.88
20.85
20.83
20.80
9.38
9.36
9.33
9.31
Ph
OP(O)(O sBu)2
Ph
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

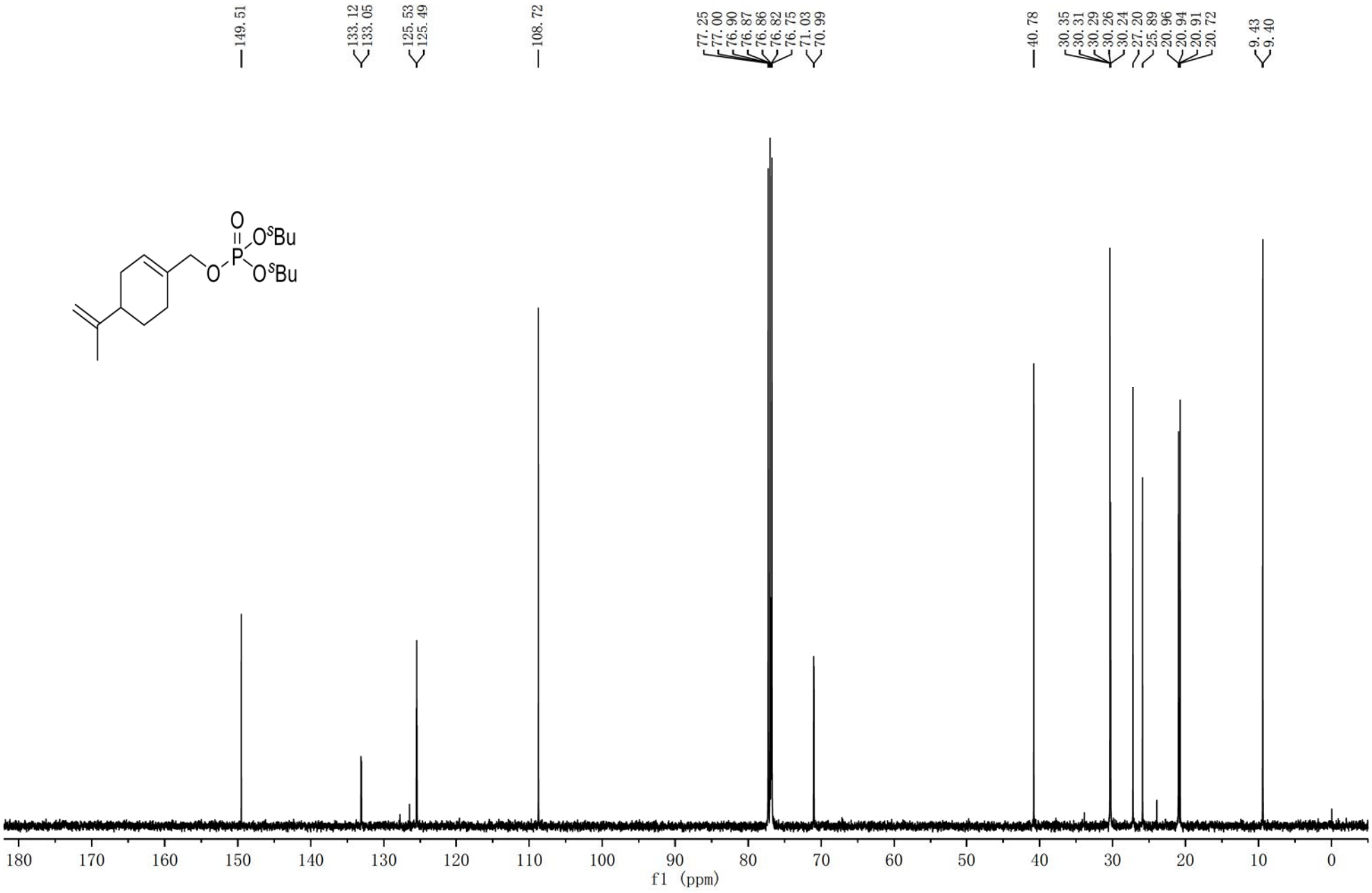

7.28
5.79
5.76
5.53
5.52
5.50
5.50
5.48
5.47
4.49
4.49
4.48
4.48
4.48
4.47
4.47
4.46
4.46
4.45
4.43
4.42
4.42
4.41
4.40
1.71
1.70
1.68
1.67
1.65
1.64
1.62
1.60
1.59
1.58
1.56
1.33
1.31
1.02
0.96
0.95
0.93
O
P
O^{s}Bu
^{t}Bu
O
O^{s}Bu
E:Z = >99:<1
1.00
1.01
5.62
8.91
11.23
9.37
11.54
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)

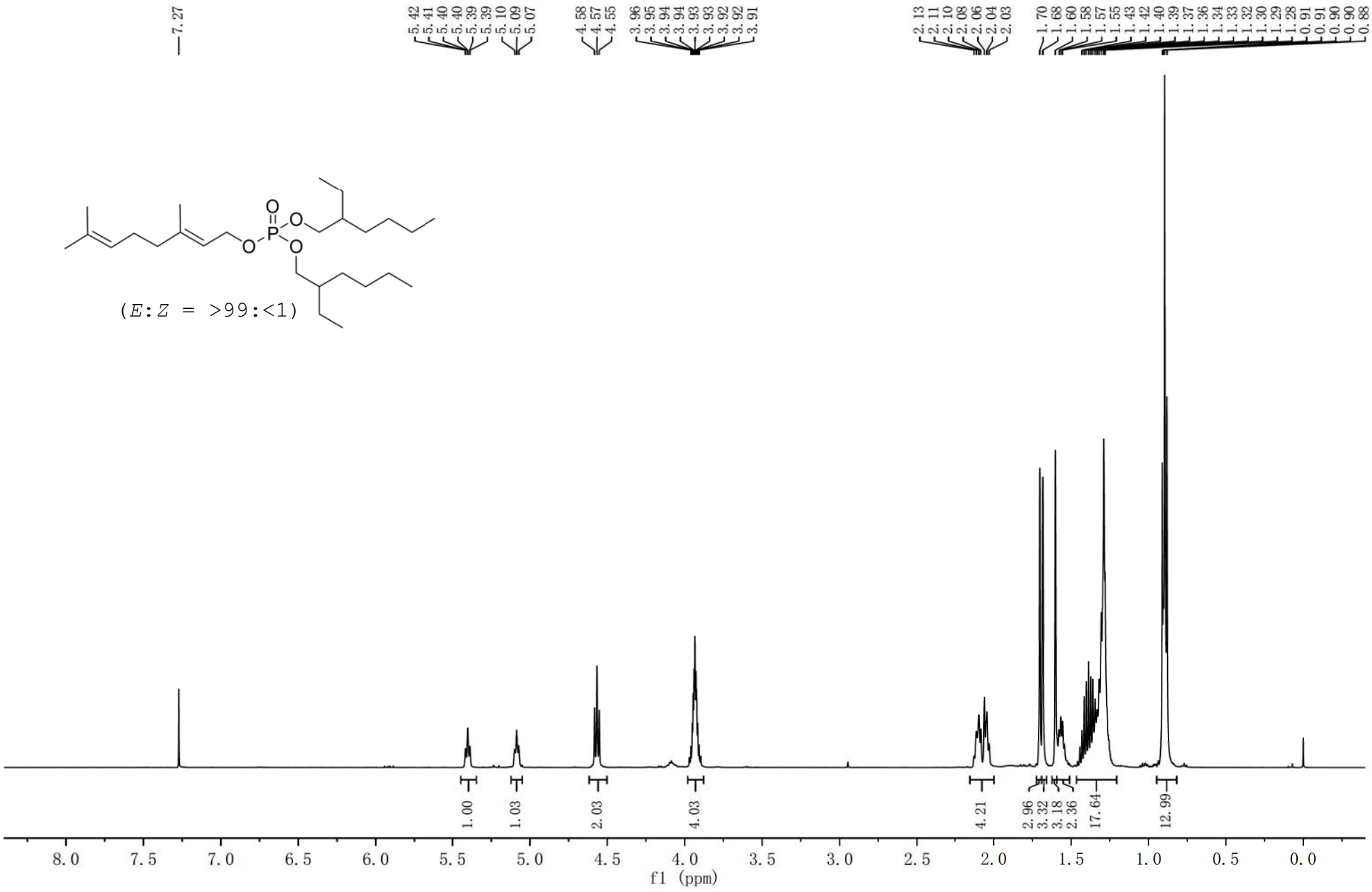

146.23
146.22
119.68
119.63
77.25
77.00
76.86
76.84
76.81
76.79
76.75
68.17
68.12
30.31
30.29
30.26
30.25
30.00
29.20
20.96
20.95
20.93
9.43
9.40
O
O^{s}Bu
^{t}Bu
O
P
O^{s}Bu
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

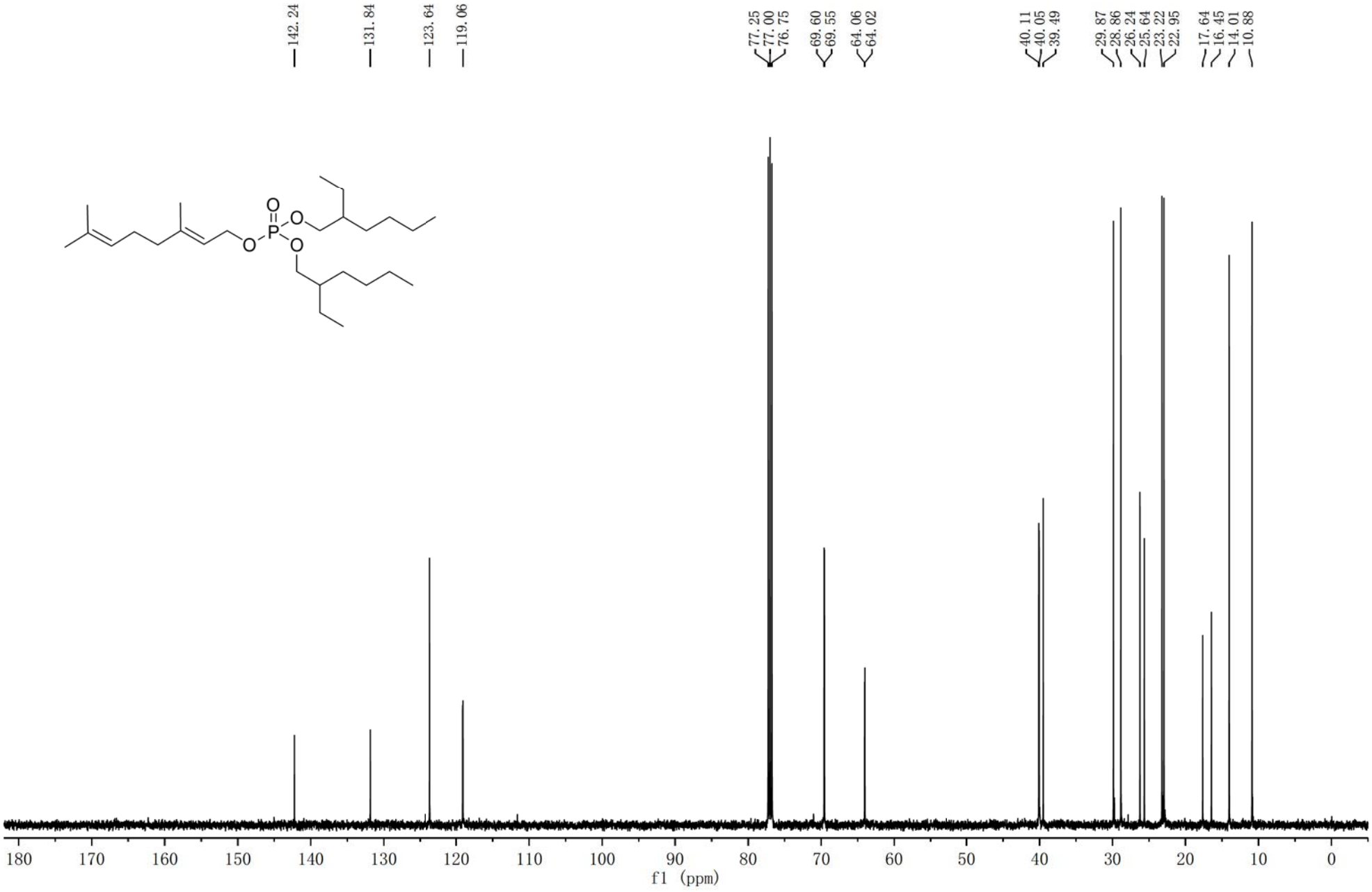

7.26
7.21
7.20
7.19
7.18
7.18
7.16
7.15
7.14
7.08
7.06
6.73
6.70
5.95
5.94
5.93
5.92
5.91
5.90
4.65
4.64
4.64
4.62
4.61
4.60
4.59
2.26
1.31
1.30
1.29
O
P
O^{i}Pr
O^{i}Pr
O
Z:E = >99:<1
3.13
1.01
1.00
1.01
4.03
3.04
12.33
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)

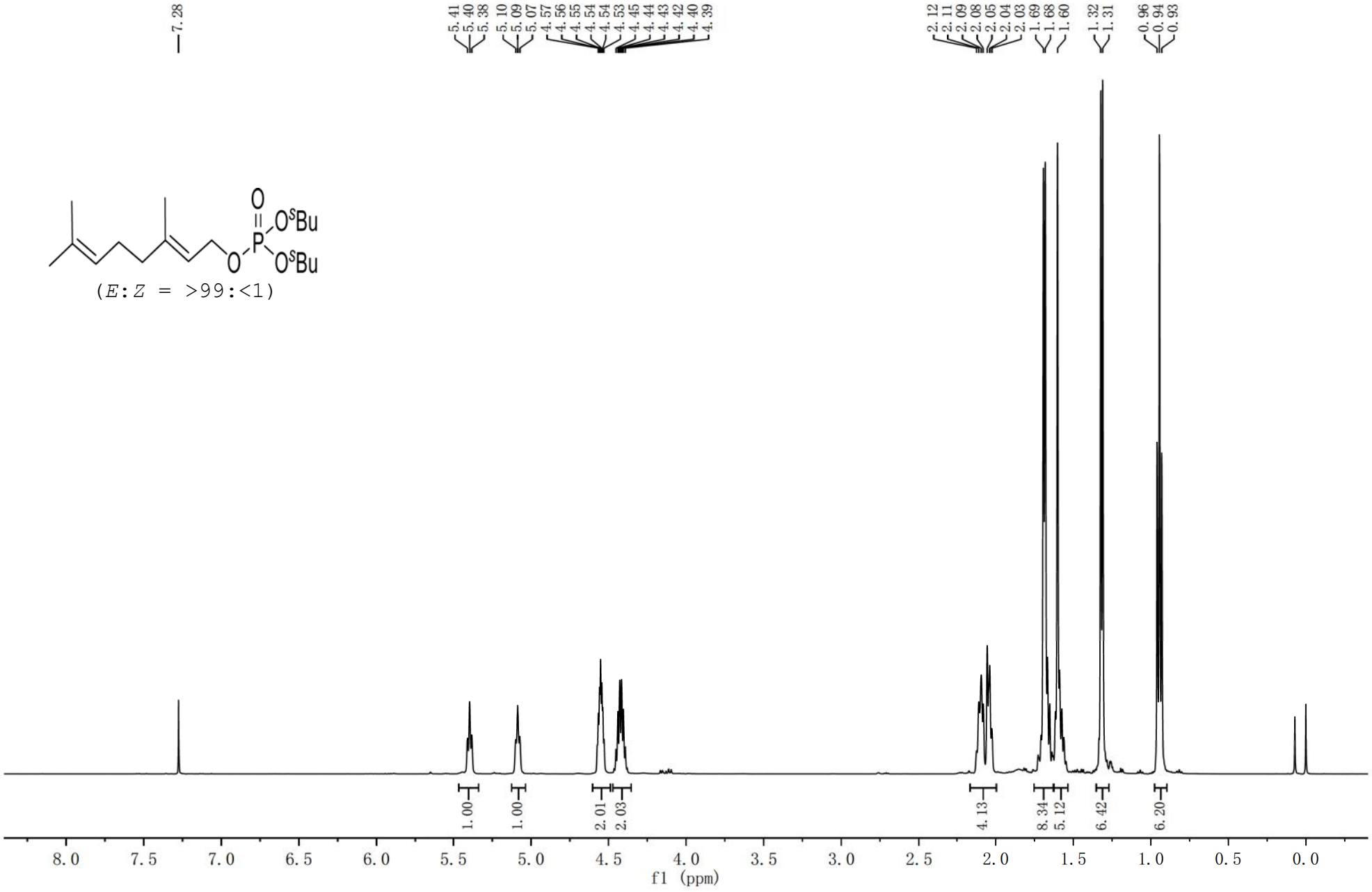

136.21
134.85
132.08
129.90
128.86
127.76
126.62
126.56
125.55
77.25
77.00
76.75
72.37
72.32
63.78
63.73
23.59
23.57
23.56
23.53
19.75
O
O
iPr
O
iPr
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

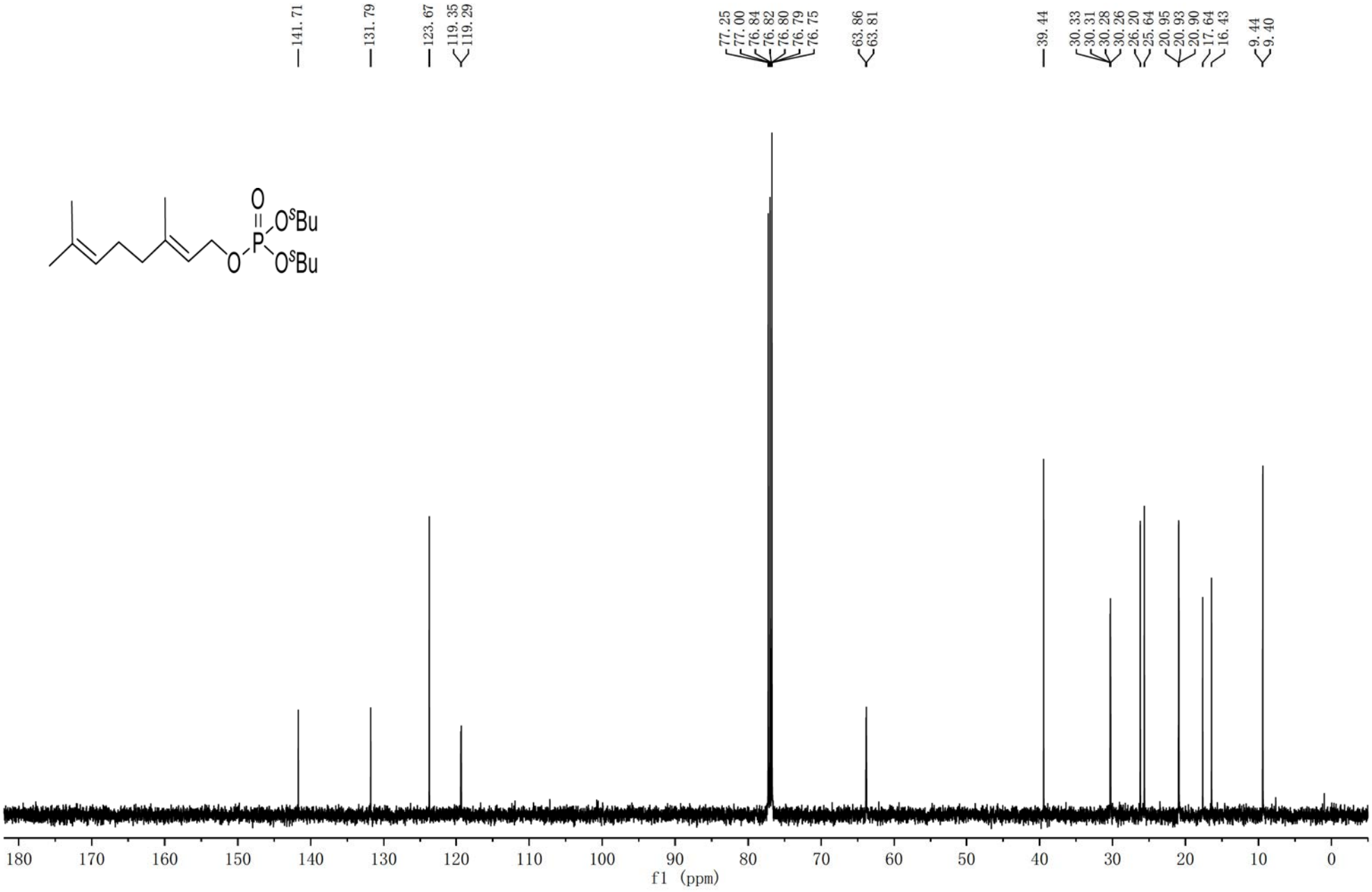

7.28
5.78
4.73
4.71
4.46
4.45
4.43
4.42
4.41
2.18
2.17
2.14
2.13
2.10
1.99
1.97
1.96
1.96
1.94
1.88
1.87
1.86
1.86
1.85
1.84
1.72
1.71
1.69
1.68
1.67
1.65
1.64
1.62
1.61
1.59
1.58
1.56
1.55
1.52
1.51
1.50
1.49
1.47
1.46
1.45
1.44
1.32
1.31
0.96
0.95
0.93
O
OsBu
P
O
OsBu
(E:Z = >99:<1)
0.98
2.00
4.11
4.08
1.33
1.05
3.01
4.31
1.07
6.41
6.30
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)

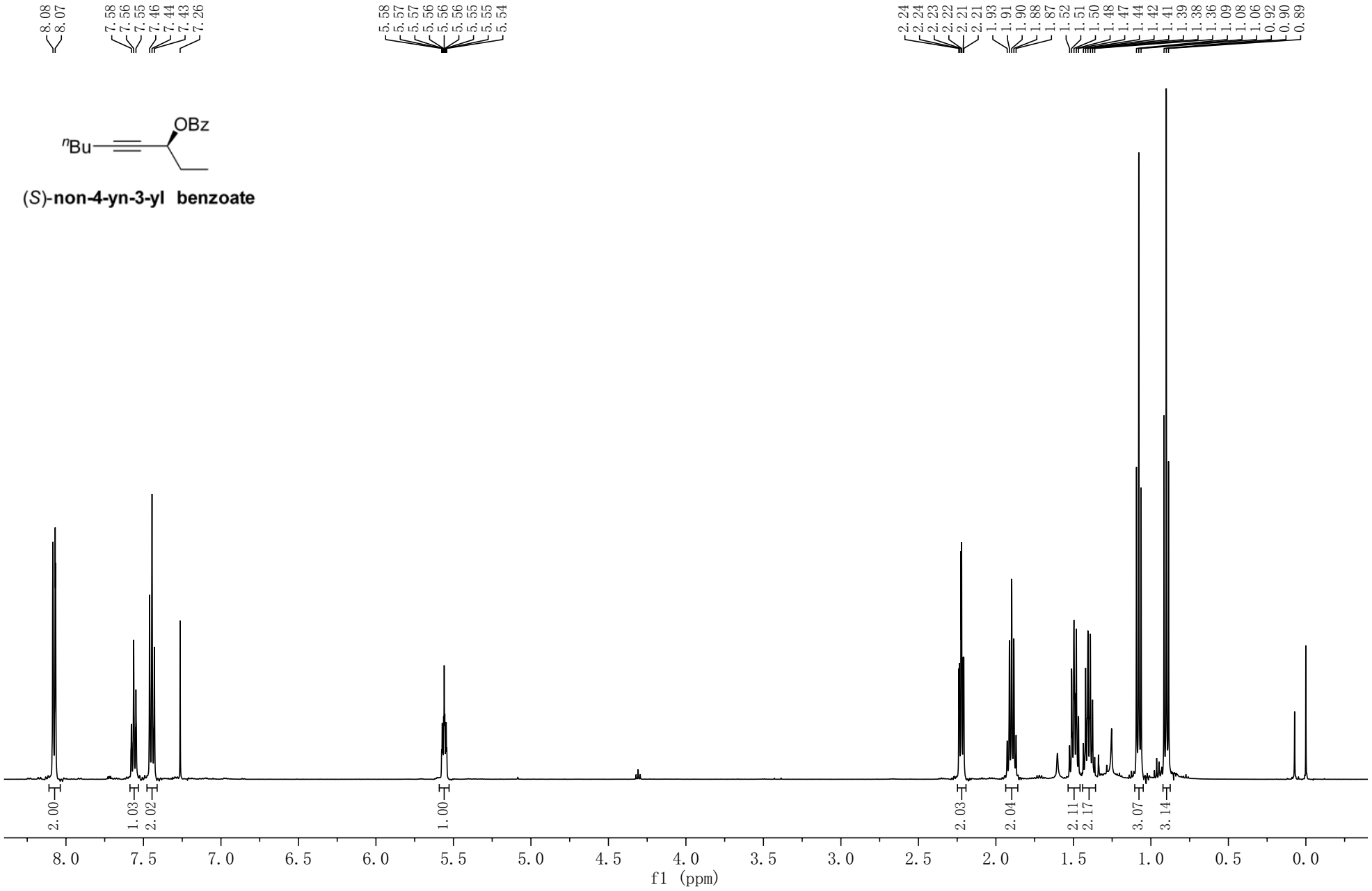

149.51
133.12
133.05
125.53
125.49
108.72
77.25
77.00
76.90
76.87
76.86
76.82
76.75
71.03
70.99
40.78
30.35
30.31
30.29
30.26
30.24
27.20
25.89
20.96
20.94
20.91
20.72
9.43
9.40
O
O^{s}Bu
P
O
O^{s}Bu
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

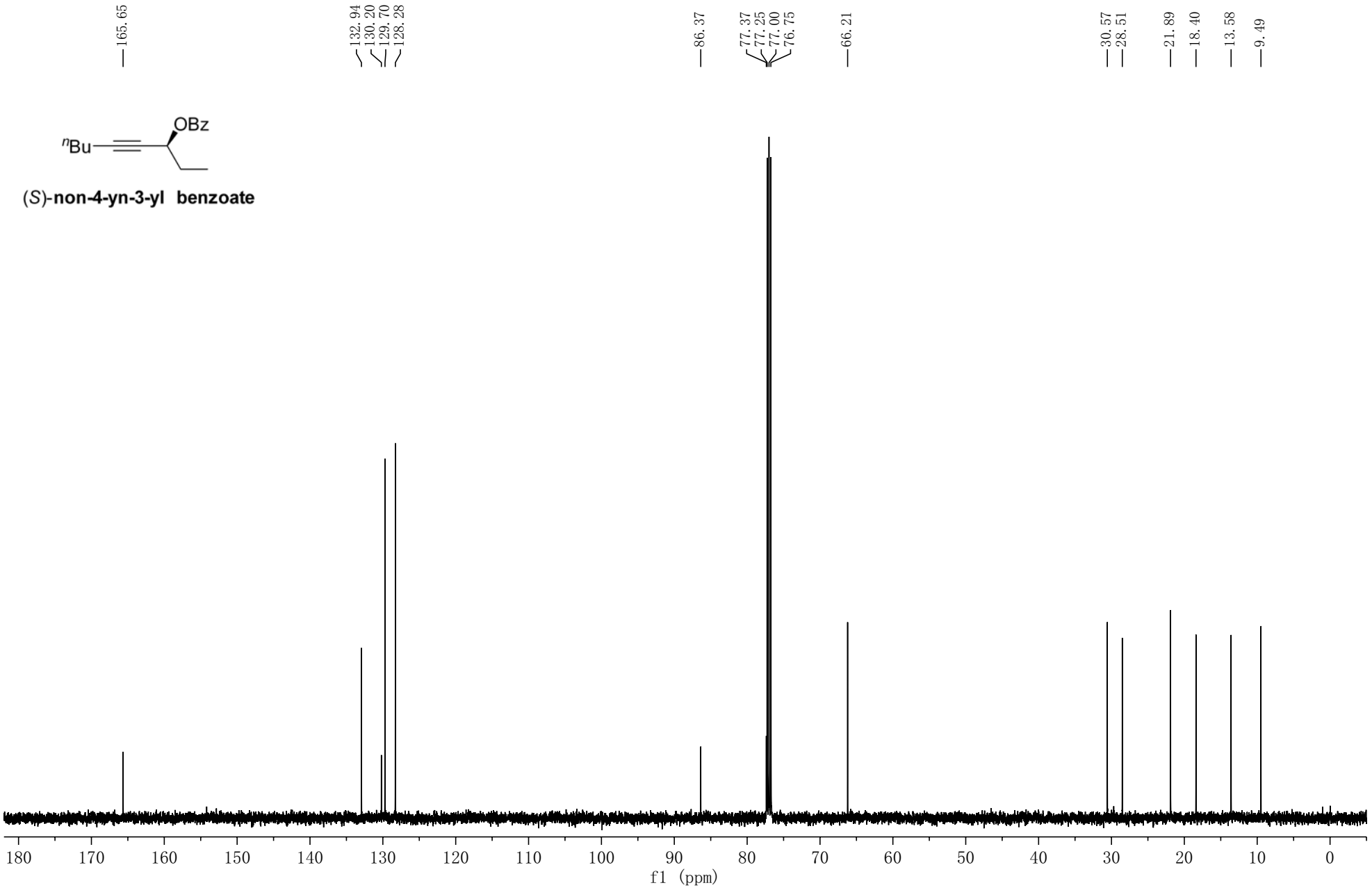

7.27
5.42
5.41
5.40
5.40
5.39
5.39
5.10
5.09
5.07
4.58
4.57
4.55
3.96
3.95
3.94
3.94
3.93
3.93
3.92
3.91
2.13
2.11
2.10
2.08
2.06
2.04
2.03
1.70
1.68
1.60
1.58
1.57
1.55
1.43
1.42
1.40
1.39
1.37
1.36
1.34
1.33
1.32
1.30
1.29
1.28
0.91
0.91
0.90
0.90
0.88
O
P
O
O
O
(E:Z = >99:<1)
1.00
1.03
2.03
4.03
4.21
2.96
3.32
3.18
2.36
17.64
12.99
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)

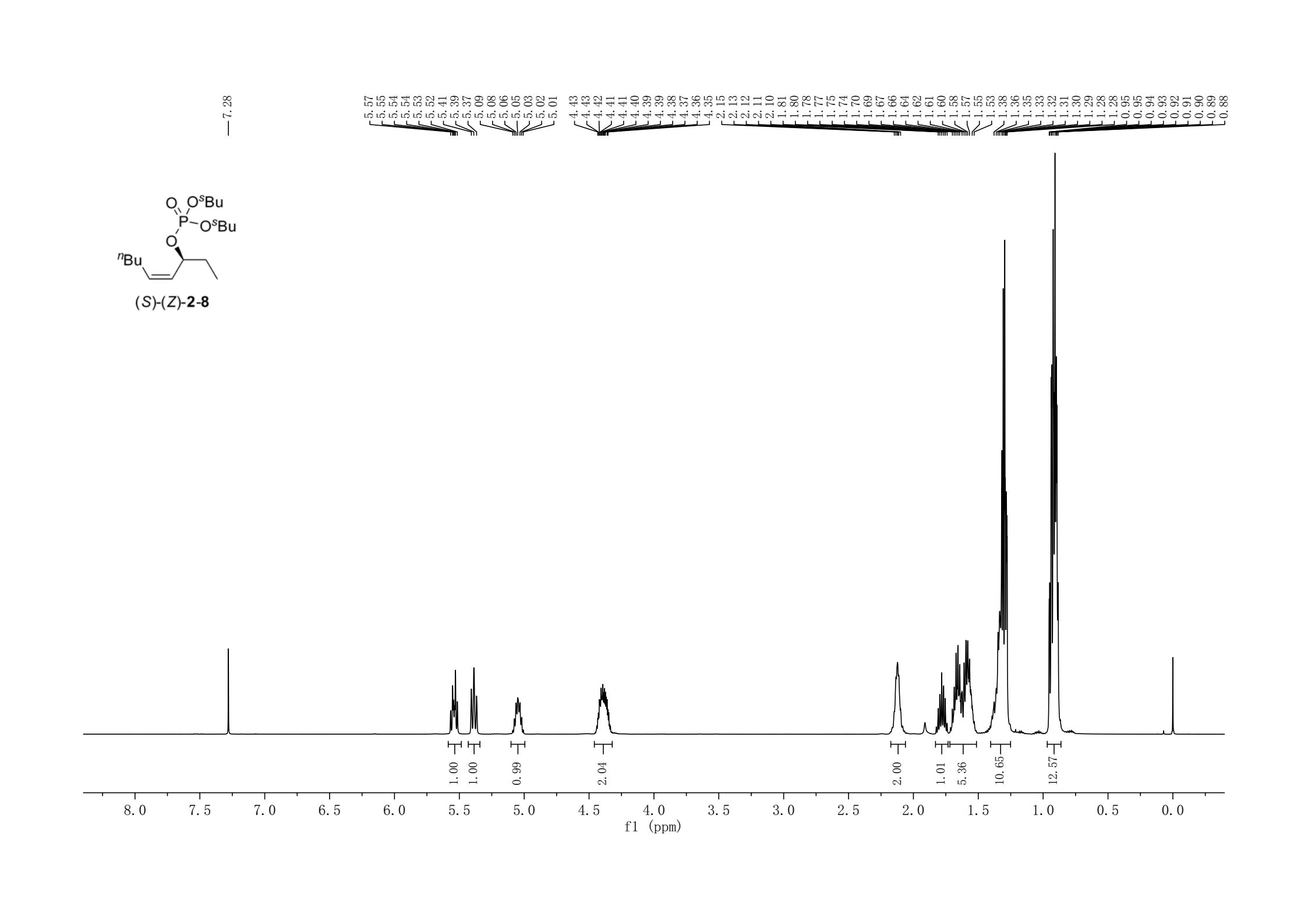

142.24
131.84
123.64
119.06
77.25
77.00
76.75
69.60
69.55
64.06
64.02
40.11
40.05
39.49
29.87
28.86
26.24
25.64
23.22
22.95
17.64
16.45
14.01
10.88
O
P
O
O
O
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

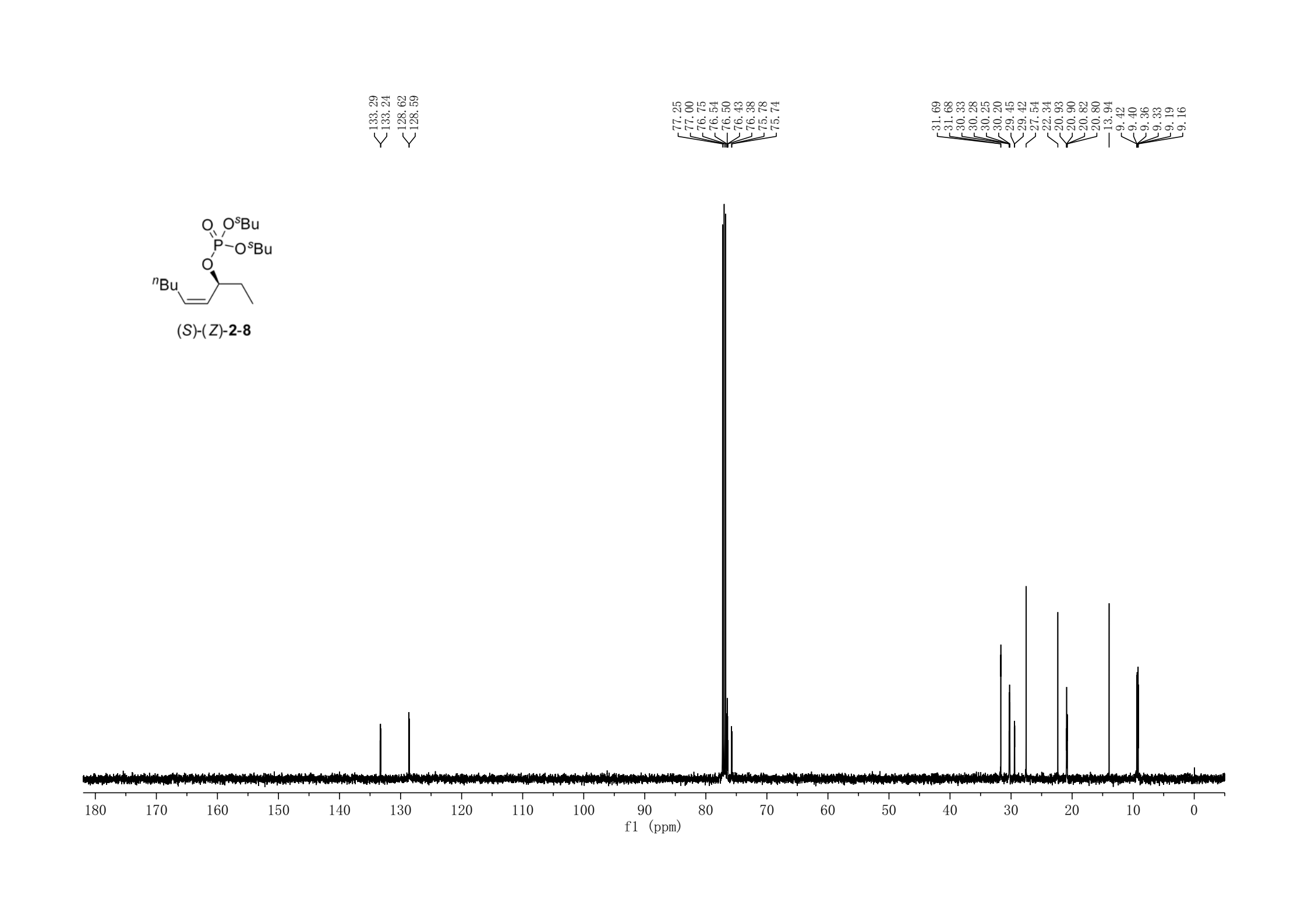

7.28
5.41
5.40
5.38
5.10
5.09
5.07
4.57
4.56
4.55
4.54
4.54
4.53
4.45
4.44
4.43
4.42
4.40
4.39
2.12
2.11
2.09
2.08
2.05
2.04
2.03
1.69
1.68
1.60
1.32
1.31
0.96
0.94
0.93
O
O^{s}Bu
P
O
O^{s}Bu
(E:Z = >99:<1)
1.00
1.00
2.01
2.03
4.13
8.34
5.12
6.42
6.20
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)


141.71
131.79
123.67
119.35
119.29
77.25
77.00
76.84
76.82
76.80
76.79
76.75
63.86
63.81
39.44
30.33
30.31
30.28
30.26
26.20
25.64
20.95
20.93
20.90
17.64
16.43
9.44
9.40
O
O^{s}Bu
P
O
O^{s}Bu
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


8.08
8.07
7.58
7.56
7.55
7.46
7.44
7.43
7.26
5.58
5.57
5.57
5.56
5.56
5.56
5.55
5.55
5.54
2.24
2.24
2.23
2.22
2.21
2.21
1.93
1.91
1.90
1.88
1.87
1.52
1.51
1.50
1.48
1.47
1.44
1.42
1.41
1.39
1.38
1.36
1.09
1.08
1.06
0.92
0.90
0.89
OBz
nBu
(S)-non-4-yn-3-yl benzoate
2.00
1.03
2.02
1.00
2.03
2.04
2.11
2.17
3.07
3.14
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)


165.65
132.94
130.20
129.70
128.28
86.37
77.37
77.25
77.00
76.75
66.21
30.57
28.51
21.89
18.40
13.58
9.49
OBz
nBu
(S)-non-4-yn-3-yl benzoate
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


7.28
5.57 5.55 5.54 5.54 5.53 5.52 5.41 5.39 5.37 5.09 5.08 5.06 5.05 5.03 5.02 5.01
4.43 4.43 4.42 4.41 4.41 4.40 4.39 4.39 4.38 4.37 4.36 4.35
2.15 2.13 2.12 2.11 2.10 1.81 1.80 1.78 1.77 1.75 1.74 1.70 1.69 1.67 1.66 1.64 1.62 1.61 1.60 1.58 1.57 1.55 1.53 1.38 1.36 1.35 1.33 1.32 1.31 1.30 1.29 1.28 1.28 0.95 0.95 0.94 0.93 0.92 0.91 0.90 0.89 0.88
O
O^{s}Bu
P
O^{s}Bu
O
^{n}Bu
(S)-(Z)-2-8
1.00
1.00
0.99
2.04
2.00
1.01
5.36
10.65
12.57
8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)


133.29
133.24
128.62
128.59
77.25
77.00
76.75
76.54
76.50
76.43
76.38
75.78
75.74
31.69
31.68
30.33
30.28
30.25
30.20
29.45
29.42
27.54
22.34
20.93
20.90
20.82
20.80
13.94
9.42
9.40
9.36
9.33
9.19
9.16
O
O^{s}Bu
P
O^{s}Bu
O
^{n}Bu
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

(*S*)-(*Z*)-**2-8**