

Appendix

for

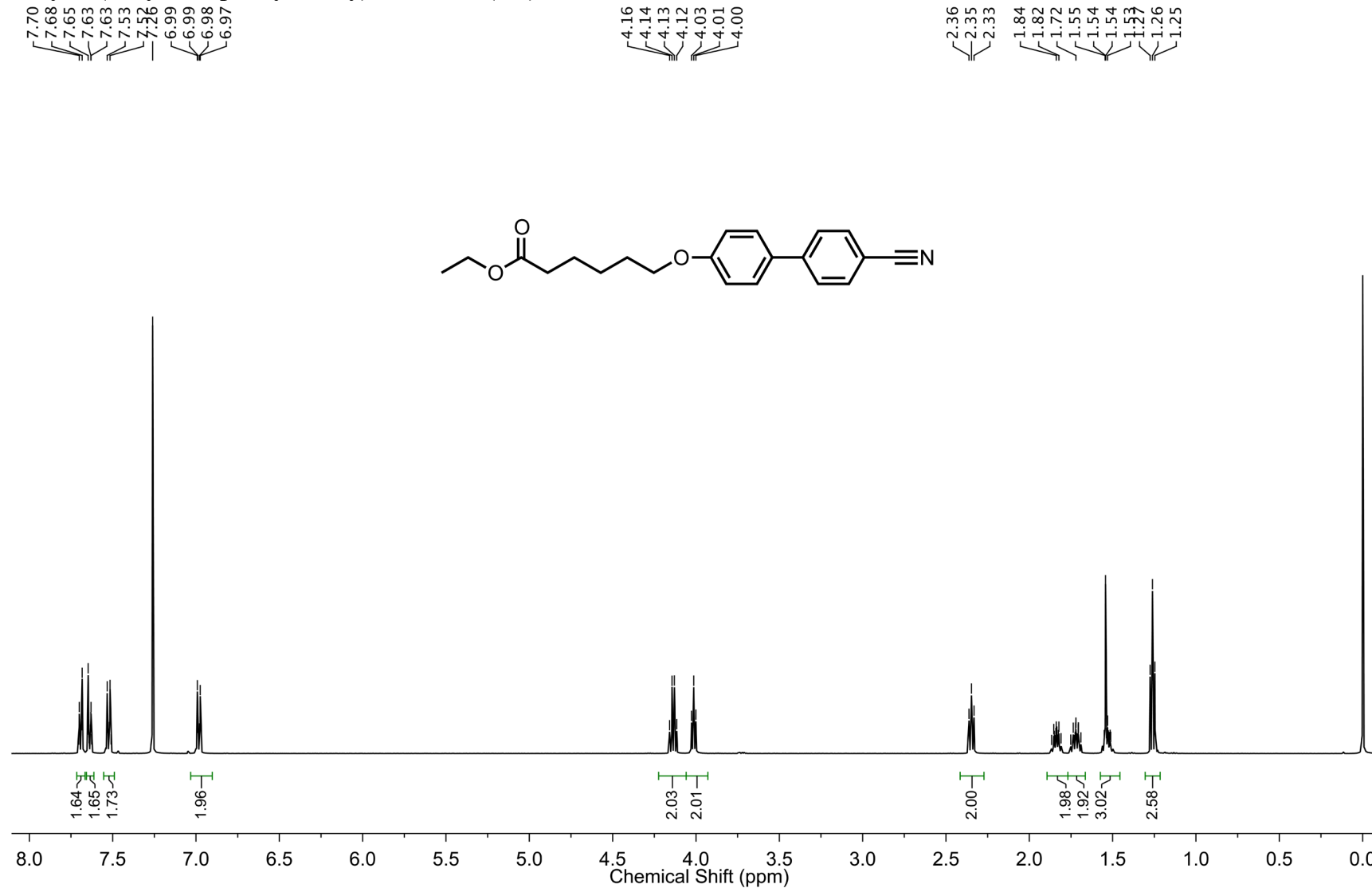
**Heterolithic branched liquid crystalline materials prepared via the Passerini three-
component reaction**

Shuang Song

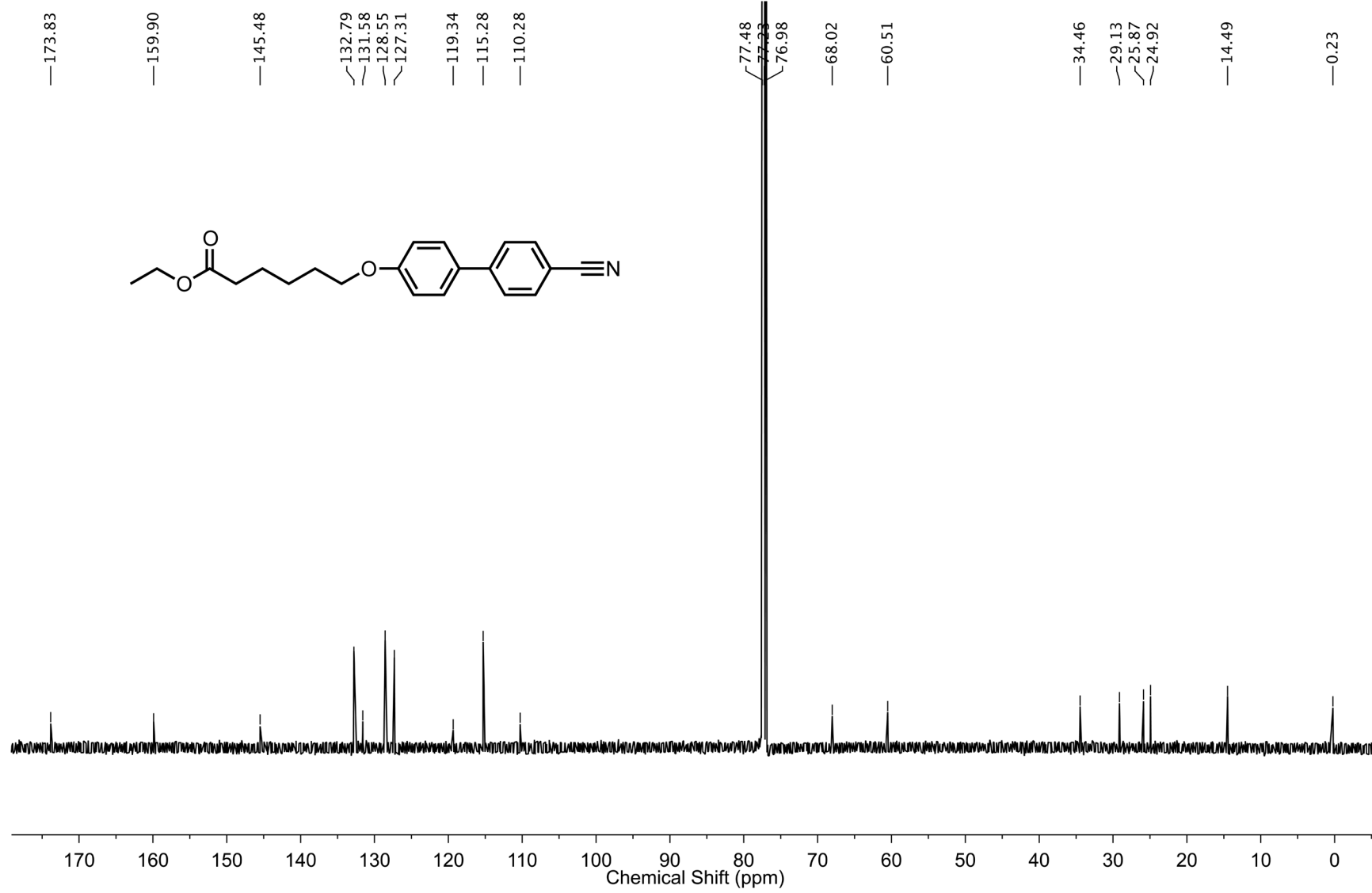
¹H and ¹³C NMR Spectra 1

¹H and ¹³C NMR Spectra

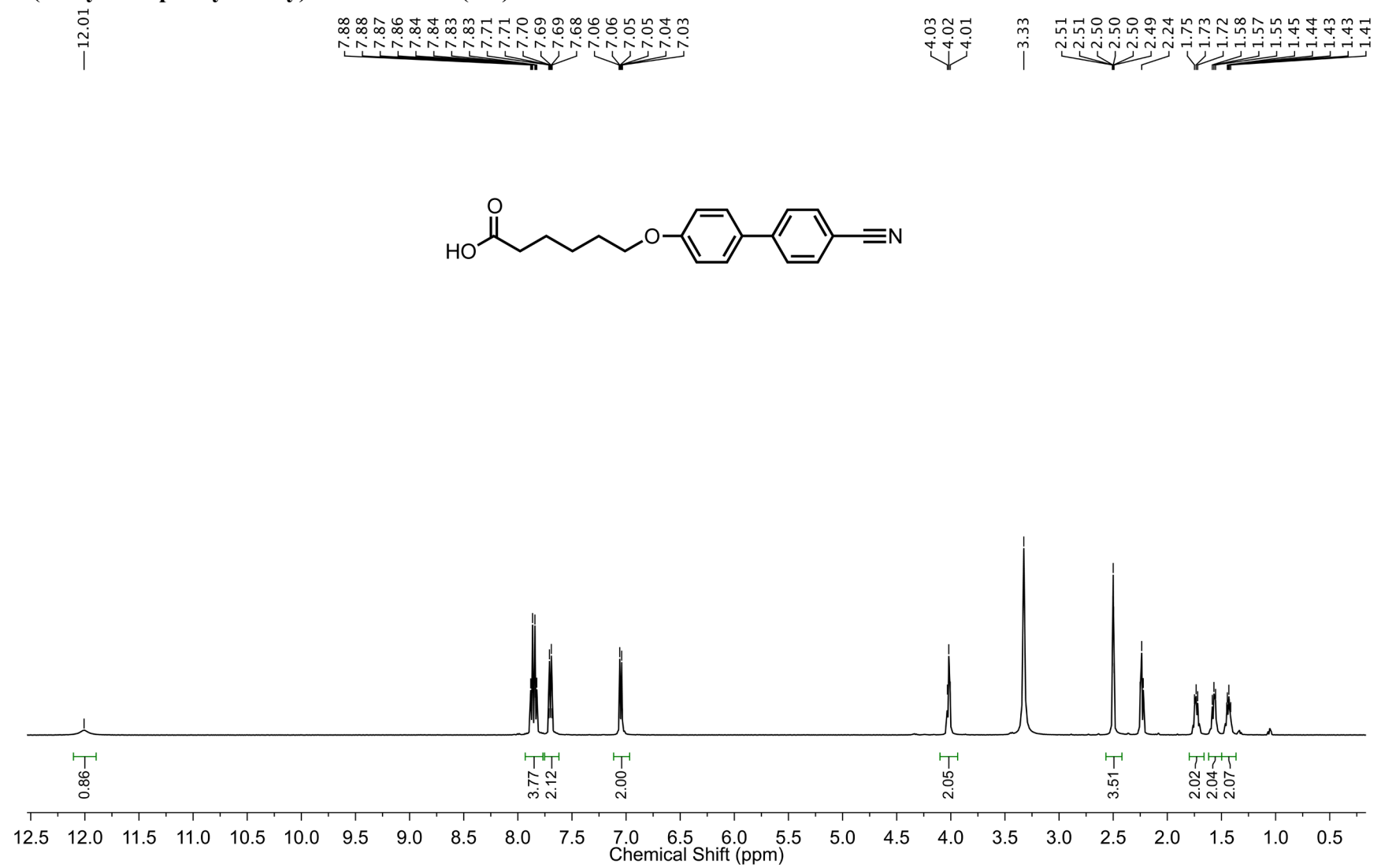
Ethyl 6-(4'-cyanobiphenyl-4-oxy)hexanoate (2-9)



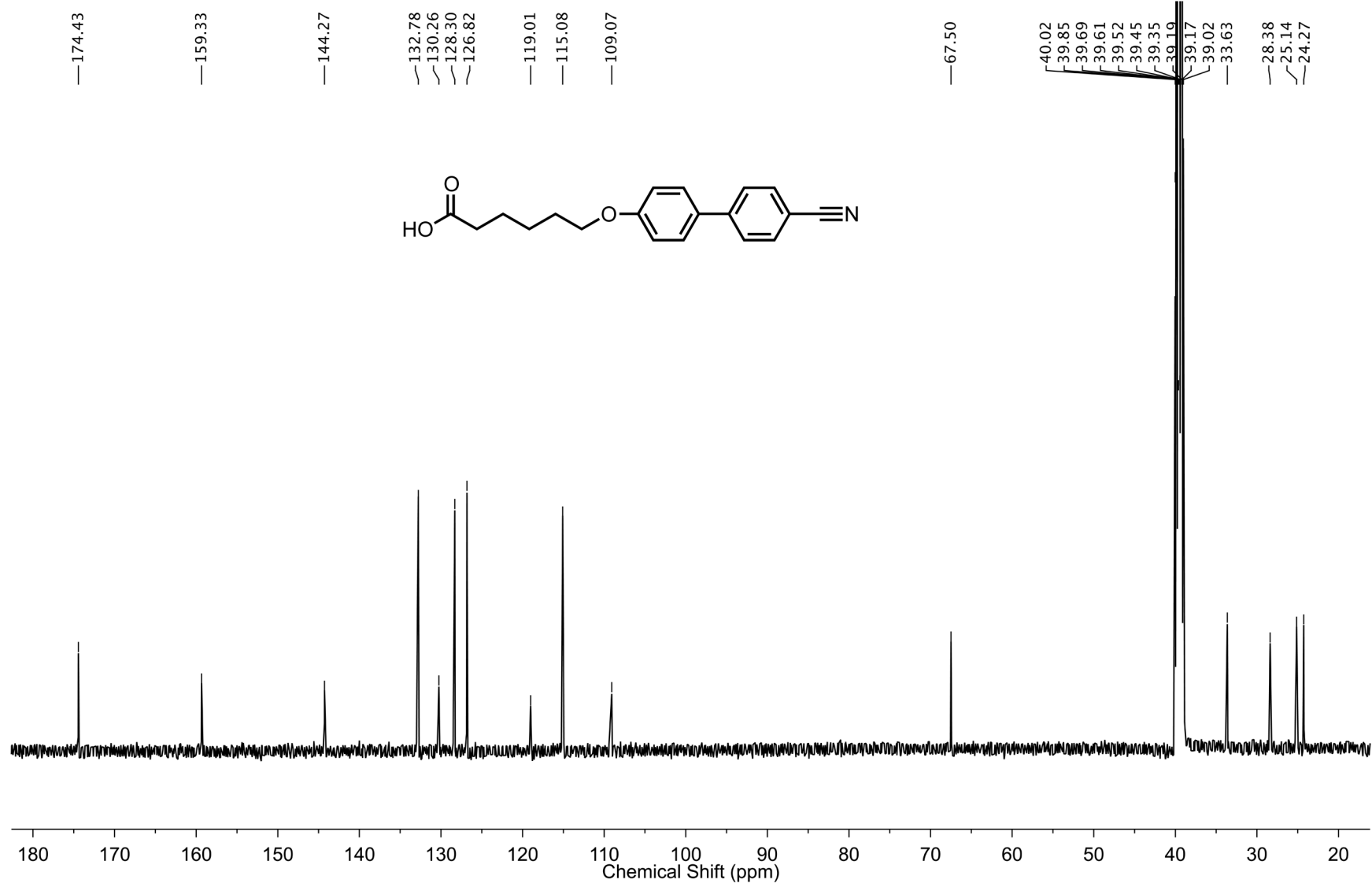
Ethyl 6-(4'-cyanobiphenyl-4-oxy)hexanoate (2-9)



6-(4'-Cyanobiphenyl-4-oxy)hexanoic acid (2-4)



6-(4'-Cyanobiphenyl-4-oxy)hexanoic acid (2-4)

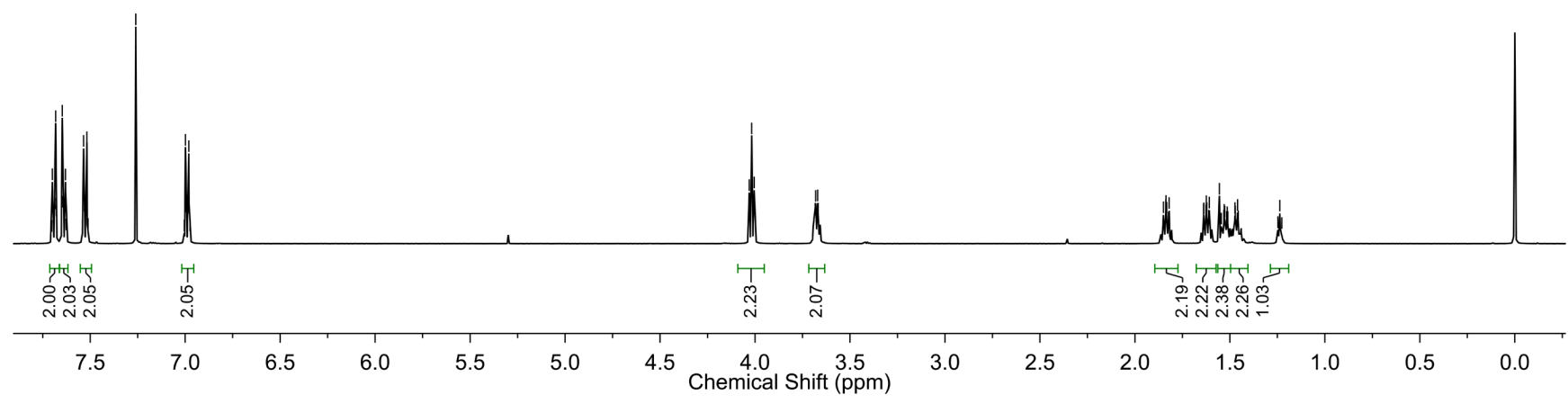
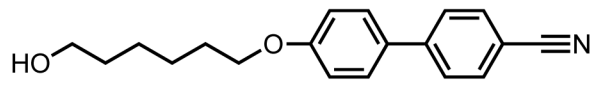


6-(4'-Cyanobiphenyl-4-oxy)hexanol (2-10)

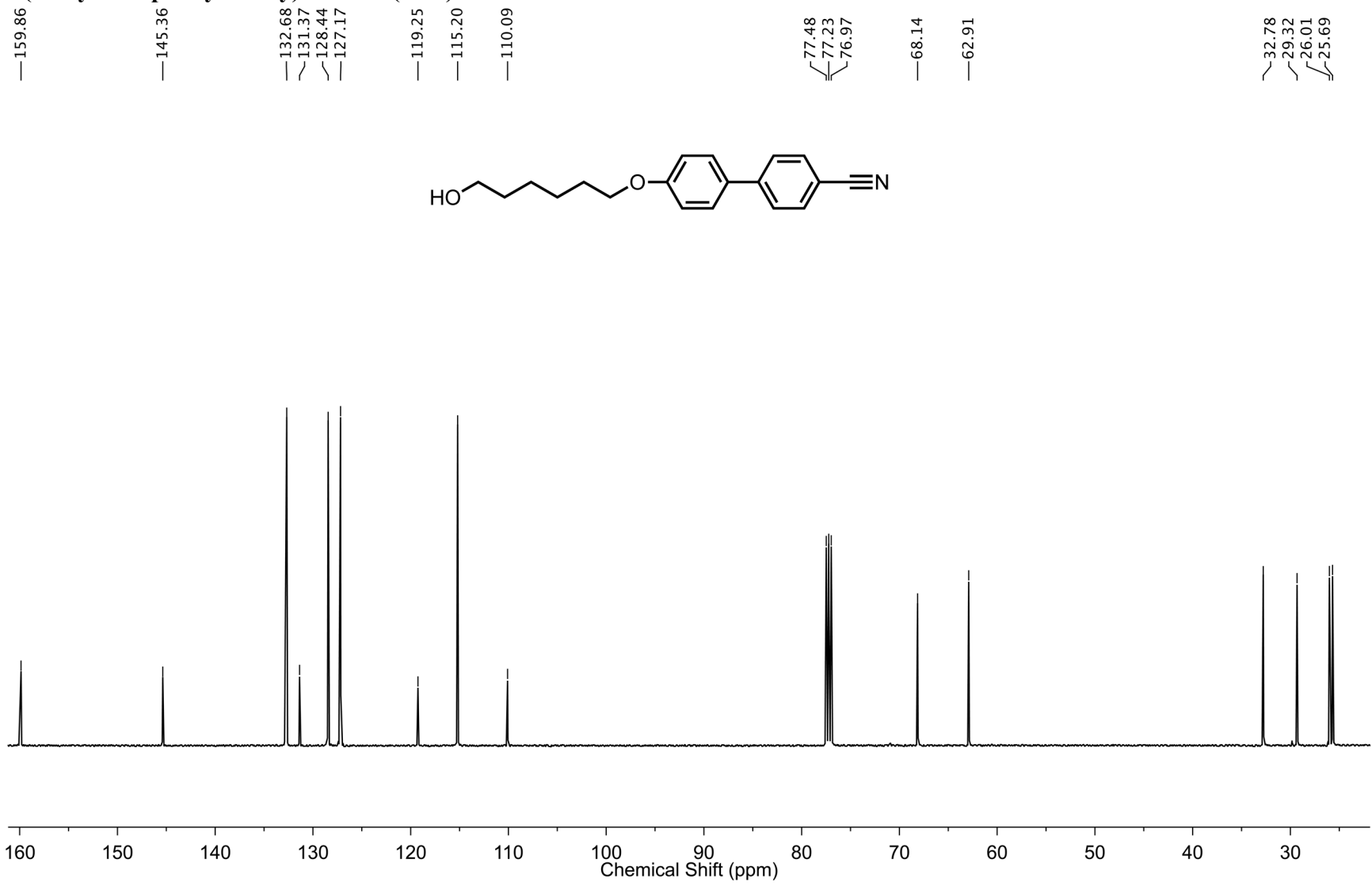
7.70
7.68
7.65
7.53
7.52
7.51
7.00
6.99
6.99
6.98
6.97

4.03
4.02
4.00
3.68
3.67
3.67

1.85
1.84
1.84
1.83
1.82
1.82
1.64
1.64
1.63
1.62
1.62
1.61
1.61
1.56
1.55
1.53
1.53
1.53
1.52
1.51
1.51
1.47
1.47
1.46
1.46
1.25
1.24
1.23



6-(4'-Cyanobiphenyl-4-oxy)hexanol (2-10)



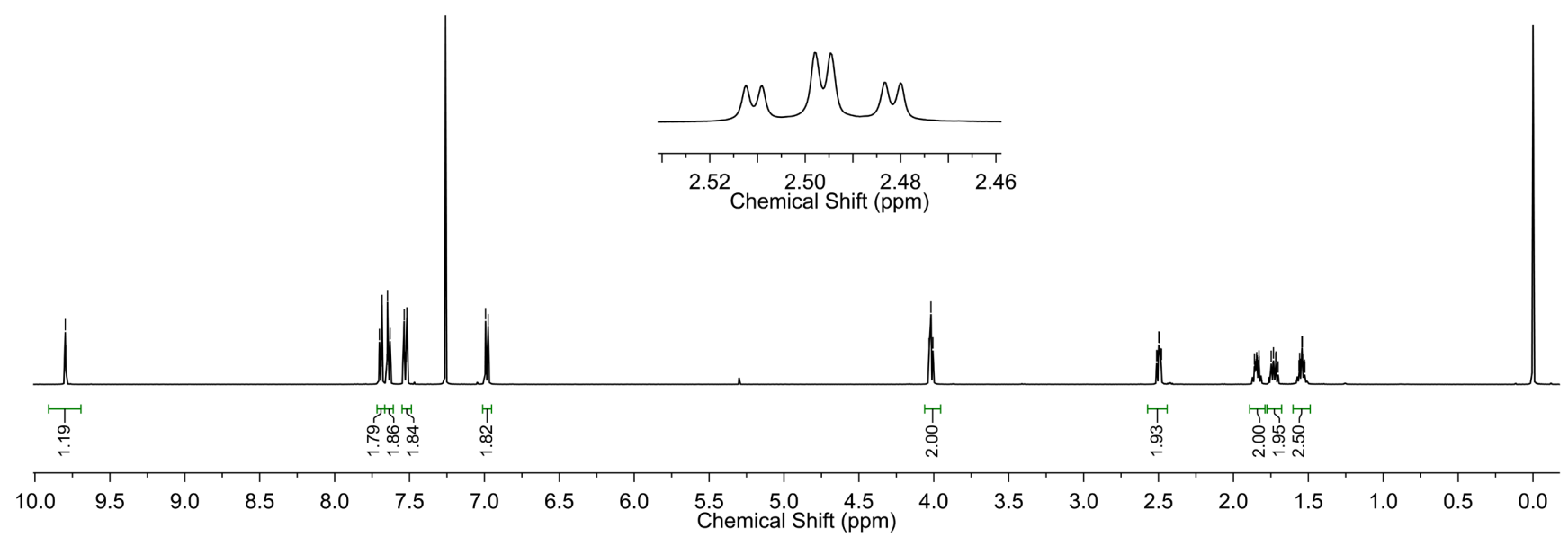
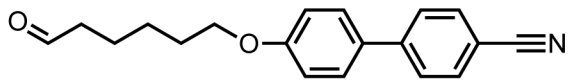
6-(4'-Cyanobiphenyl-4-oxy)hexanal (2-5)

9.80
9.80
9.79
7.70
7.70
7.70
7.69
7.68
7.68
7.65
7.65
7.64
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7.52
7.52
7.26
6.99
6.99
6.98
6.97

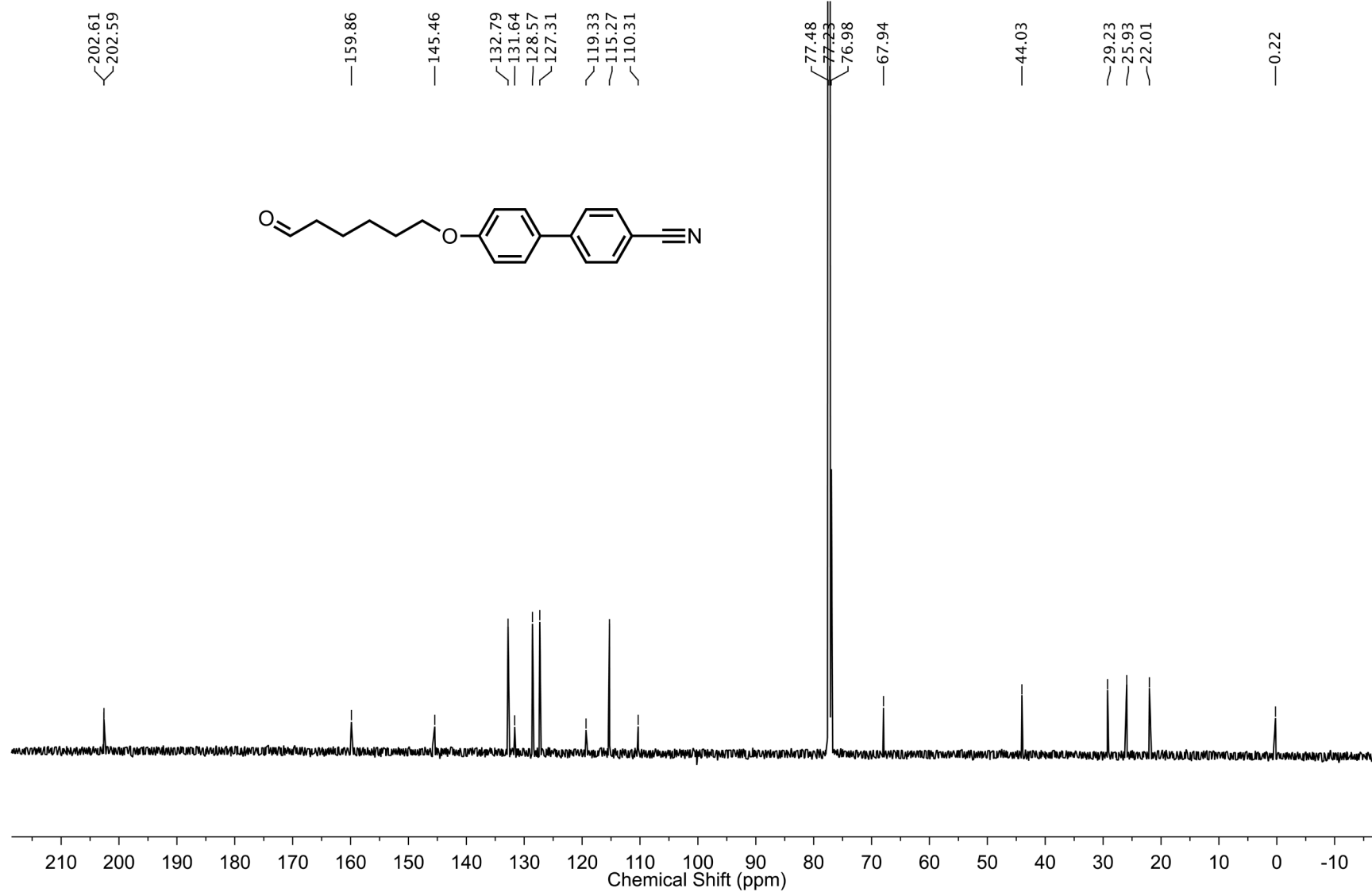
4.03
4.02
4.01

2.51
2.51
2.50
2.49
2.48
2.48

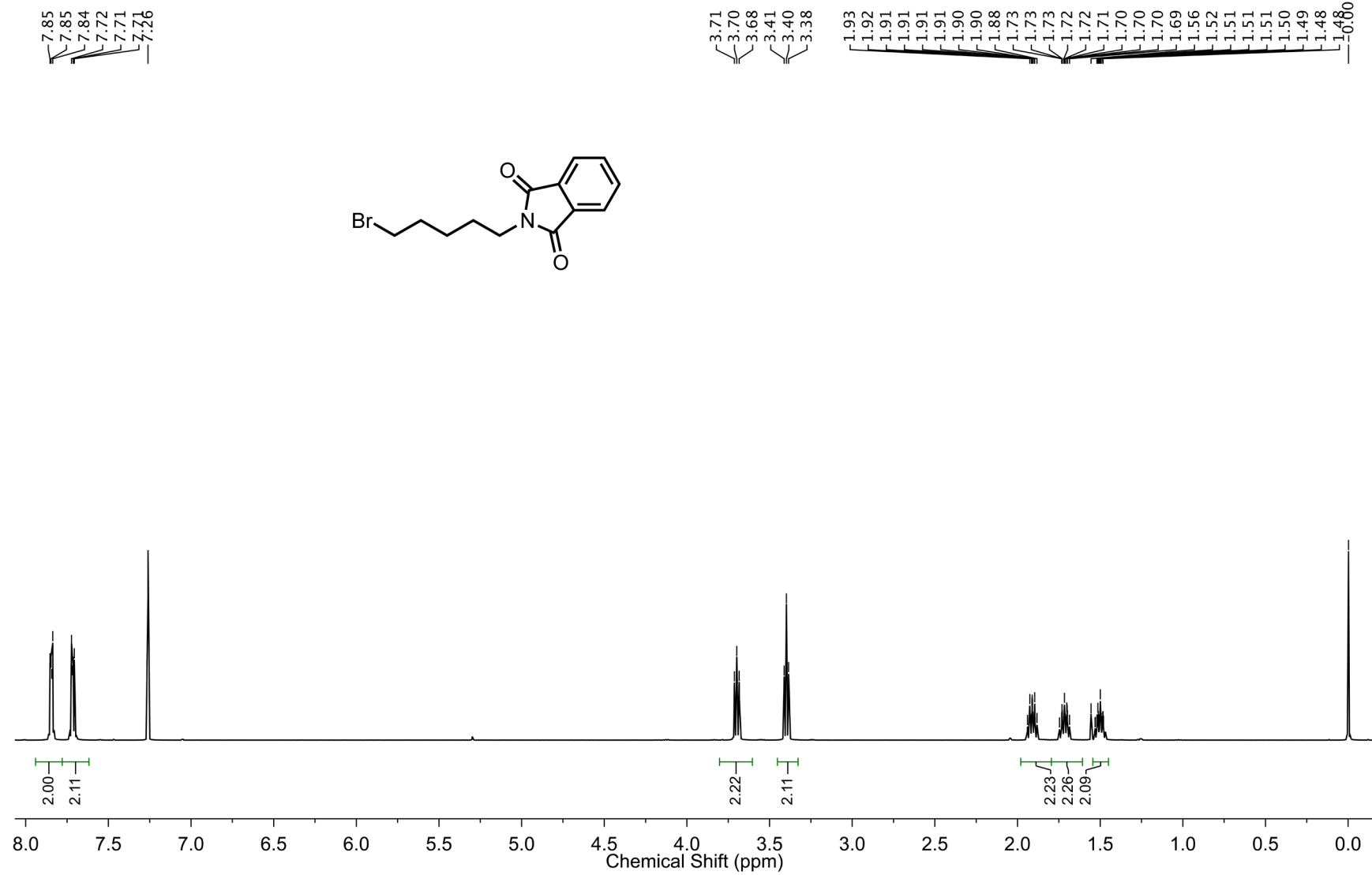
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1.85
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1.84
1.84
1.83
1.83
1.75
1.72
1.72
1.56
1.55
1.54
1.54



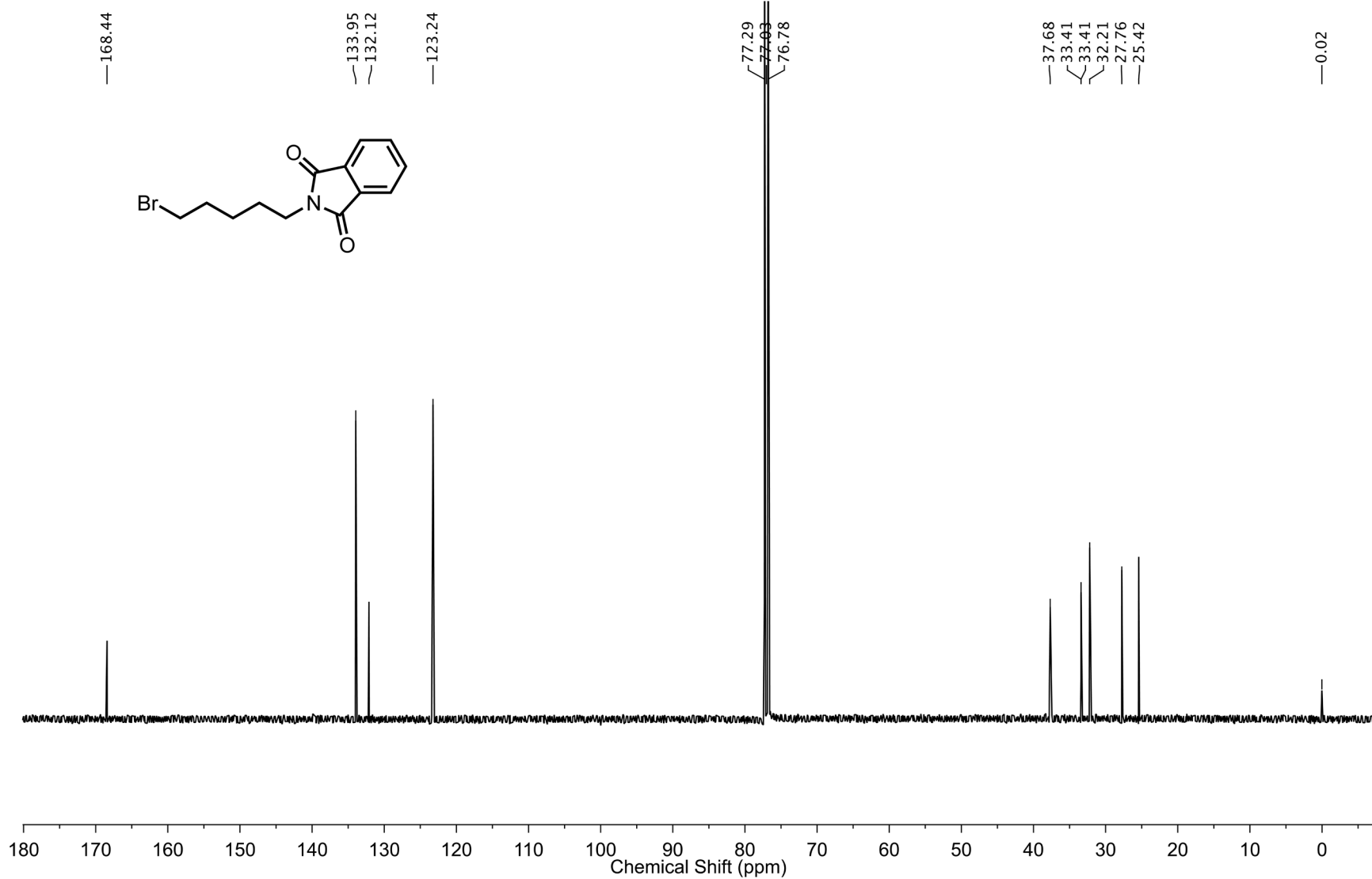
6-(4'-Cyanobiphenyl-4-oxy)hexanal (2-5)



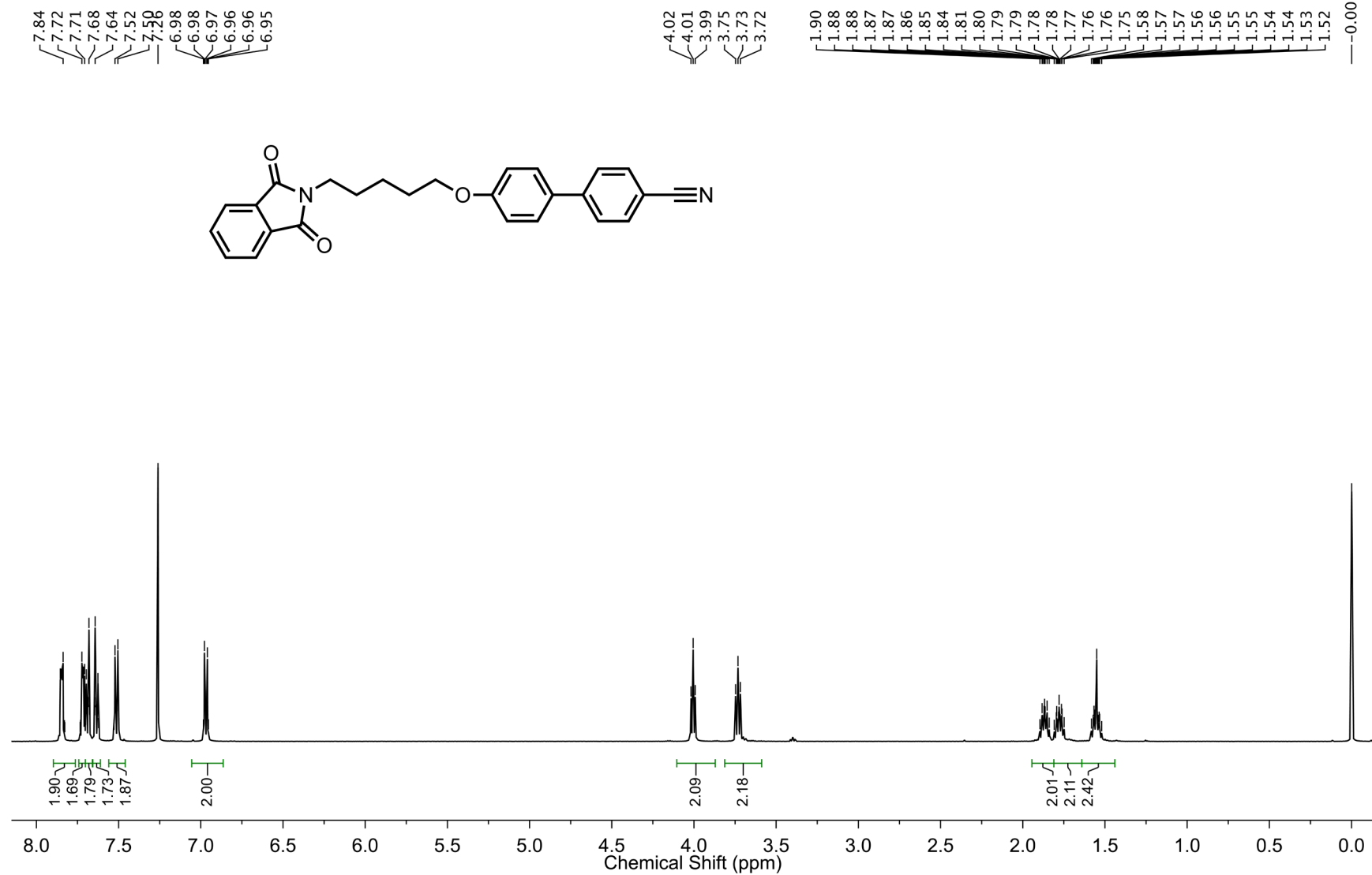
N-(5-Bromopentyl)phthalimide (2-11)



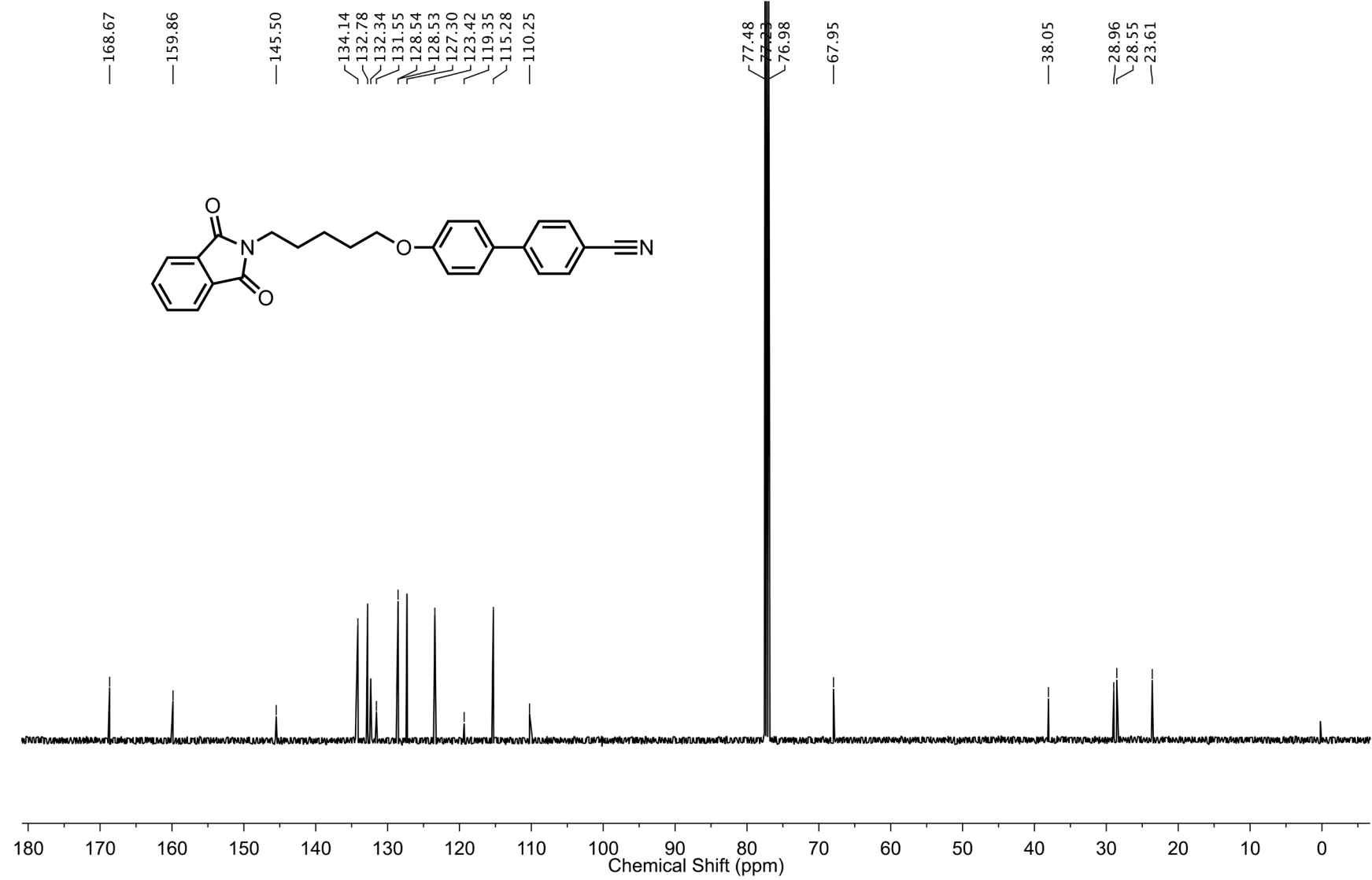
N-(5-Bromopentyl)phthalimide (2-11)



***N*-(5-(4'-Cyanobiphenyl-4-oxy)pentyl)phthalimide (2-12)**



***N*-(5-(4'-Cyanobiphenyl-4-oxy)pentyl)phthalimide (2-12)**



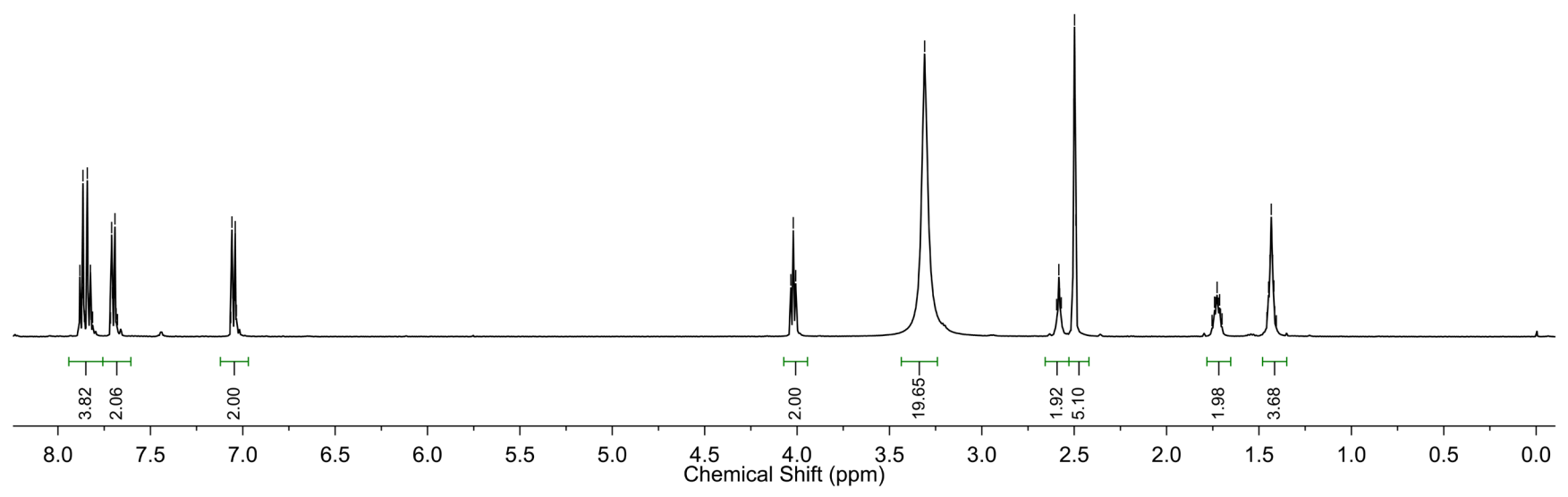
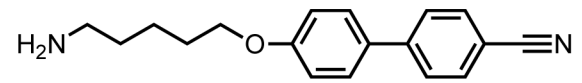
5-(4'-Cyanobiphenyl-4-oxy)pentylamine (2-13)

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7.86
7.84
7.84
7.82
7.71
7.68
7.06
7.05
7.04
7.03

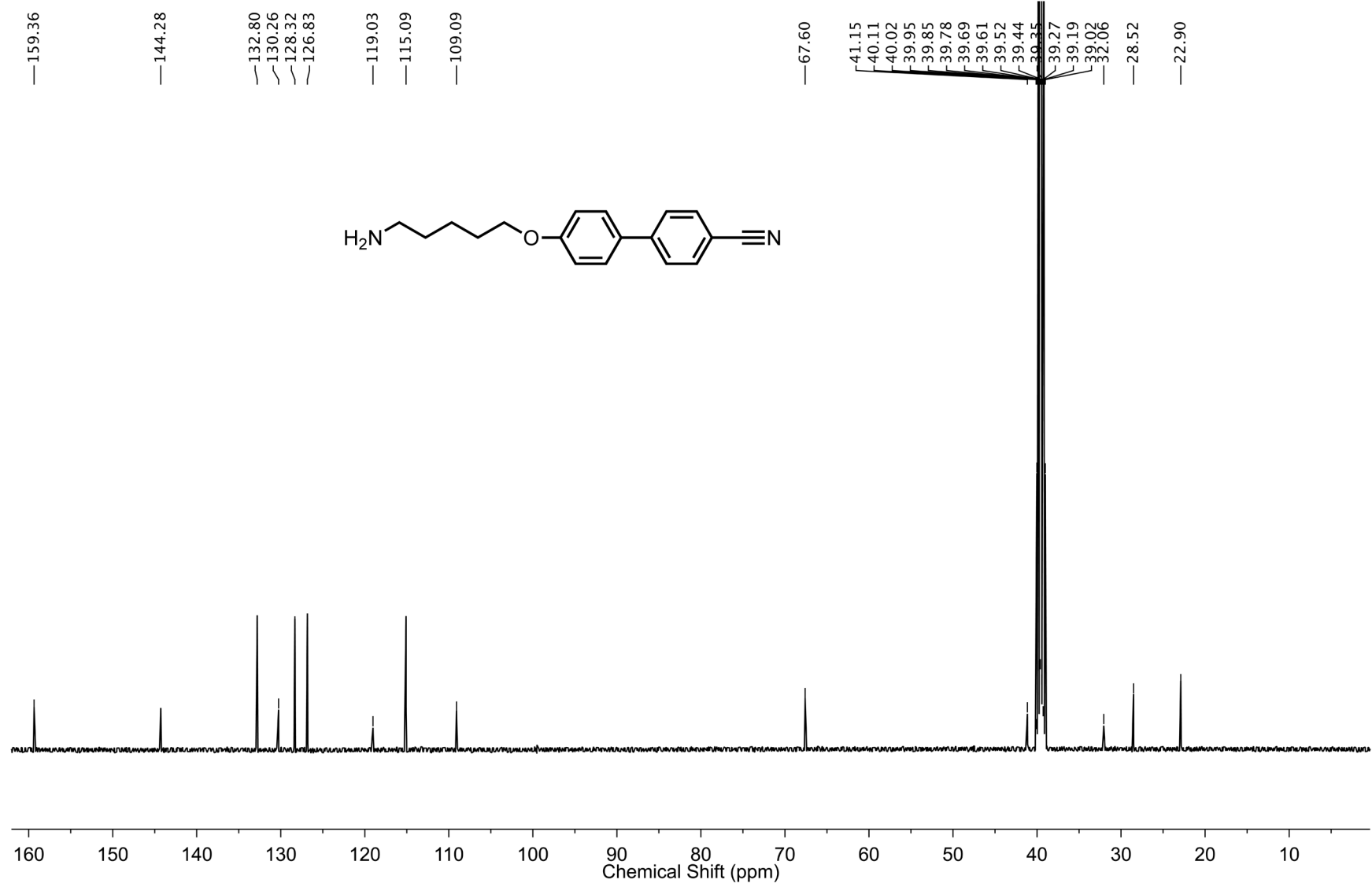
4.03
4.02
4.01

3.31
2.60
2.58
2.58
2.57
2.51
2.50
2.50
2.49

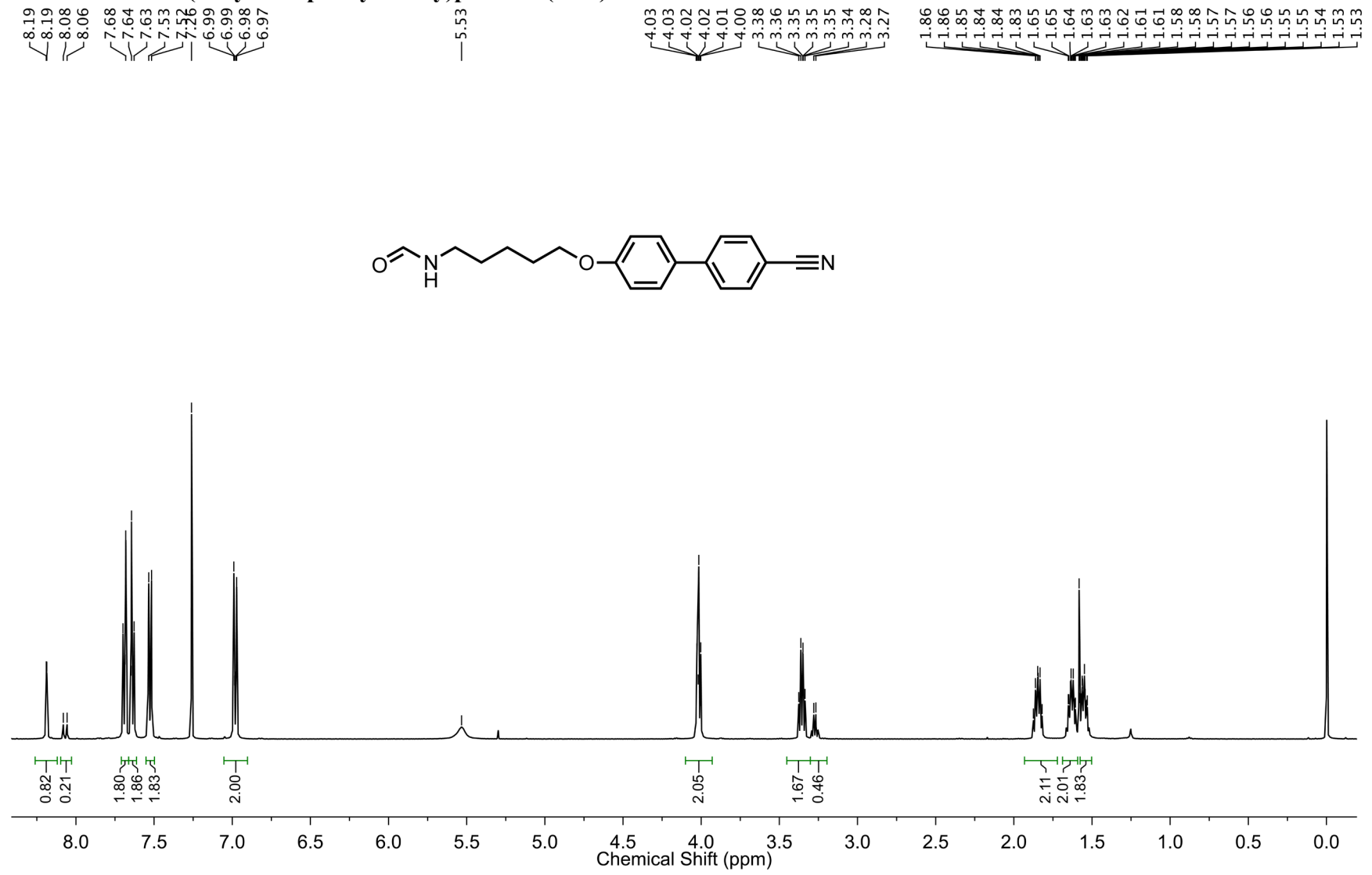
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1.45
1.44
1.43
1.43
1.42
1.41
1.41



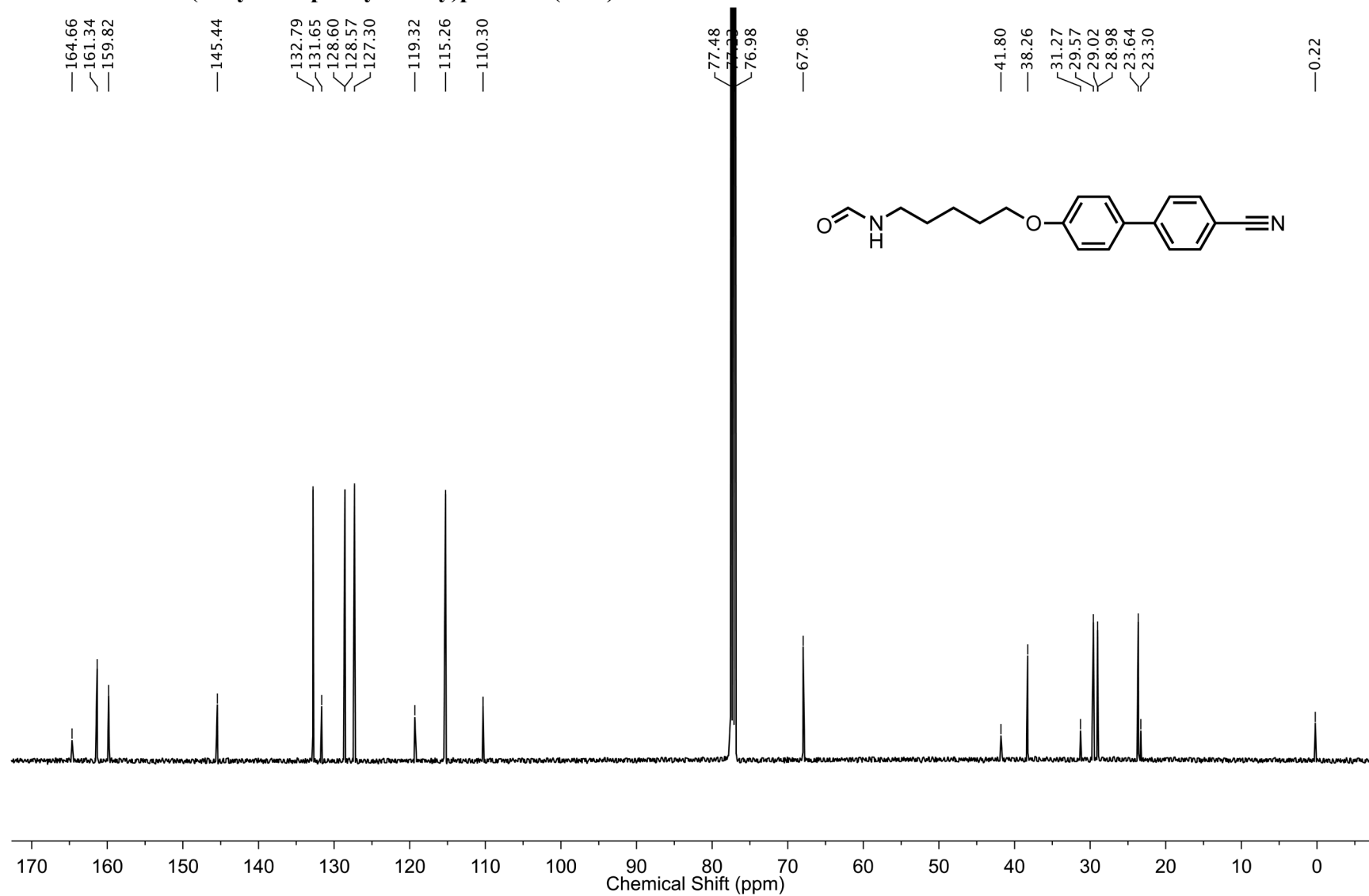
5-(4'-Cyanobiphenyl-4-oxy)pentylamine (2-13)



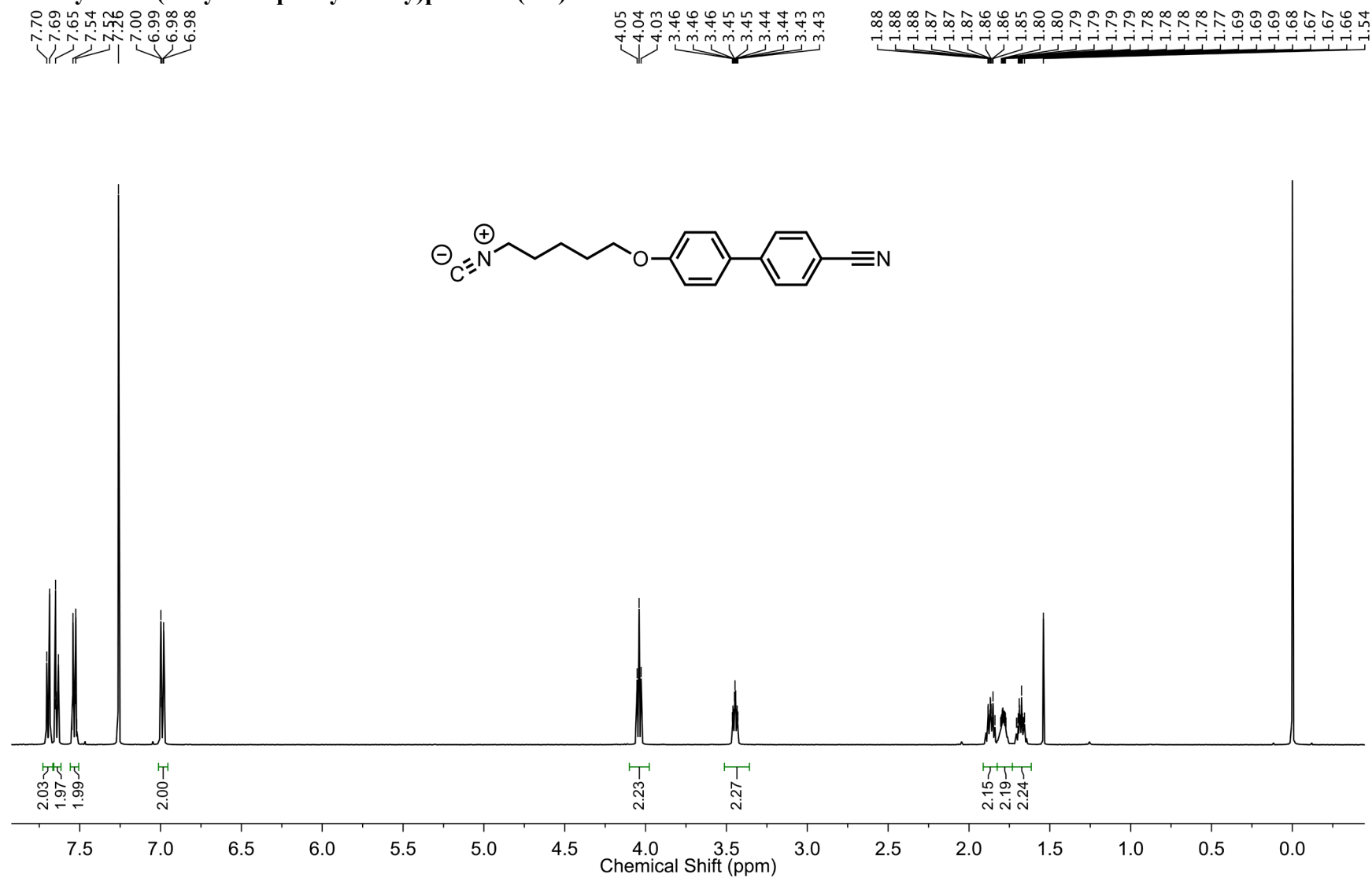
1-Formamido-5-(4'-cyanobiphenyl-4-oxy)pentane (2-14)



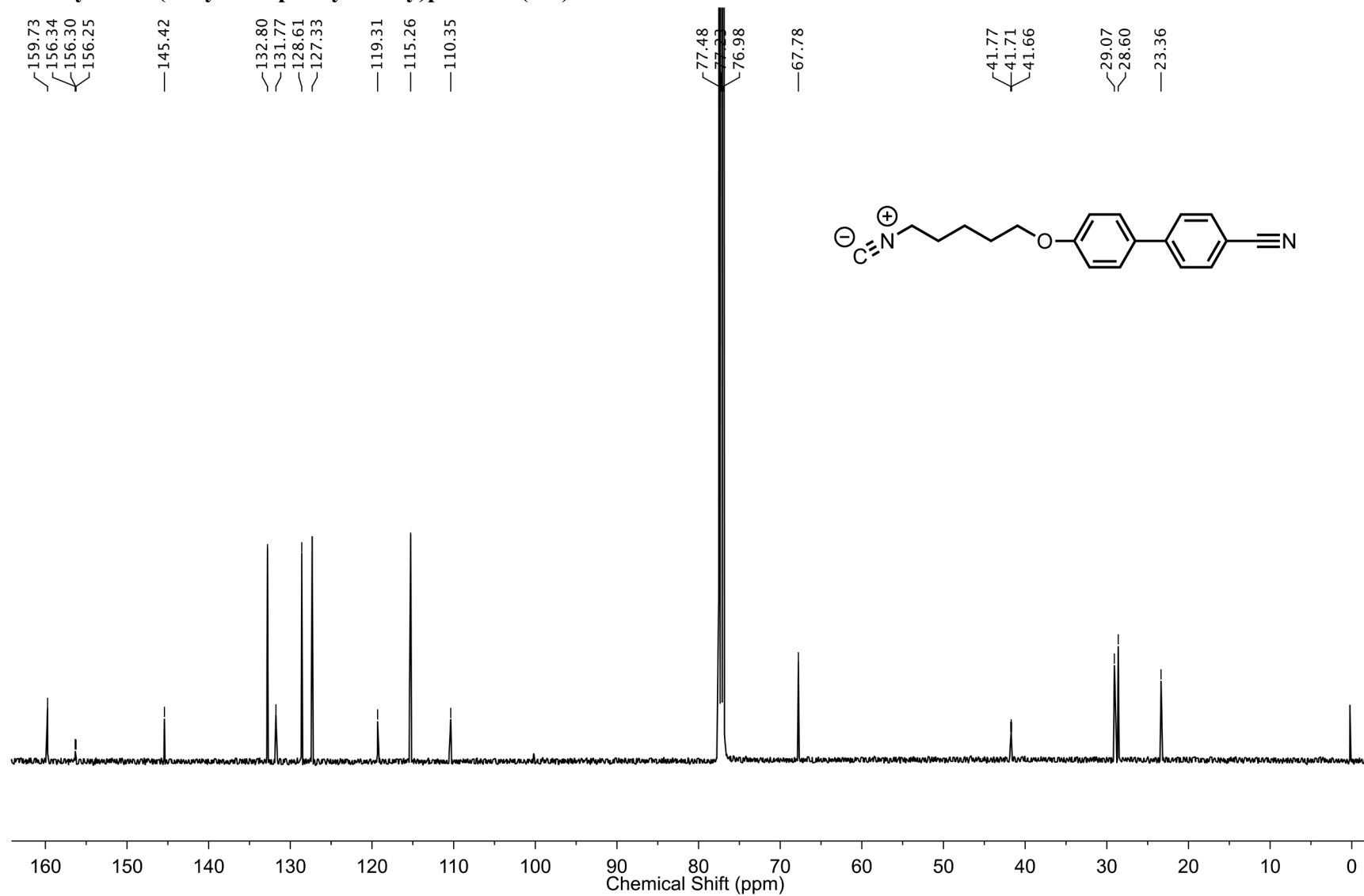
1-Formamido-5-(4'-cyanobiphenyl-4-oxy)pentane (2-14)



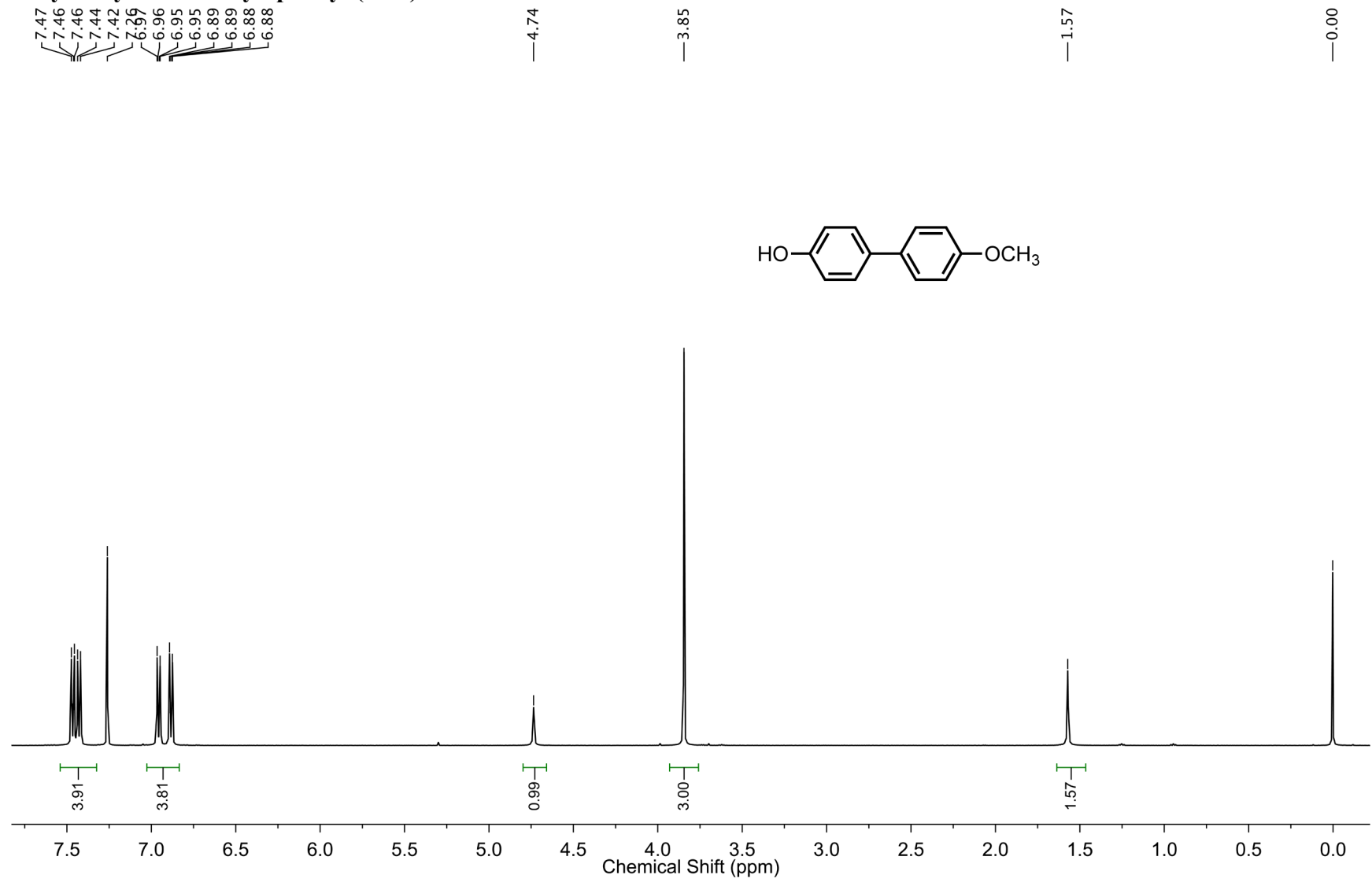
1-Isocyano-5-(4'-cyanobiphenyl-4-oxy)pentane (2-6)



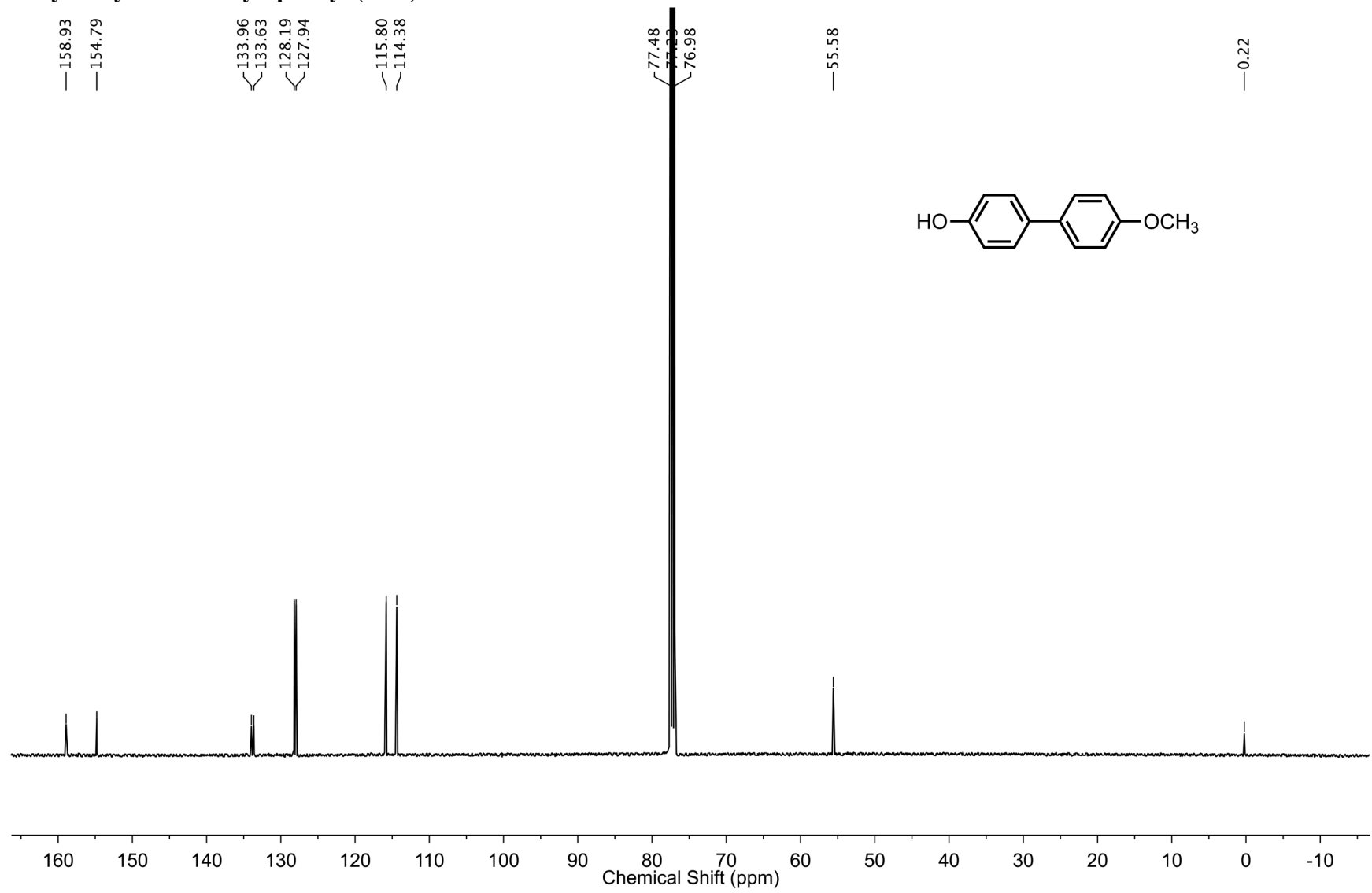
1-Isocyano-5-(4'-cyanobiphenyl-4-oxy)pentane (2-6)



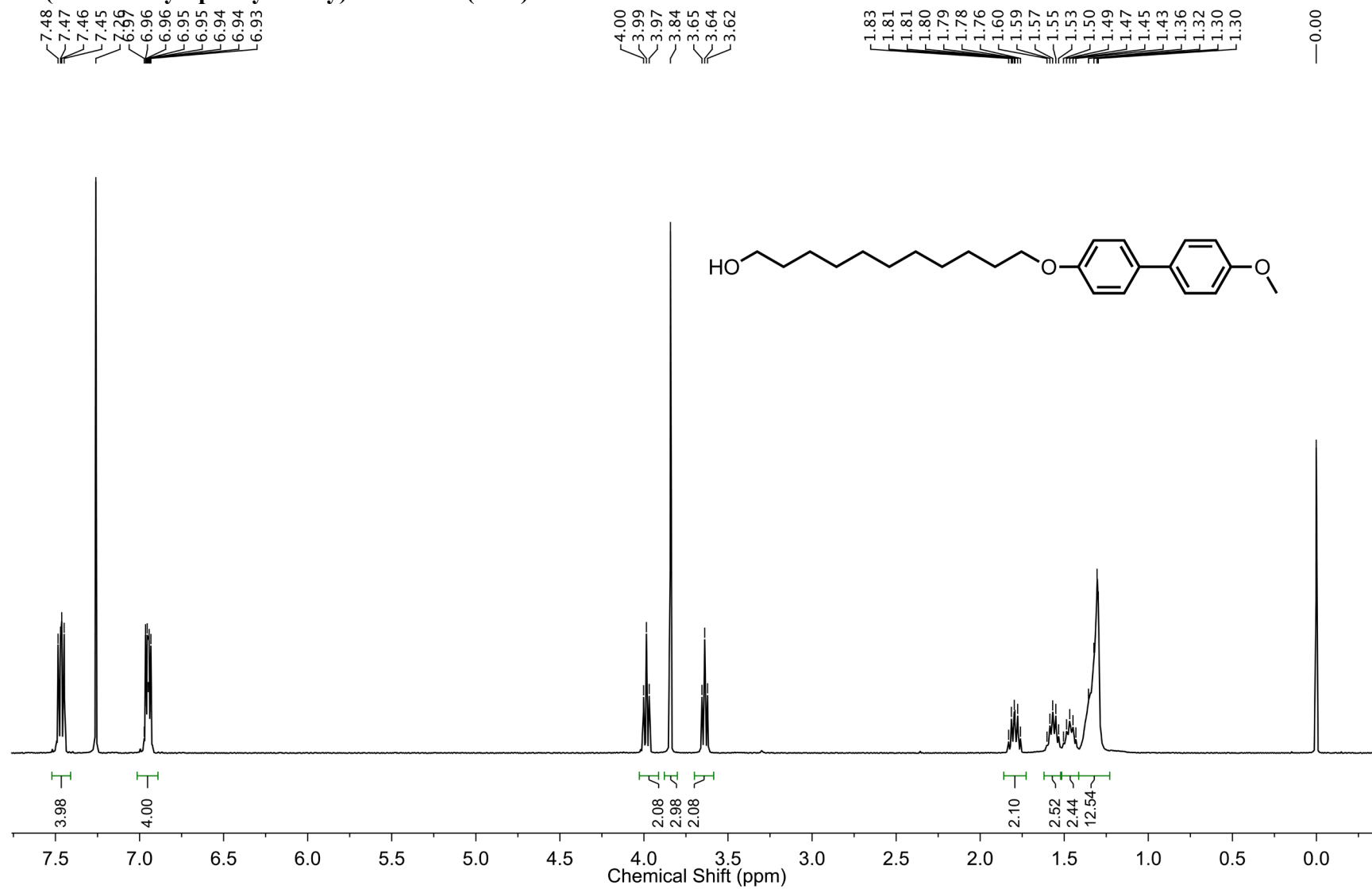
4-Hydroxy-4'-methoxybiphenyl (2-15)



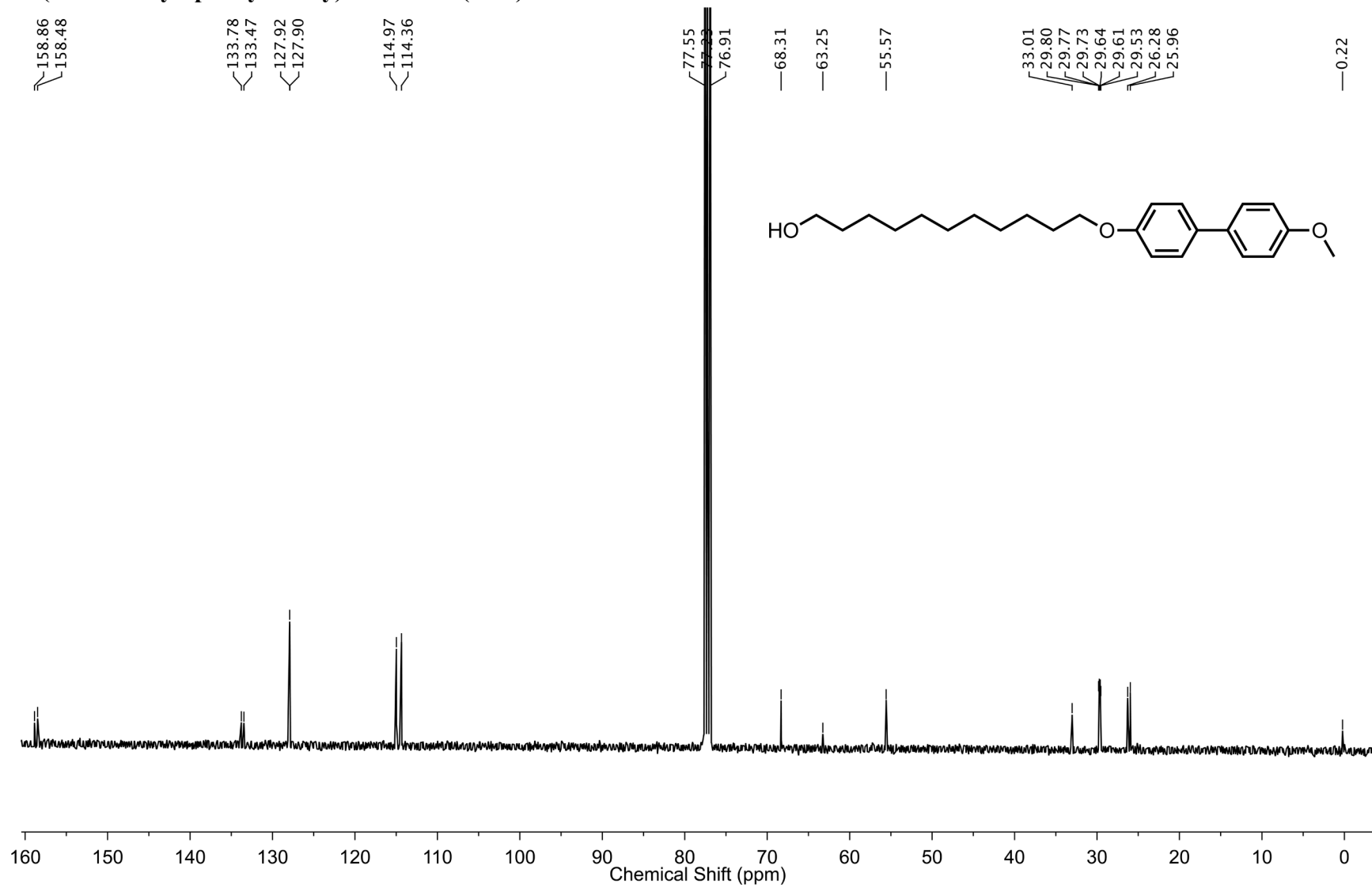
4-Hydroxy-4'-methoxybiphenyl (2-15)



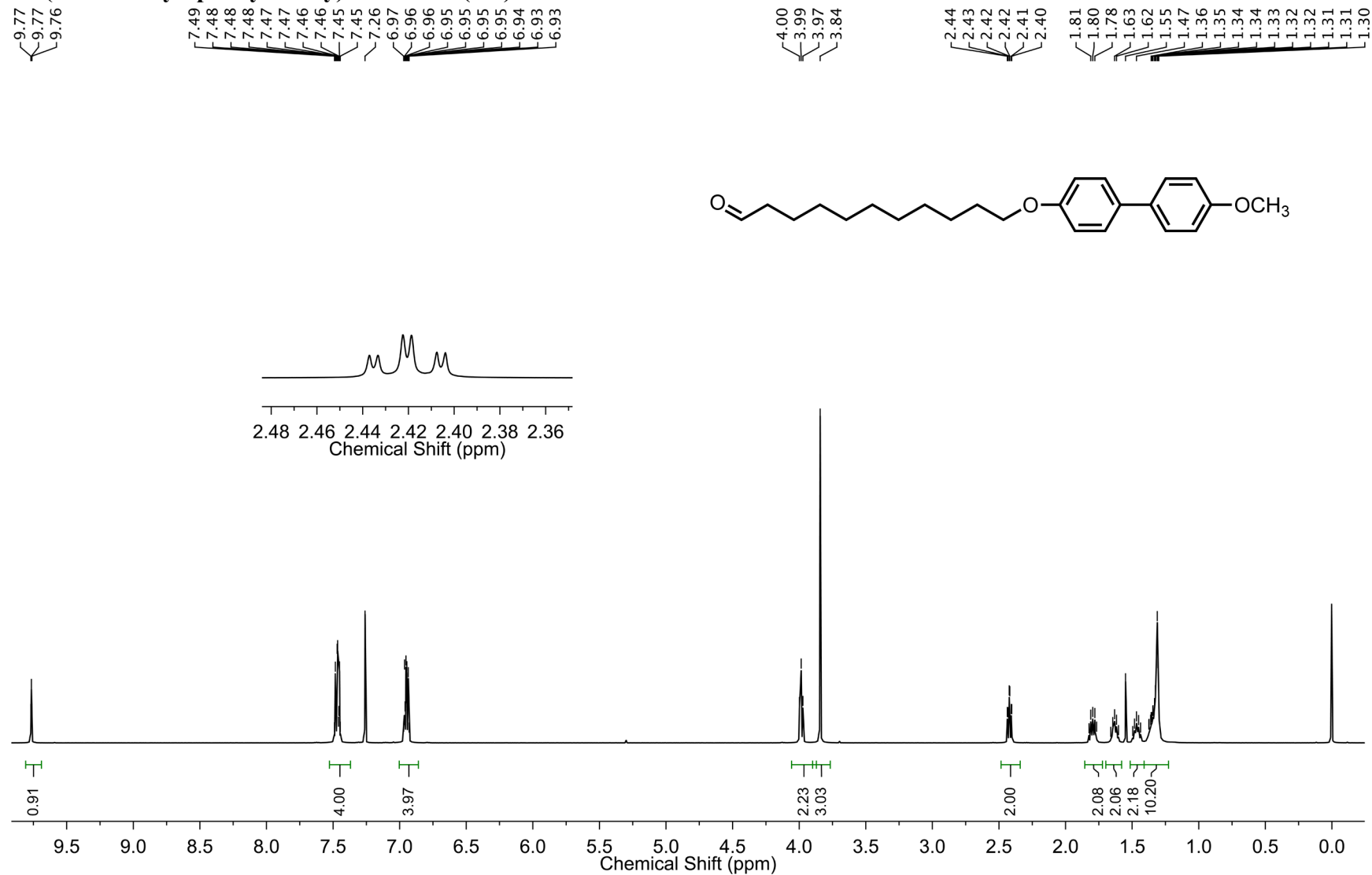
11-(4'-Methoxybiphenyl-4-oxy)undecanol (2-16)



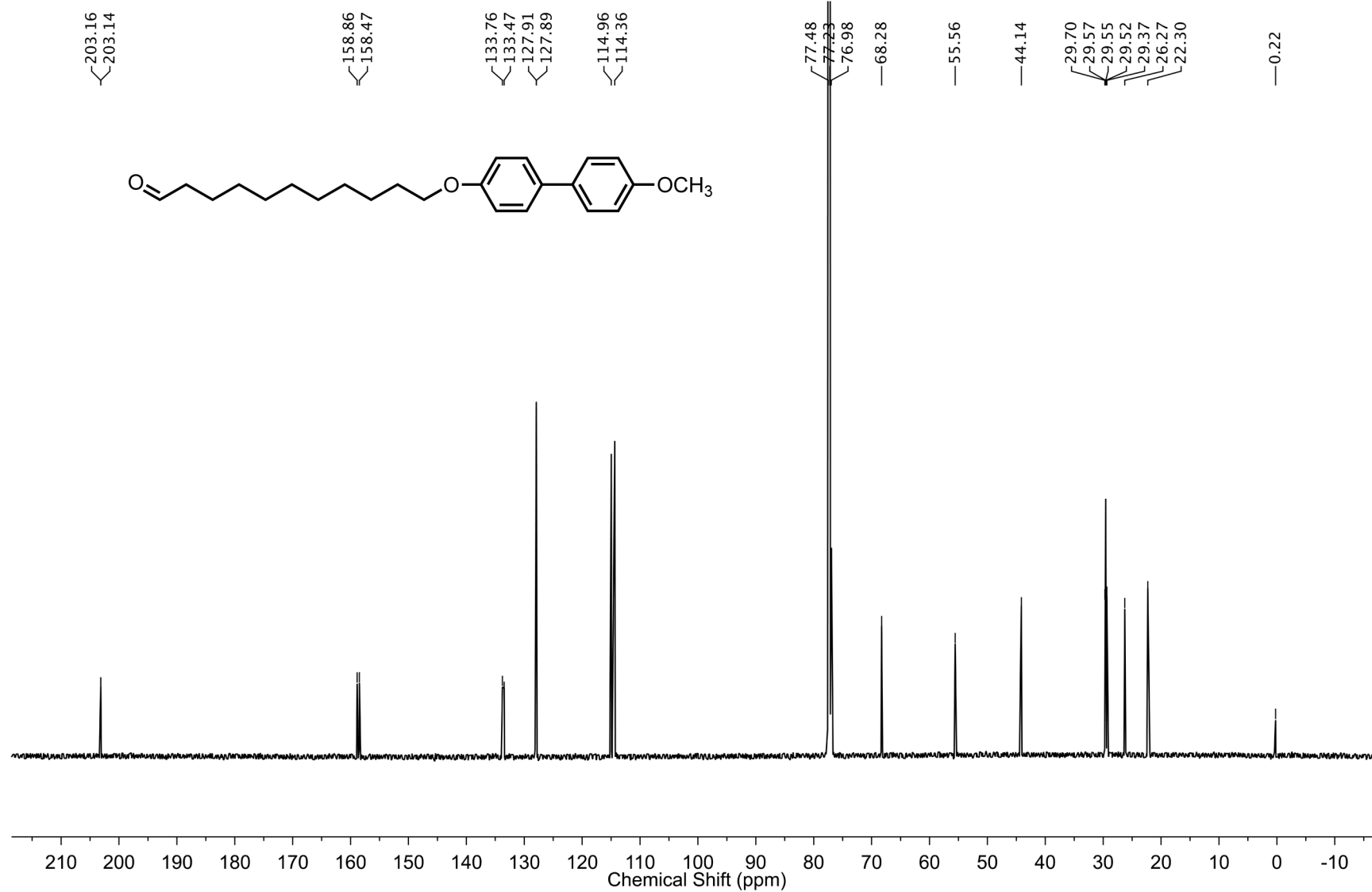
11-(4'-Methoxybiphenyl-4-oxy)undecanol (2-16)



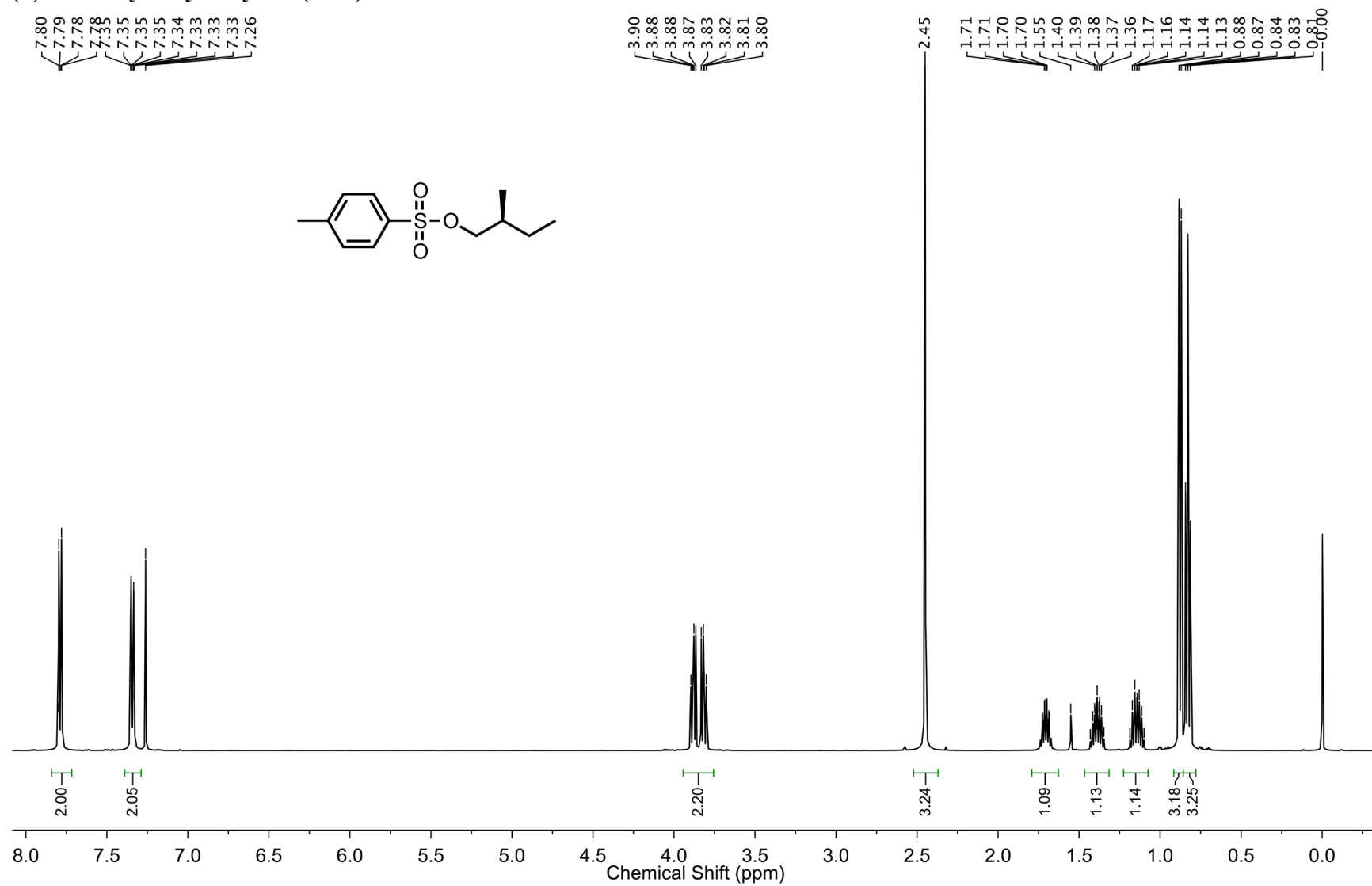
11-(4'-Methoxybiphenyl-4-oxy)undecanal (2-7)



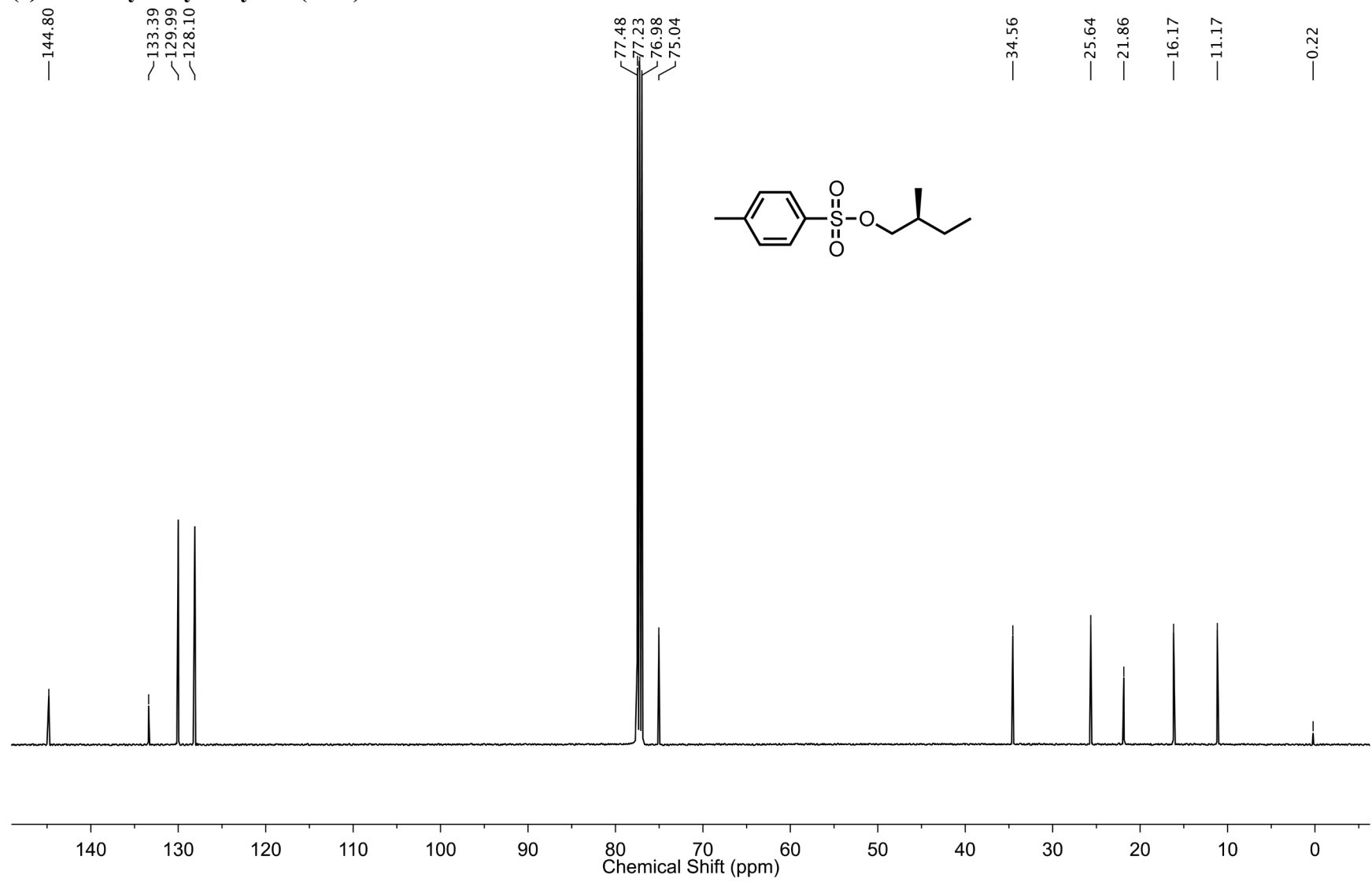
11-(4'-Methoxybiphenyl-4-oxy)undecanal (2-7)



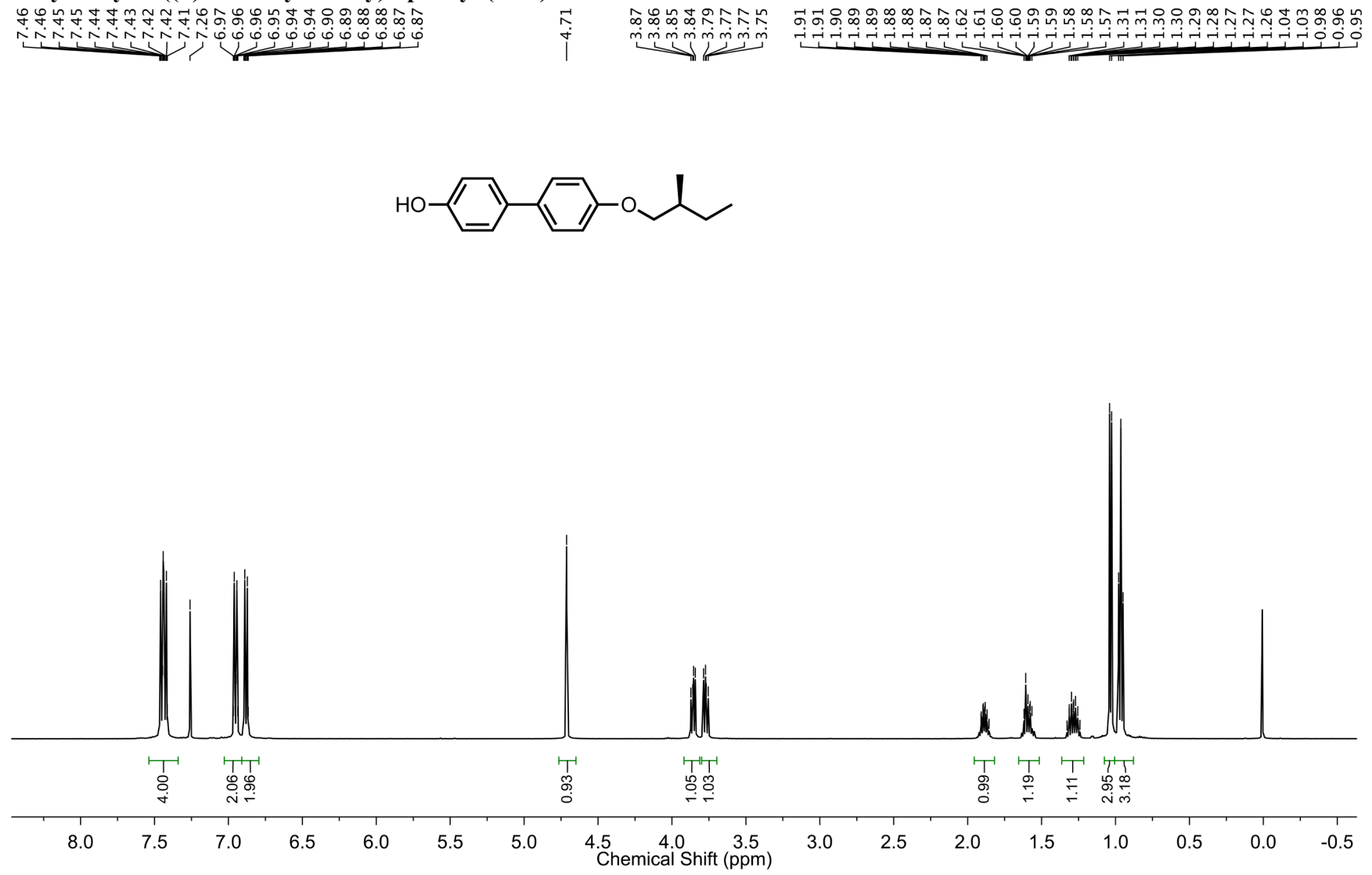
(S)-2-Methylbutyl tosylate (2-17)



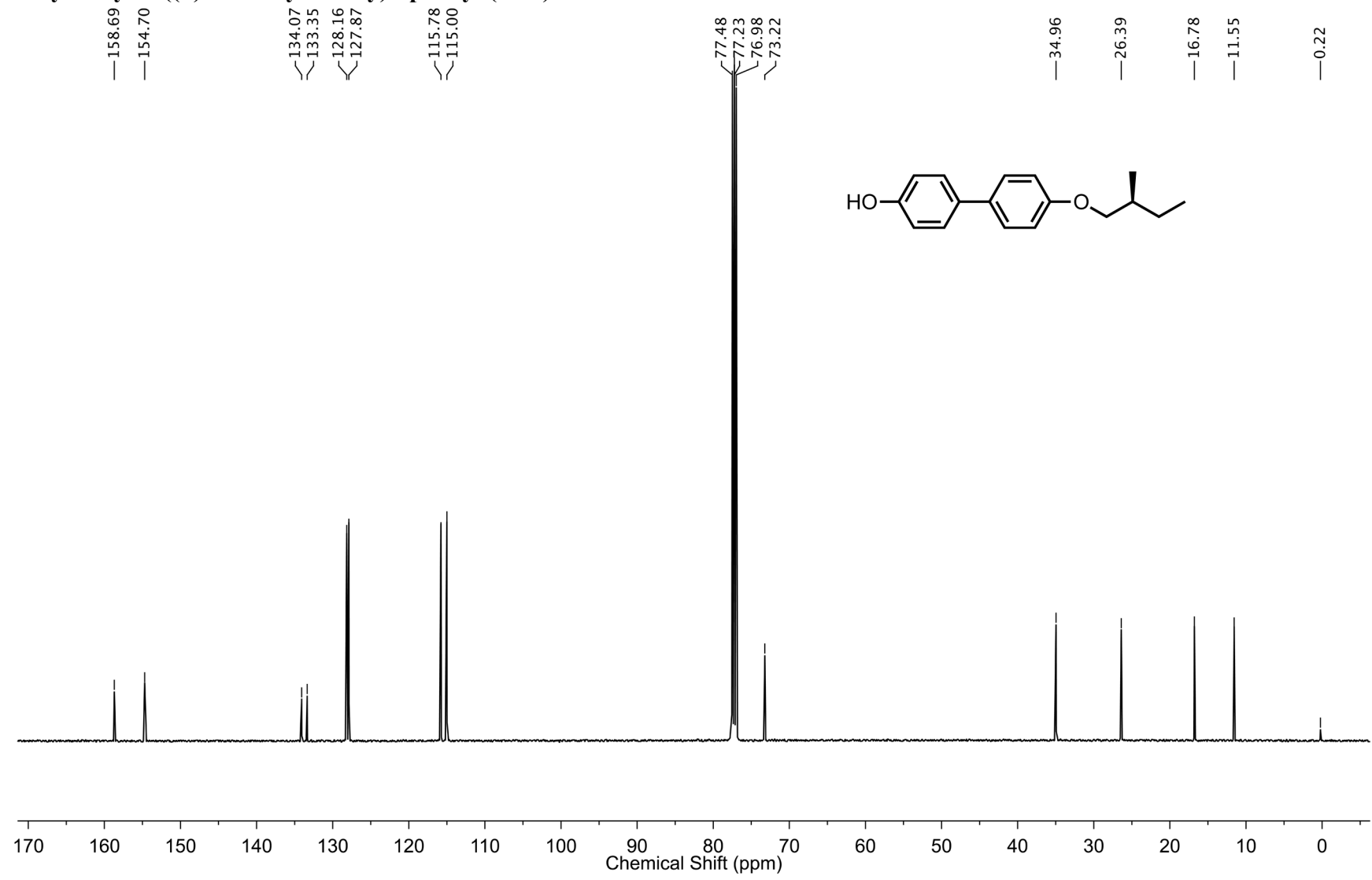
(S)-2-Methylbutyl tosylate (2-17)



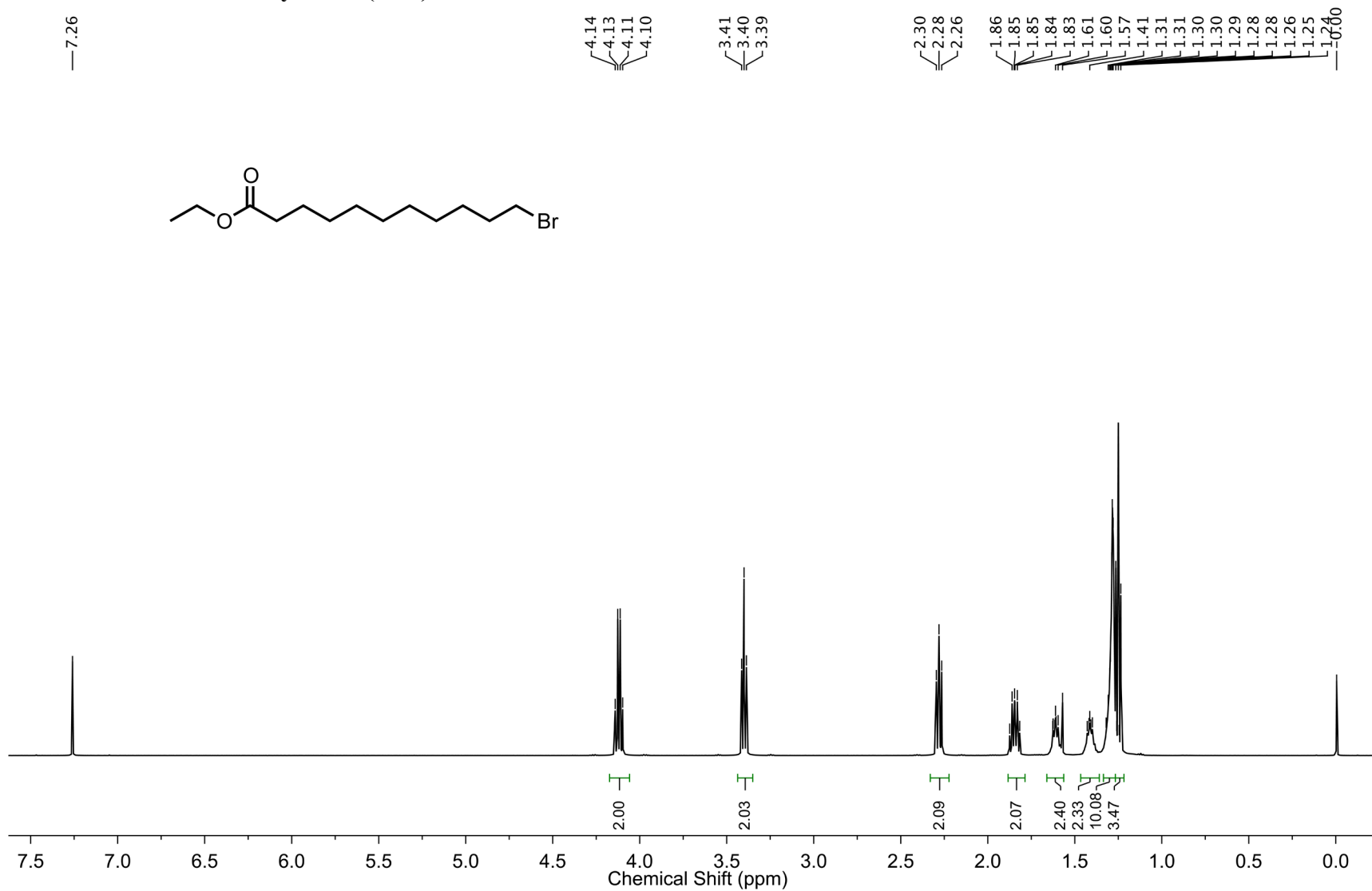
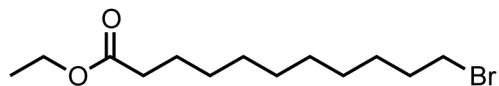
4-Hydroxy-4'-((S)-2-methylbutoxy)biphenyl (2-18)



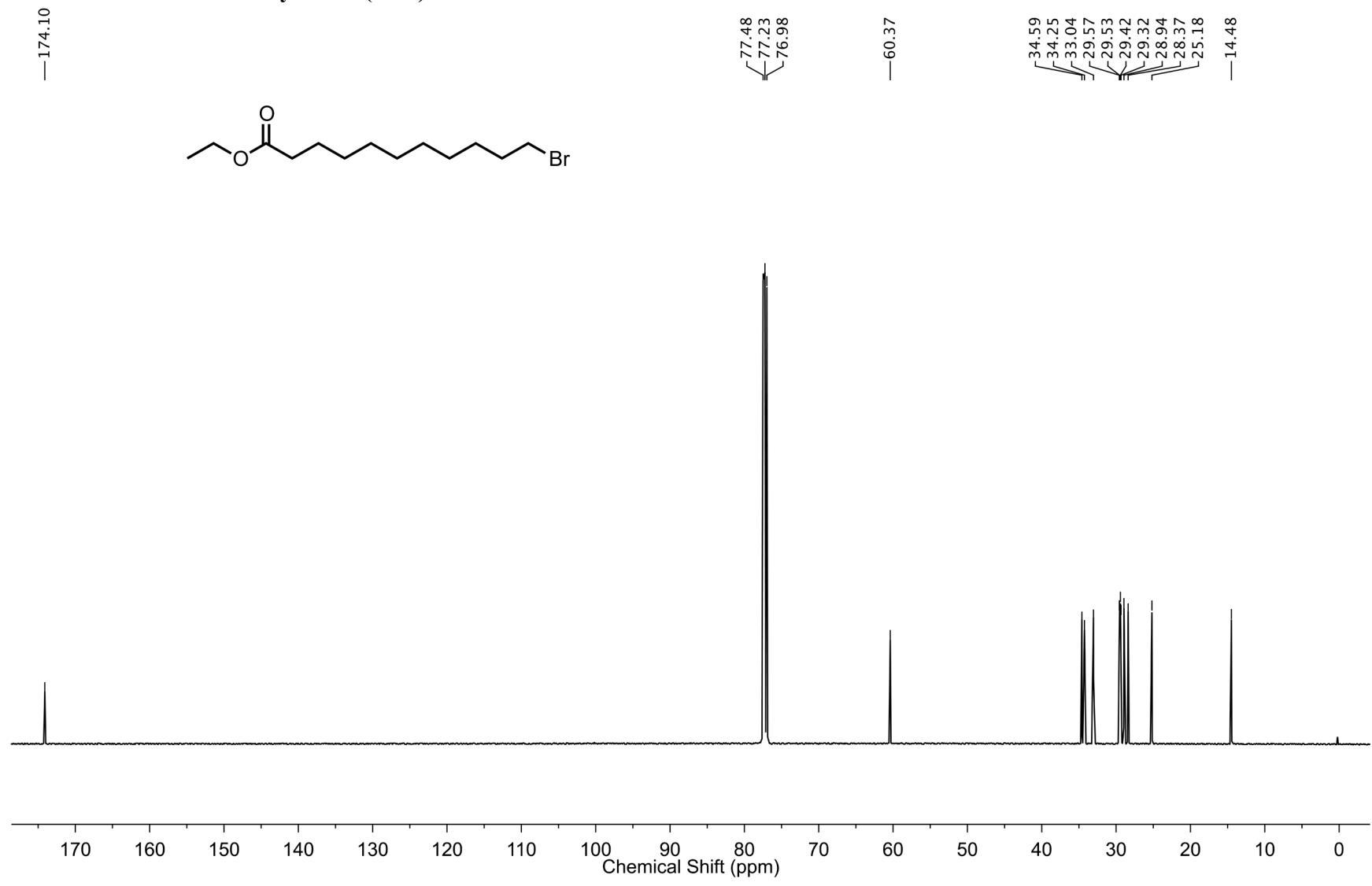
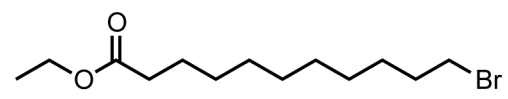
4-Hydroxy-4'-((S)-2-methylbutoxy)biphenyl (2-18)



11-Bromoundecanoic ethyl ester (2-19)



11-Bromoundecanoic ethyl ester (2-19)

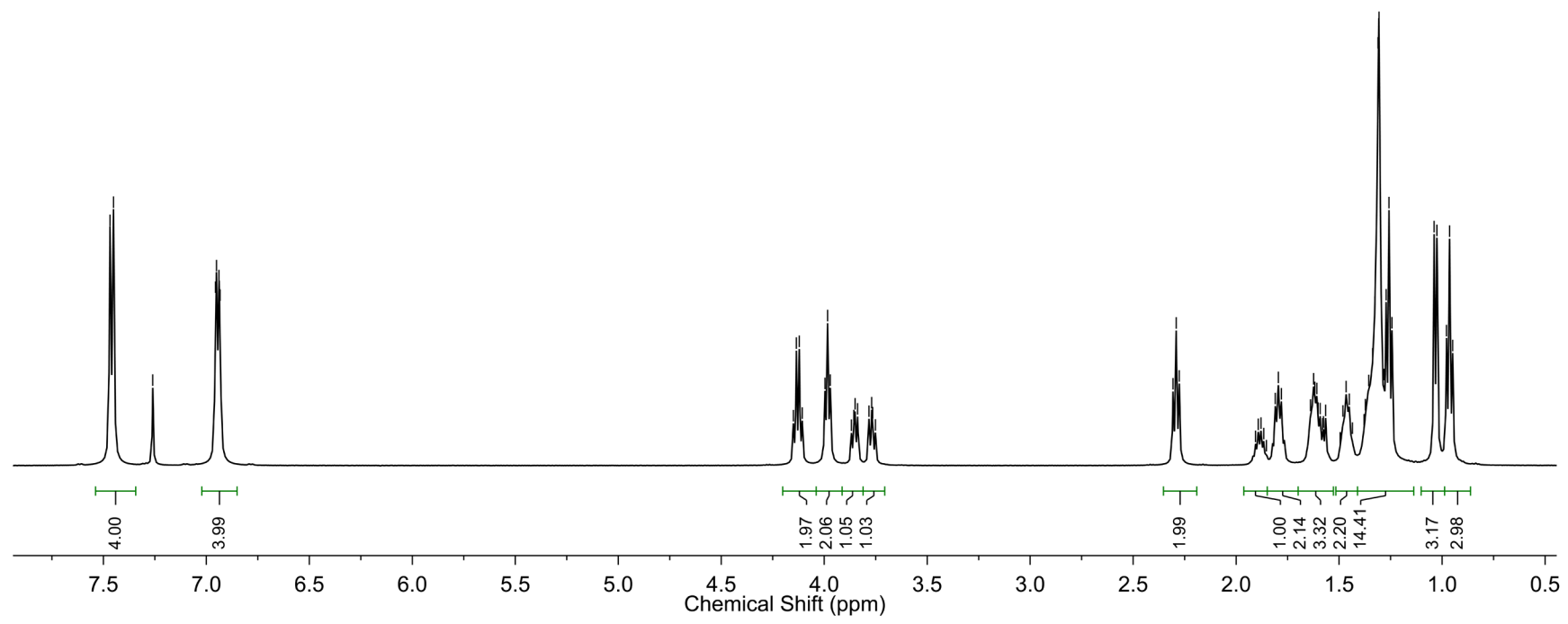
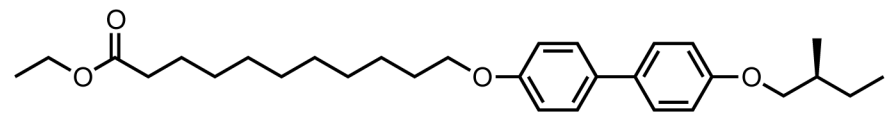


Ethyl 11-(4'-((*S*)-2-methylbutoxy)biphenyl-4-oxy)undecanoate (2-20)

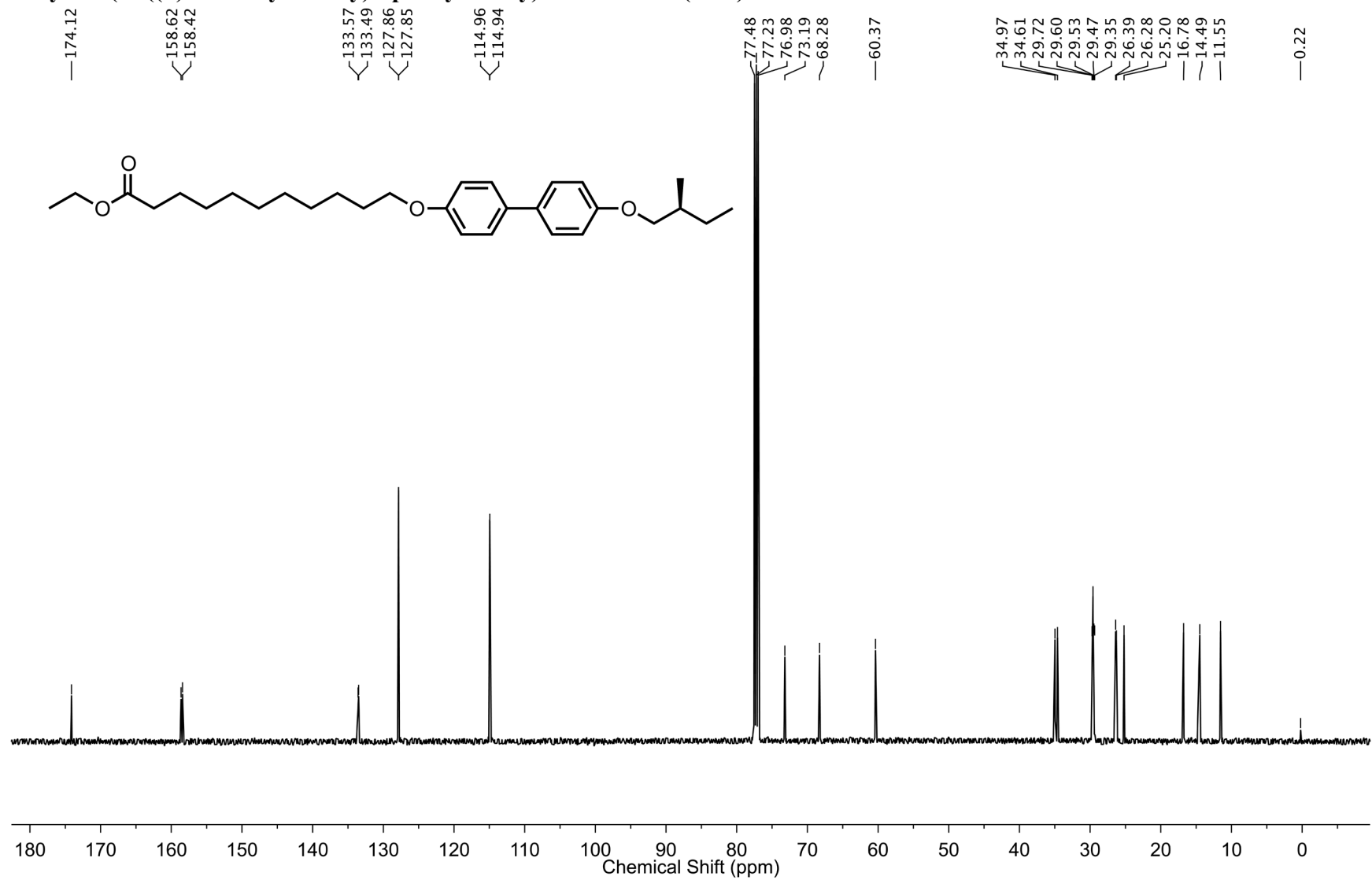
7.47
7.45
7.26
6.96
6.95
6.94
6.93

4.15
4.14
4.12
4.11
4.00
3.98
3.97
3.87
3.86
3.85
3.84
3.78
3.77
3.76
3.75

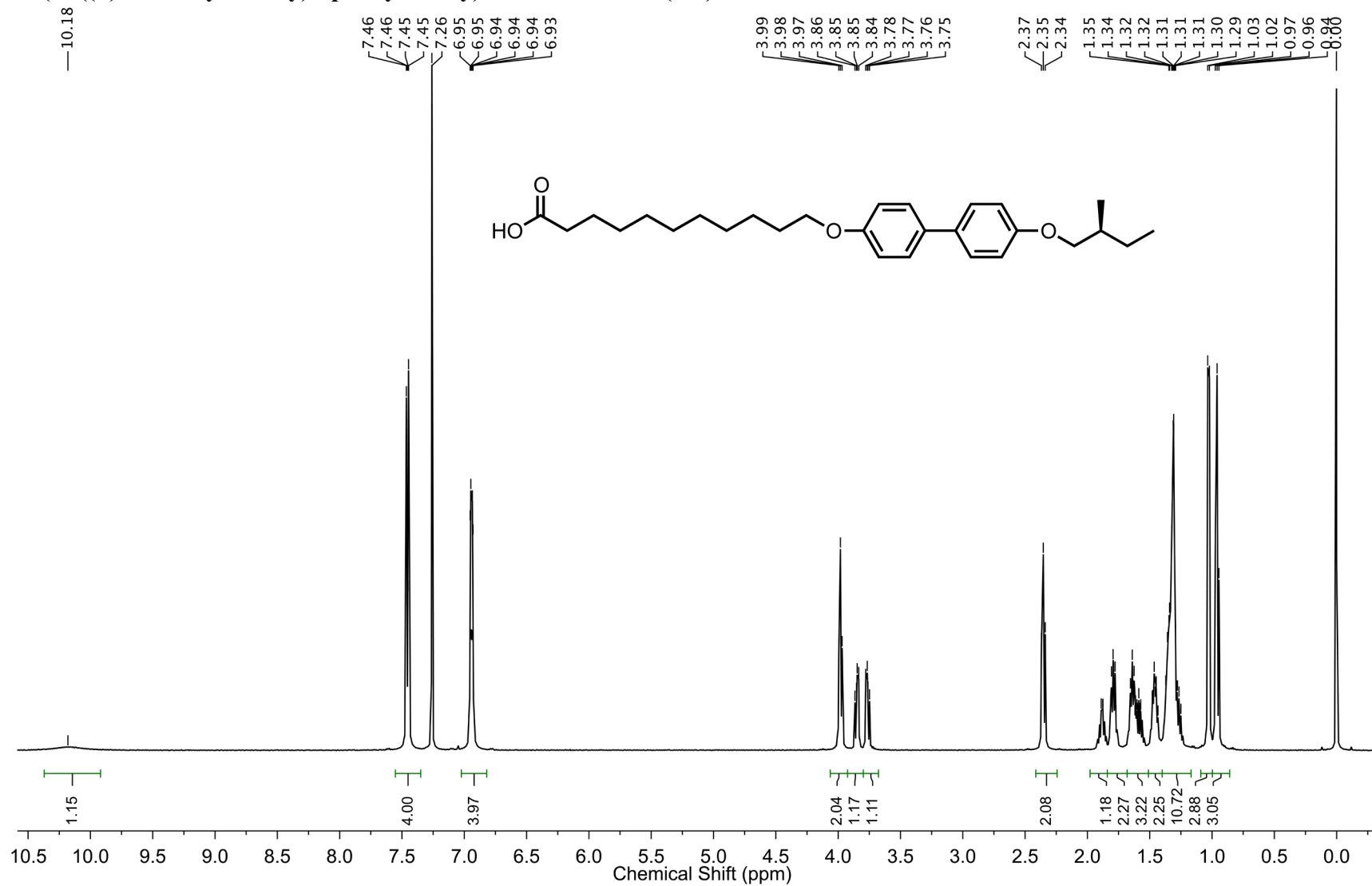
2.31
2.29
2.28
1.79
1.62
1.34
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1.31
1.31
1.28
1.27
1.26
1.04
1.03
0.98
0.96
0.95



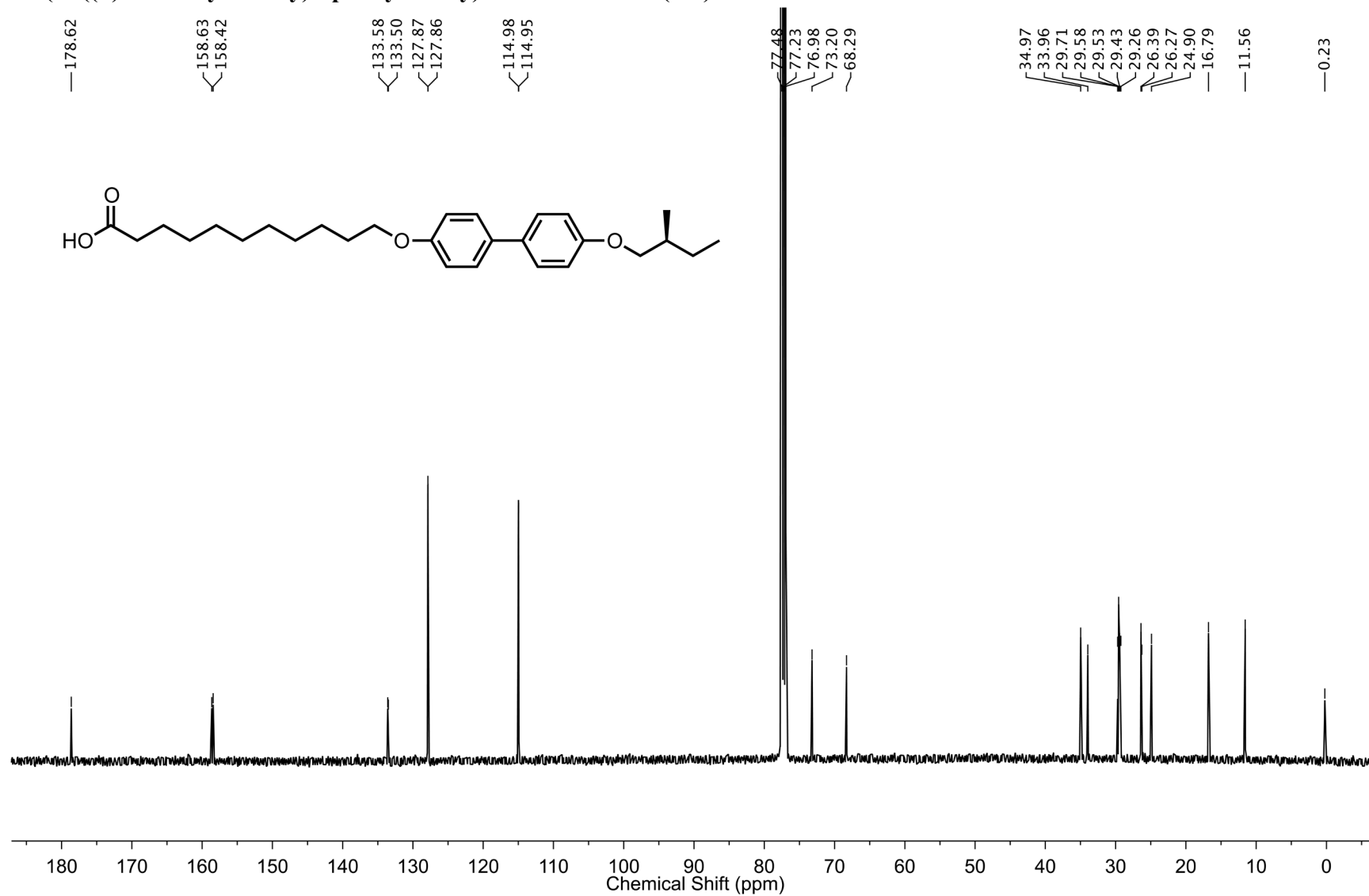
Ethyl 11-(4'-((*S*)-2-methylbutoxy)biphenyl-4-oxy)undecanoate (2-20)



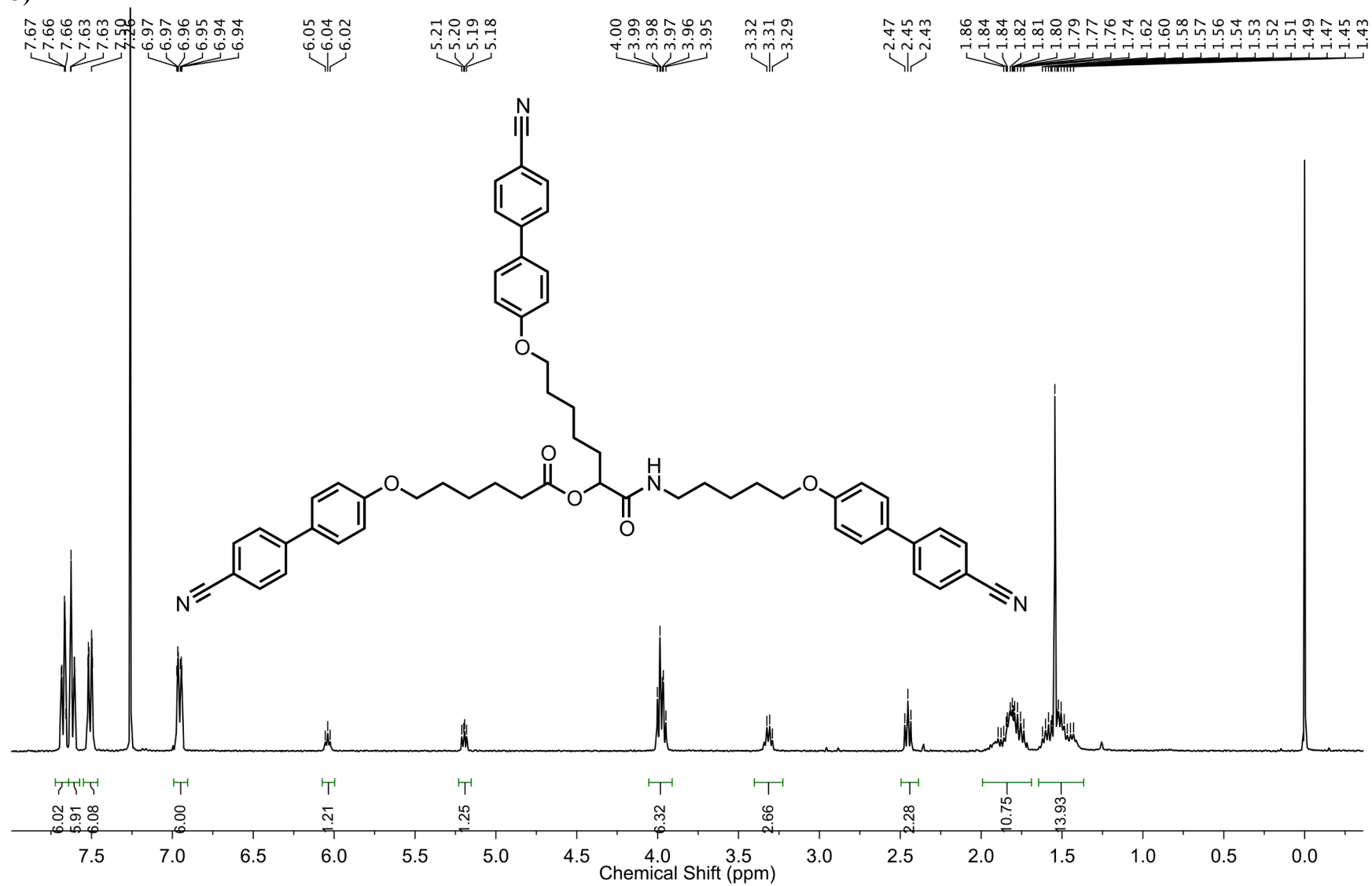
11-(4'-((S)-2-Methylbutoxy)biphenyl-4-oxy)undecanoic acid (2-8)



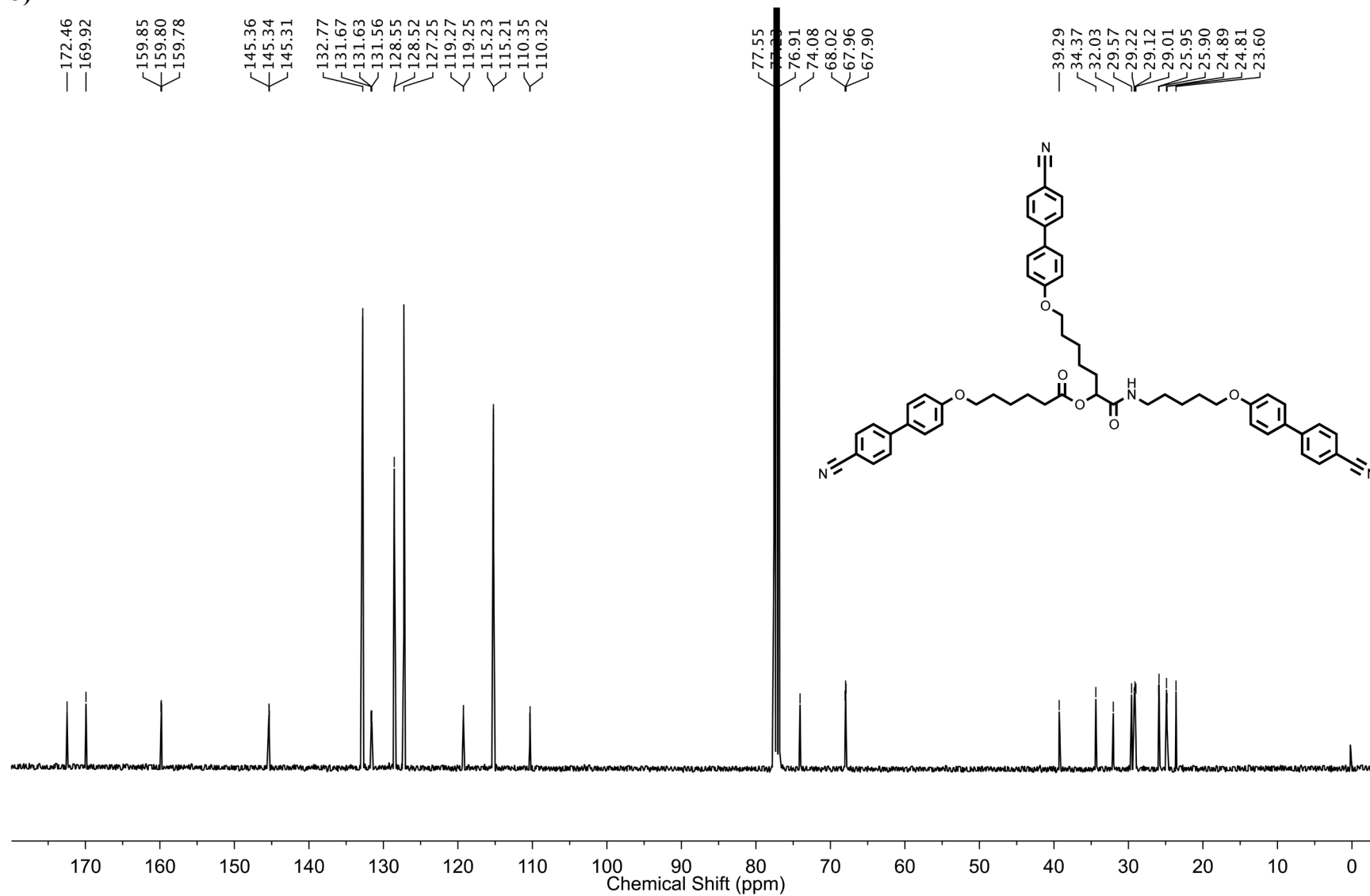
11-(4'-((S)-2-Methylbutoxy)biphenyl-4-oxy)undecanoic acid (2-8)



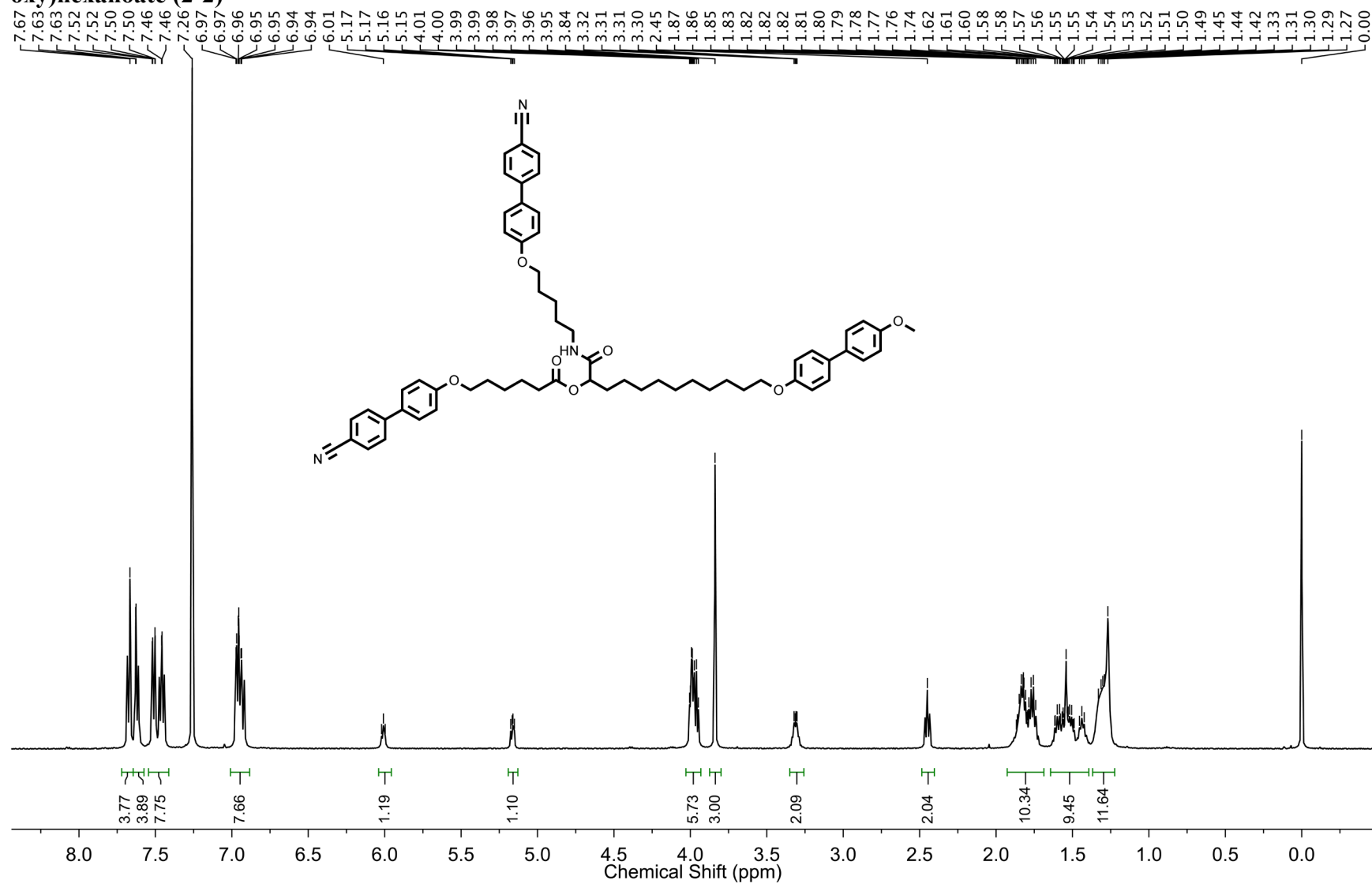
1-(5-(4'-Cyanobiphenyl-4-oxy)pentylaminocarbonyl)-6-(4'-cyanobiphenyl-4-oxy)hexyl 6-(4'-cyanobiphenyl-4-oxy)hexanoate (2-3)



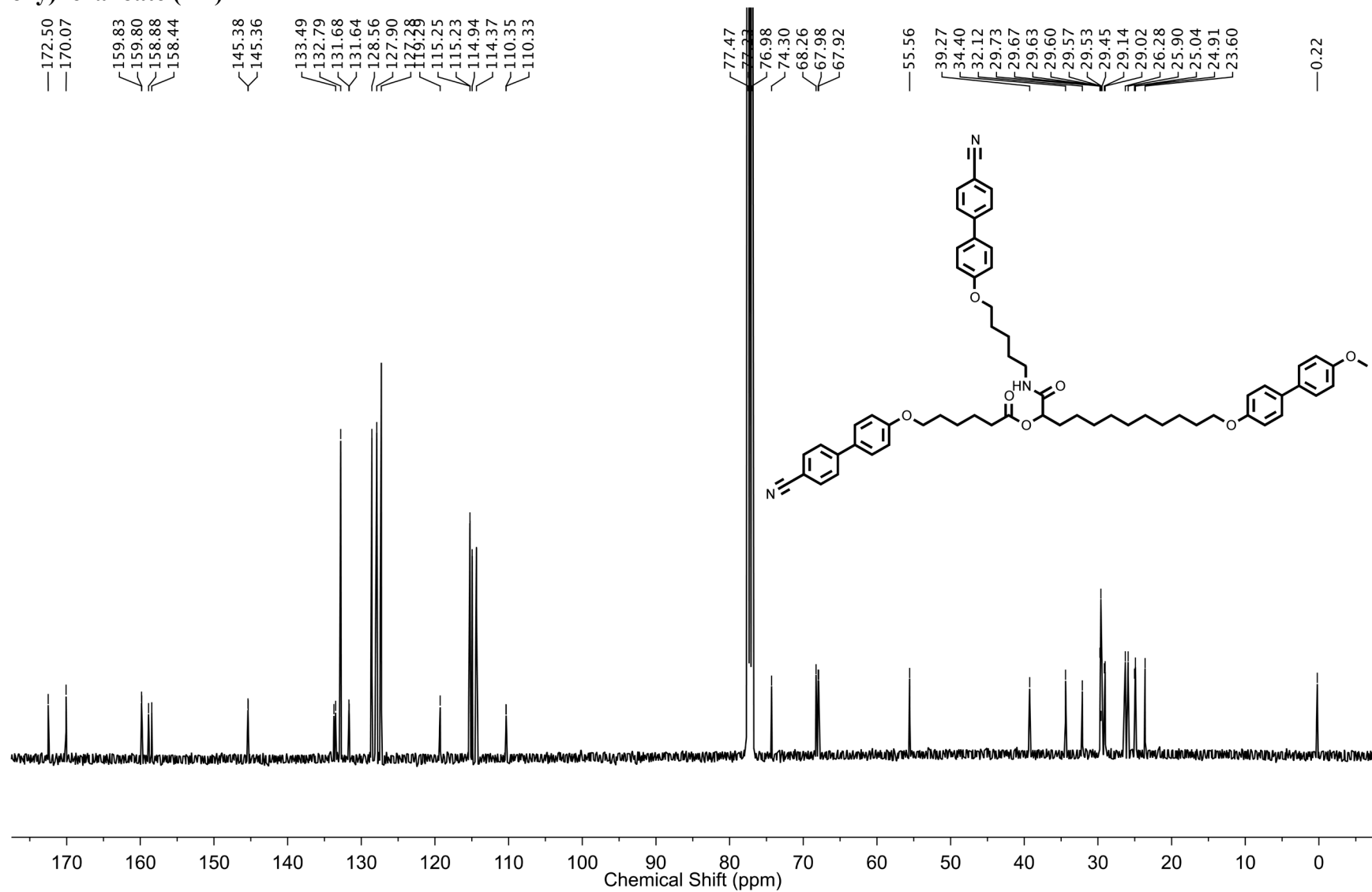
1-(5-(4'-Cyanobiphenyl-4-oxy)pentylaminocarbonyl)-6-(4'-cyanobiphenyl-4-oxy)hexyl 6-(4'-cyanobiphenyl-4-oxy)hexanoate (2-3)



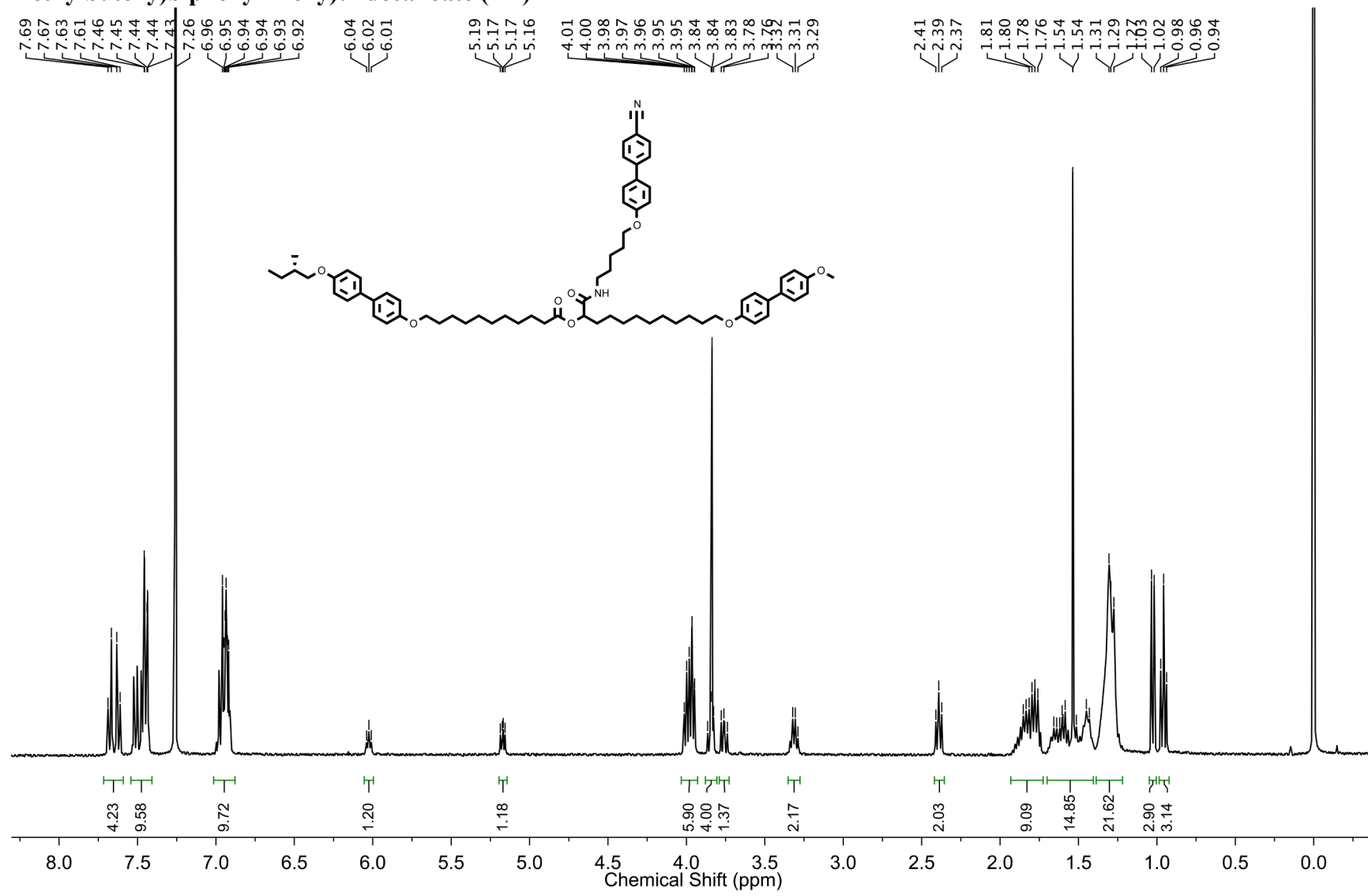
1-(5-(4'-Cyanobiphenyl-4-oxypentylaminocarbonyl)-11-(4'-methoxybiphenyl-4-oxyl)undecyl 6-(4'-cyanobiphenyl-4-oxyl)hexanoate (2-2)



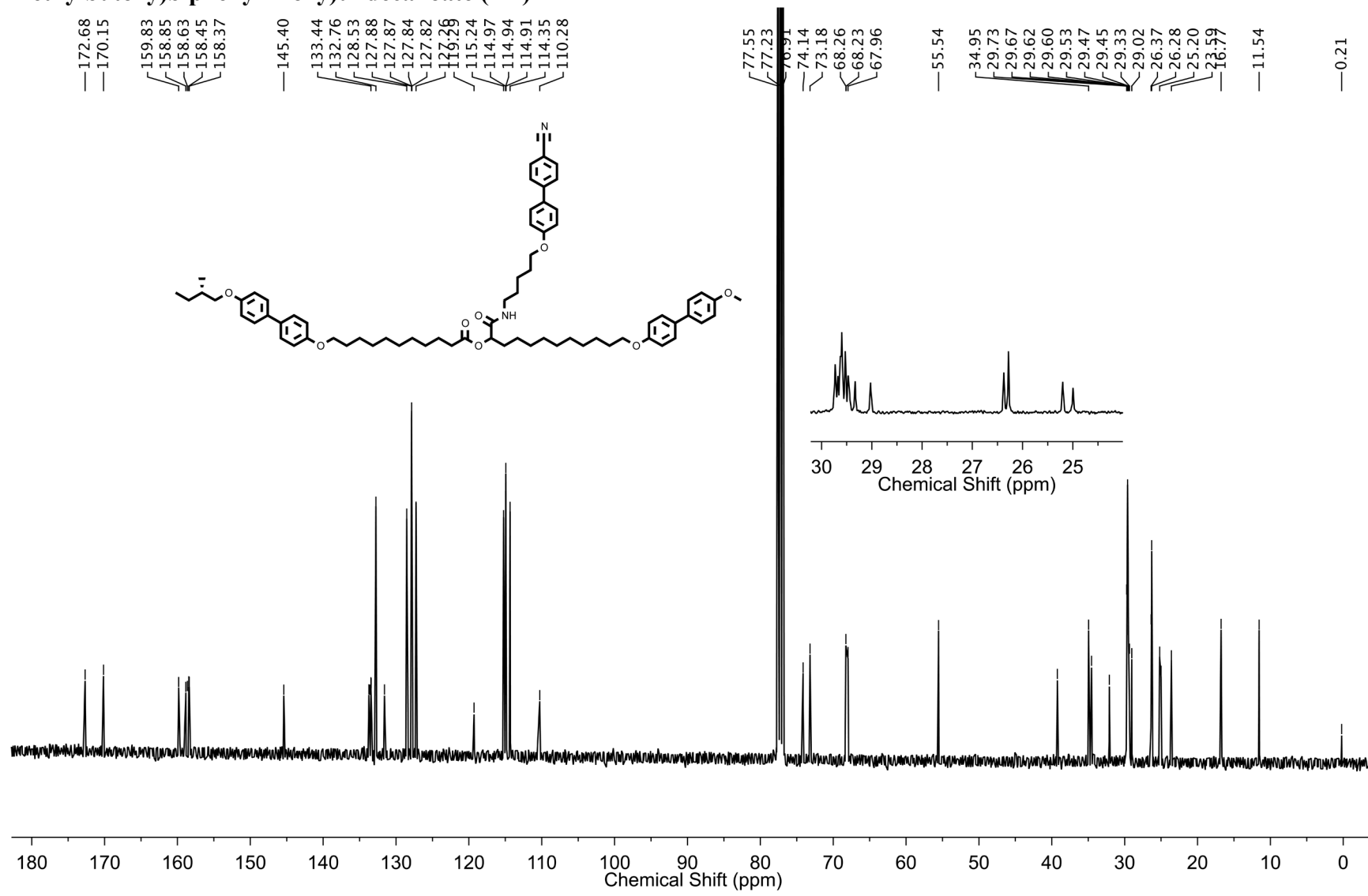
1-(5-(4'-Cyanobiphenyl-4-oxy)pentylaminocarbonyl)-11-(4'-methoxybiphenyl-4-oxy)undecyl 6-(4'-cyanobiphenyl-4-oxy)hexanoate (2-2)



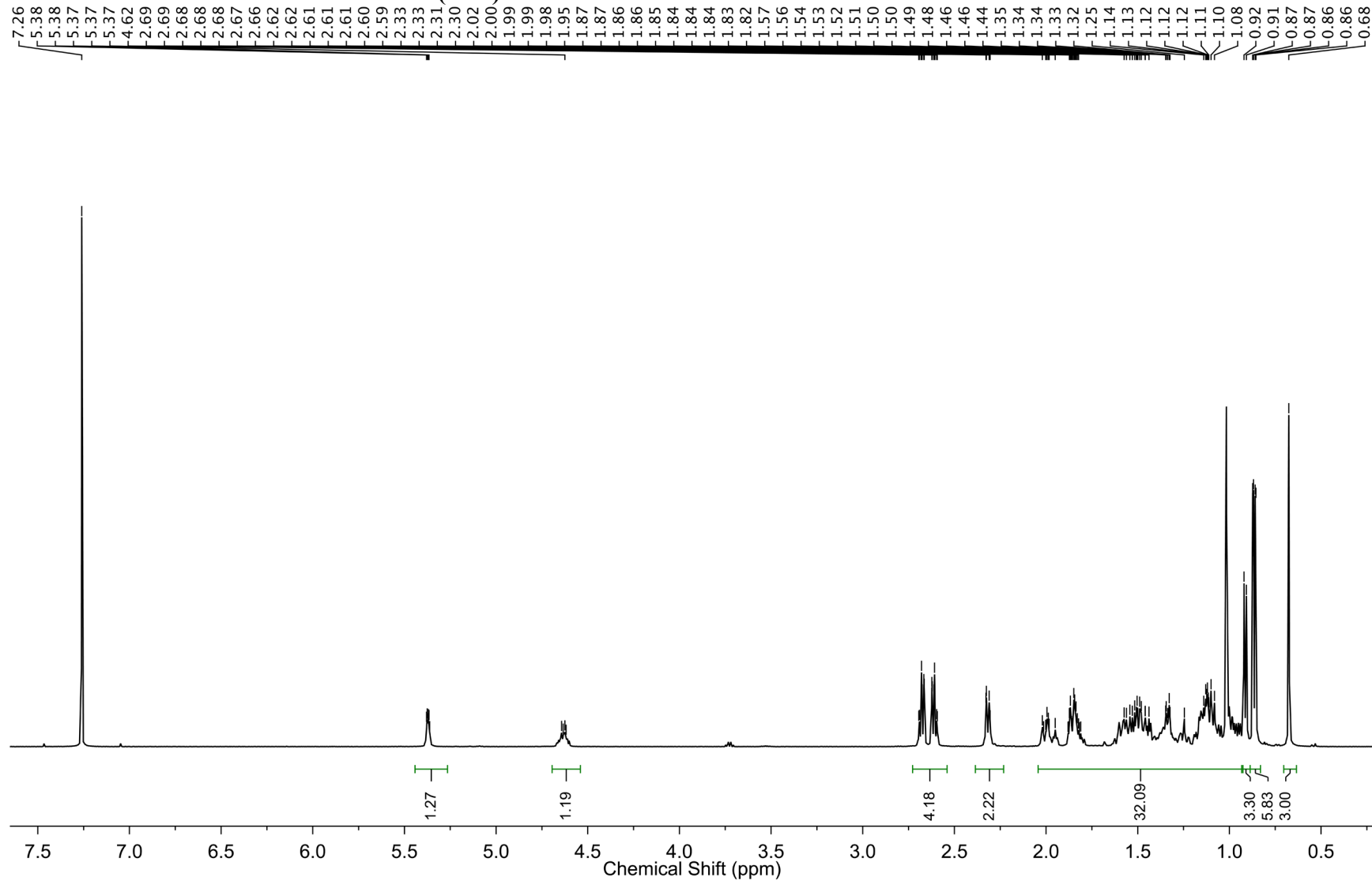
1-(5-(4'-Cyanobiphenyl-4-oxy)pentylaminocarbonyl)-11-(4'-methoxybiphenyl-4-oxy)undecyl 11-(4'-((S)-2-methylbutoxy)biphenyl-4-oxy)undecanoate (2-1)



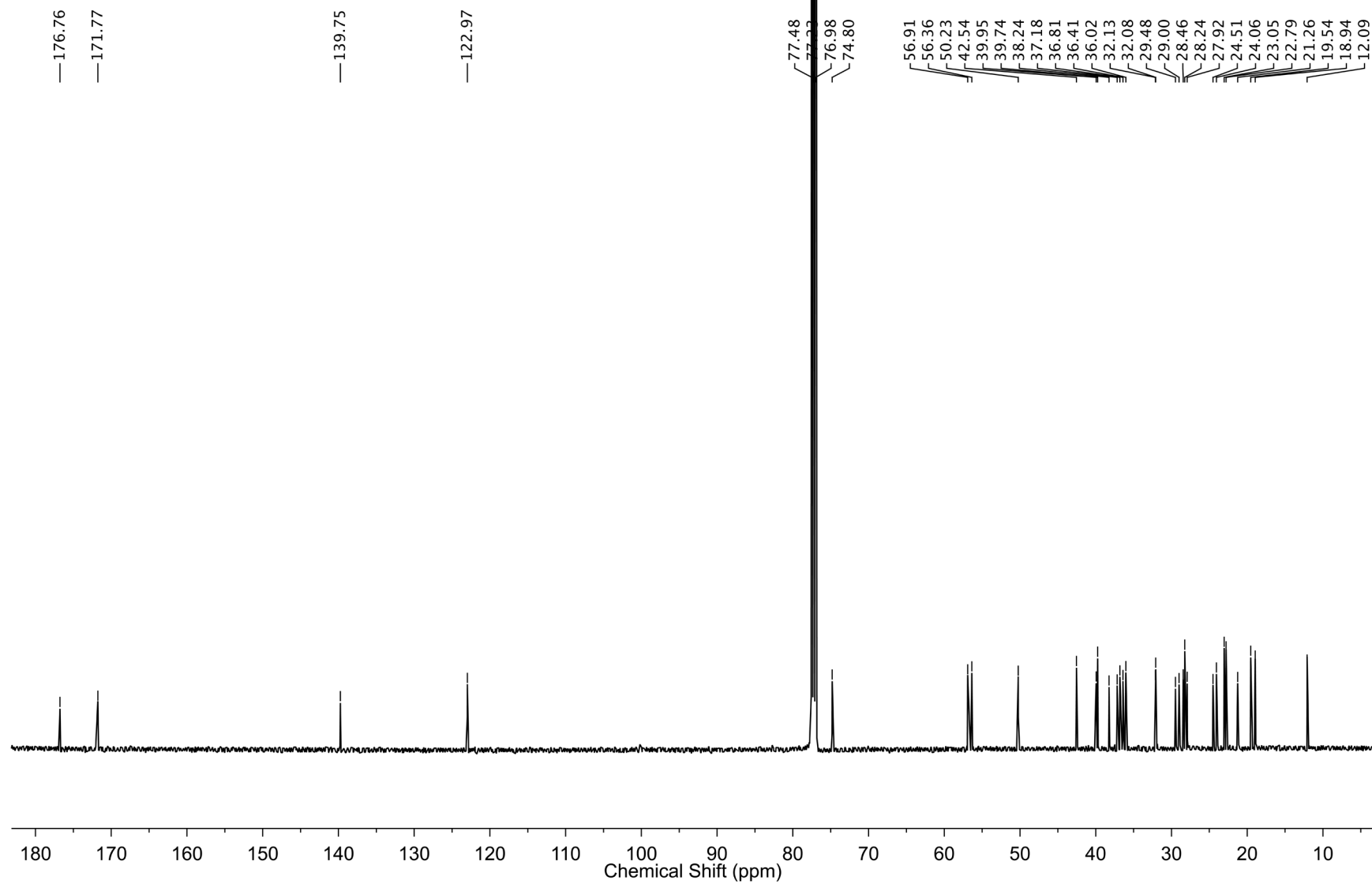
1-(5-(4'-Cyanobiphenyl-4-oxy)pentylaminocarbonyl)-11-(4'-methoxybiphenyl-4-oxy)undecyl 11-(4'-((S)-2-methylbutoxy)biphenyl-4-oxy)undecanoate (2-1)



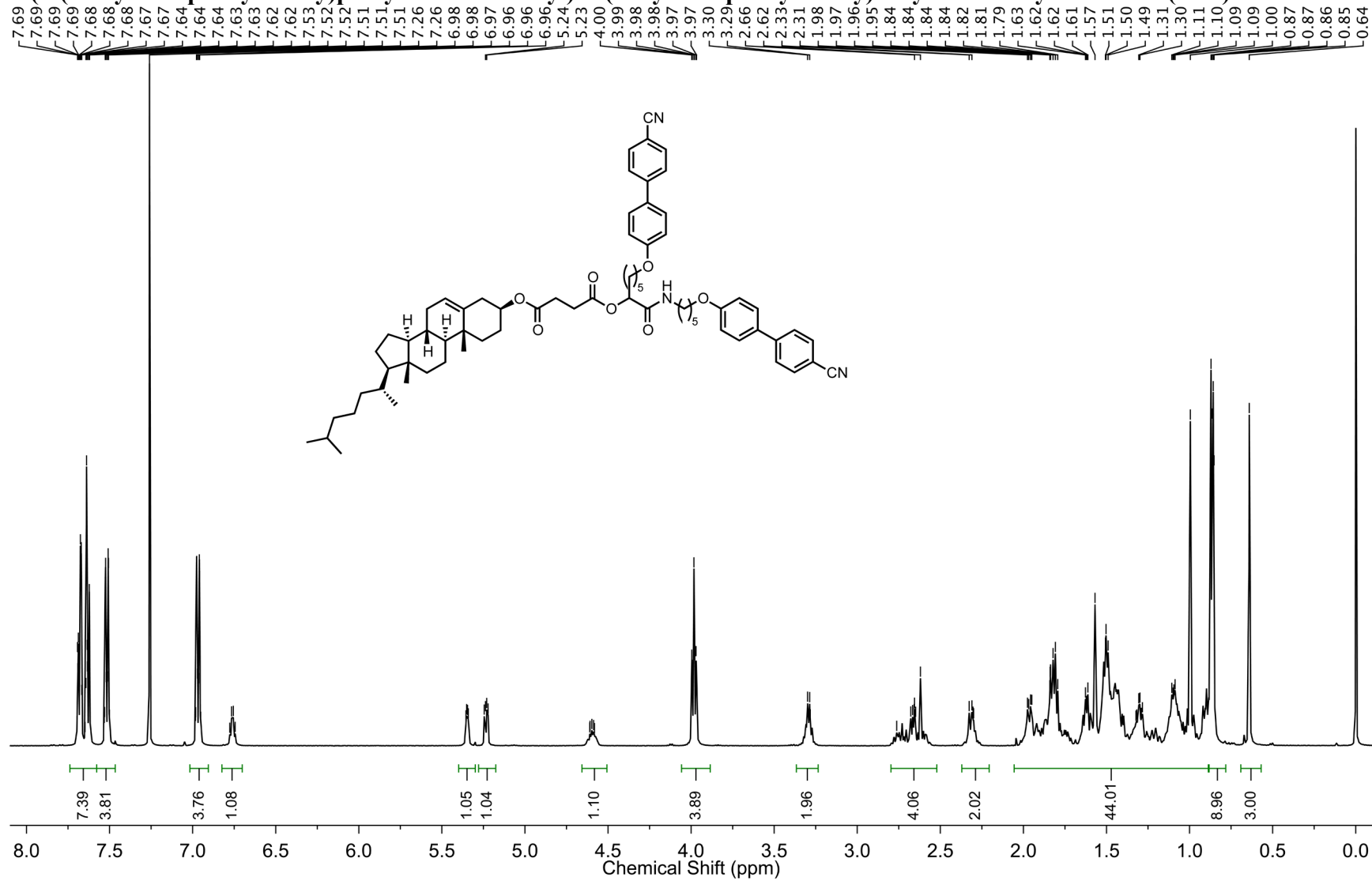
Butanedioic acid monocholesterol ester (2-21)



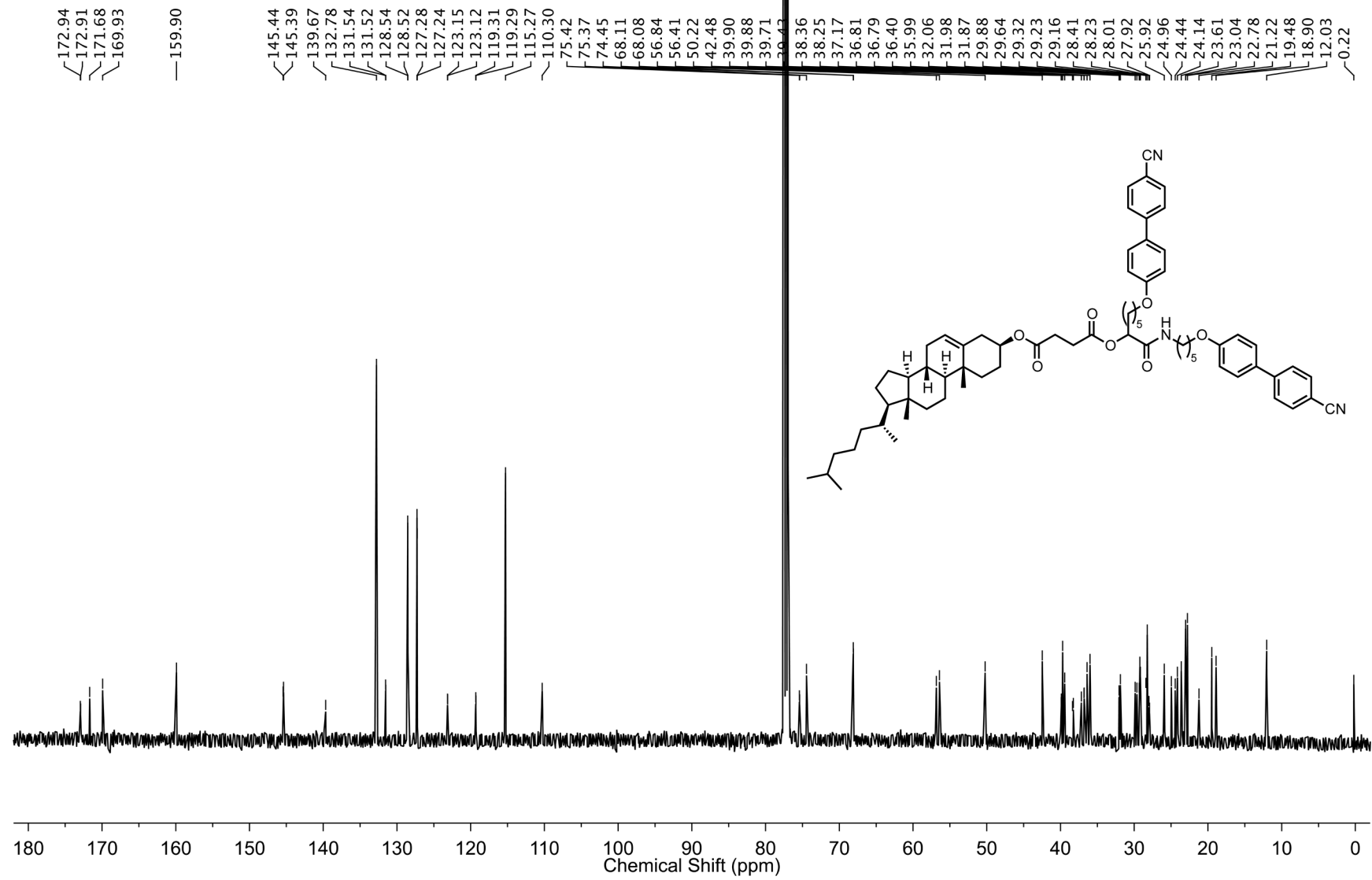
Butanedioic acid monocholesterol ester (2-21)



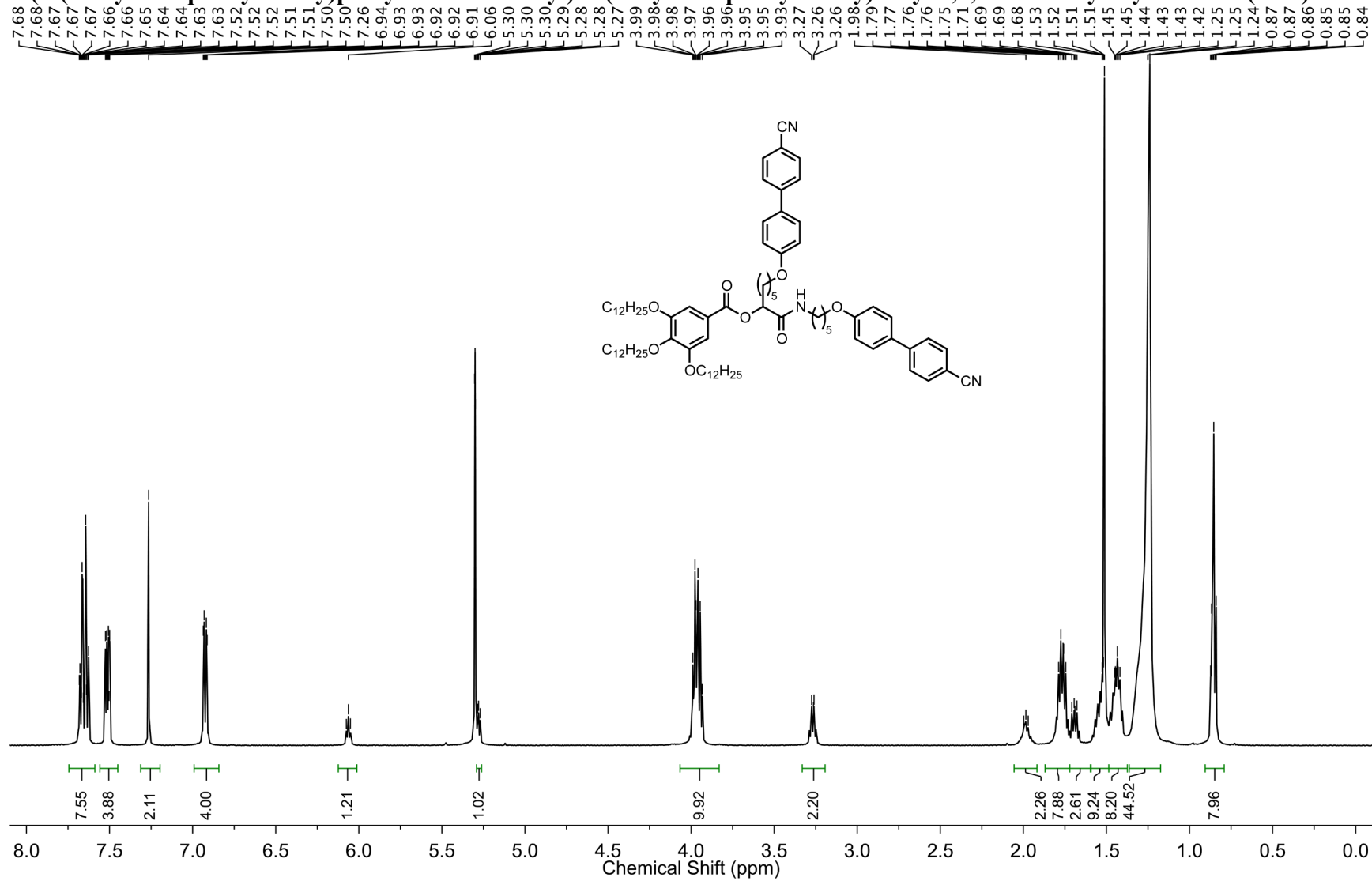
1-(5-(4'-Cyanobiphenyl-4-oxy)pentylaminocarbonyl)-6-(4'-cyanobiphenyl-4-oxy)hexyl cholesterol succinate (2-22)



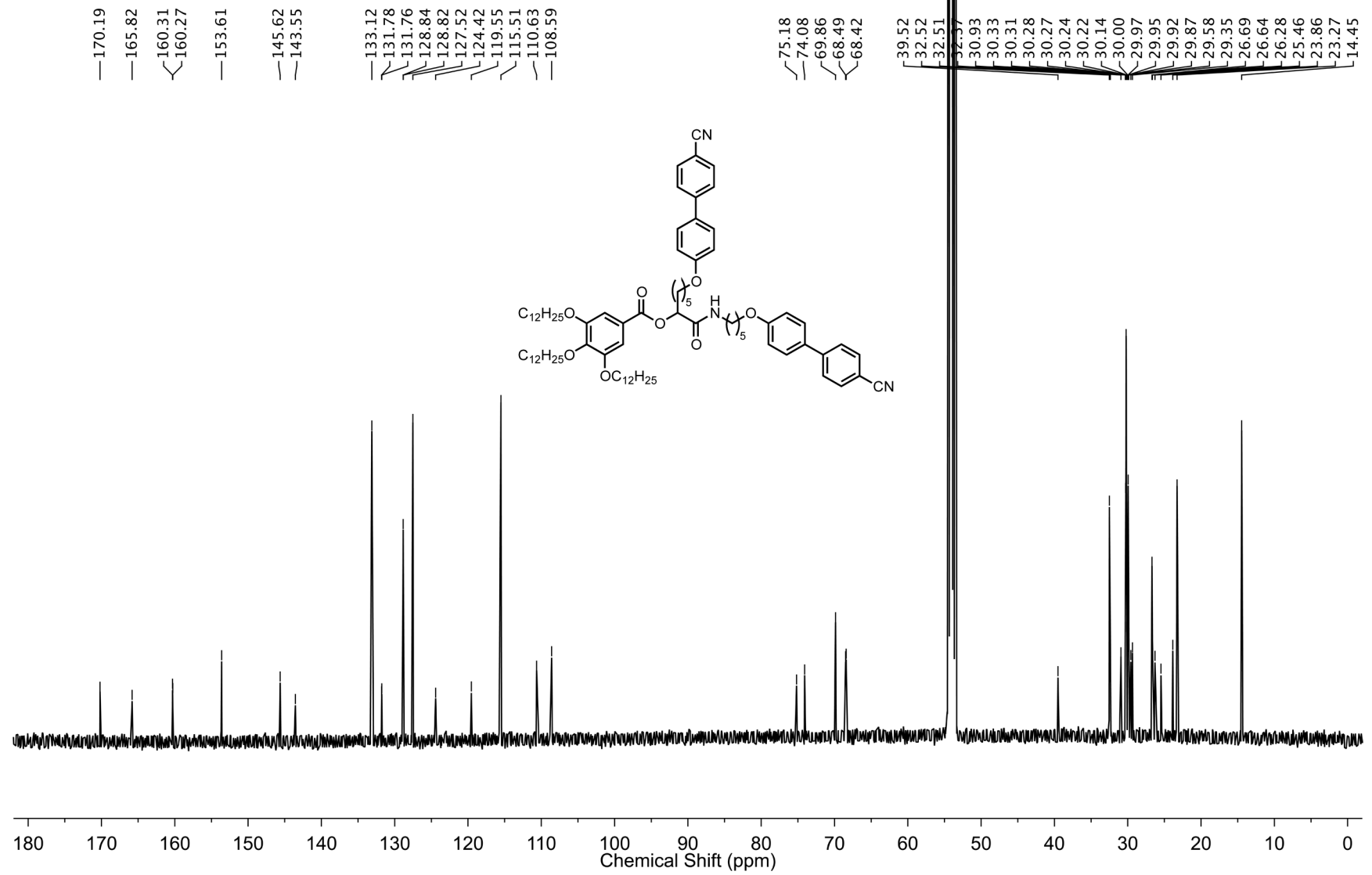
1-(5-(4'-Cyanobiphenyl-4-oxypentylaminocarbonyl)-6-(4'-cyanobiphenyl-4-oxyl)hexyl)cholesterol succinate (2-22)



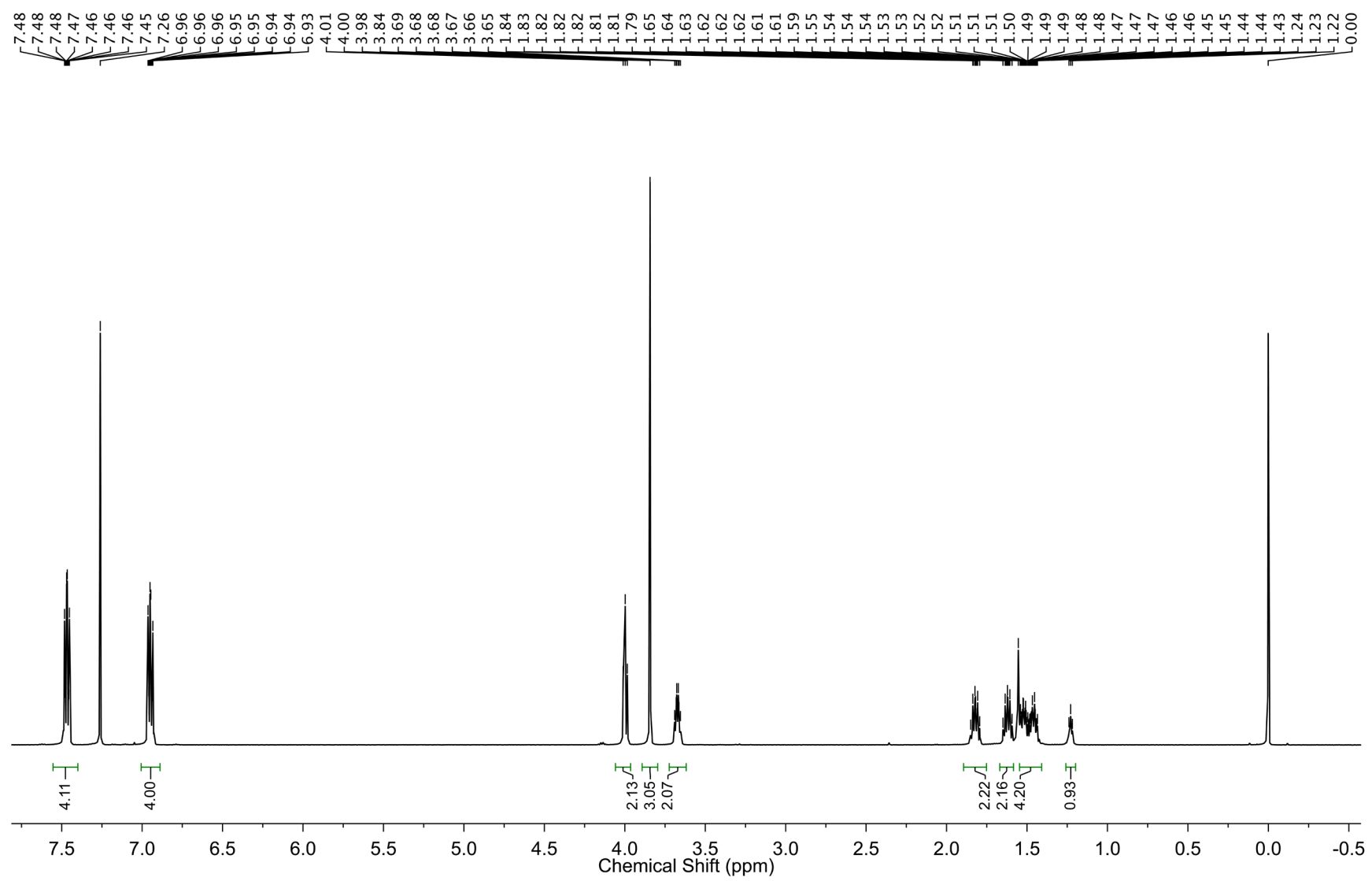
1-(5-(4'-Cyanobiphenyl-4-oxy)pentylaminocarbonyl)-6-(4'-cyanobiphenyl-4-oxy)hexyl 3,4,5-tridodecyloxybenzoate (2-24)



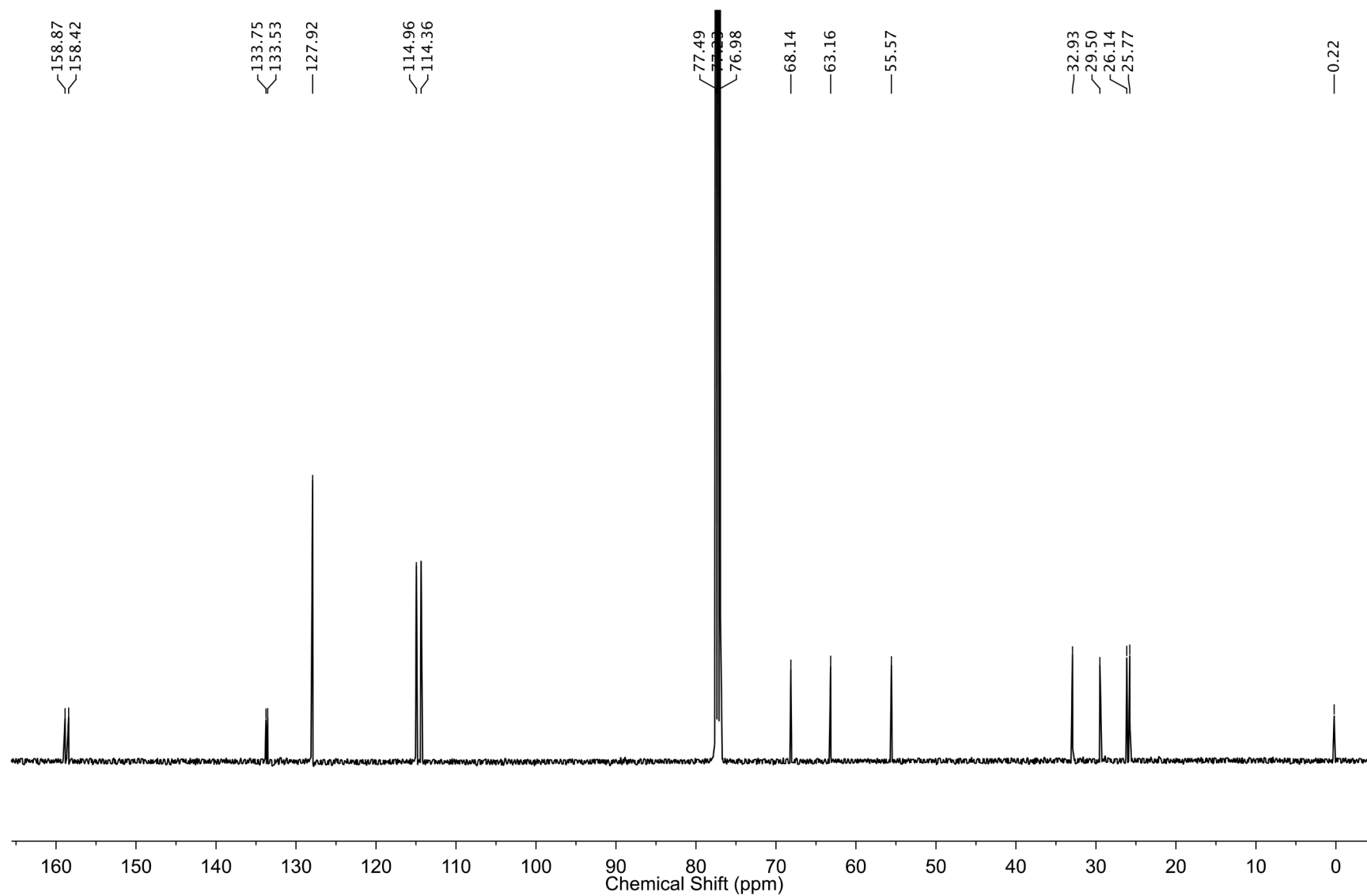
1-(5-(4'-Cyanobiphenyl-4-oxy)pentylaminocarbonyl)-6-(4'-cyanobiphenyl-4-oxy)hexyl 3,4,5-tridodecyloxybenzoate (2-24)



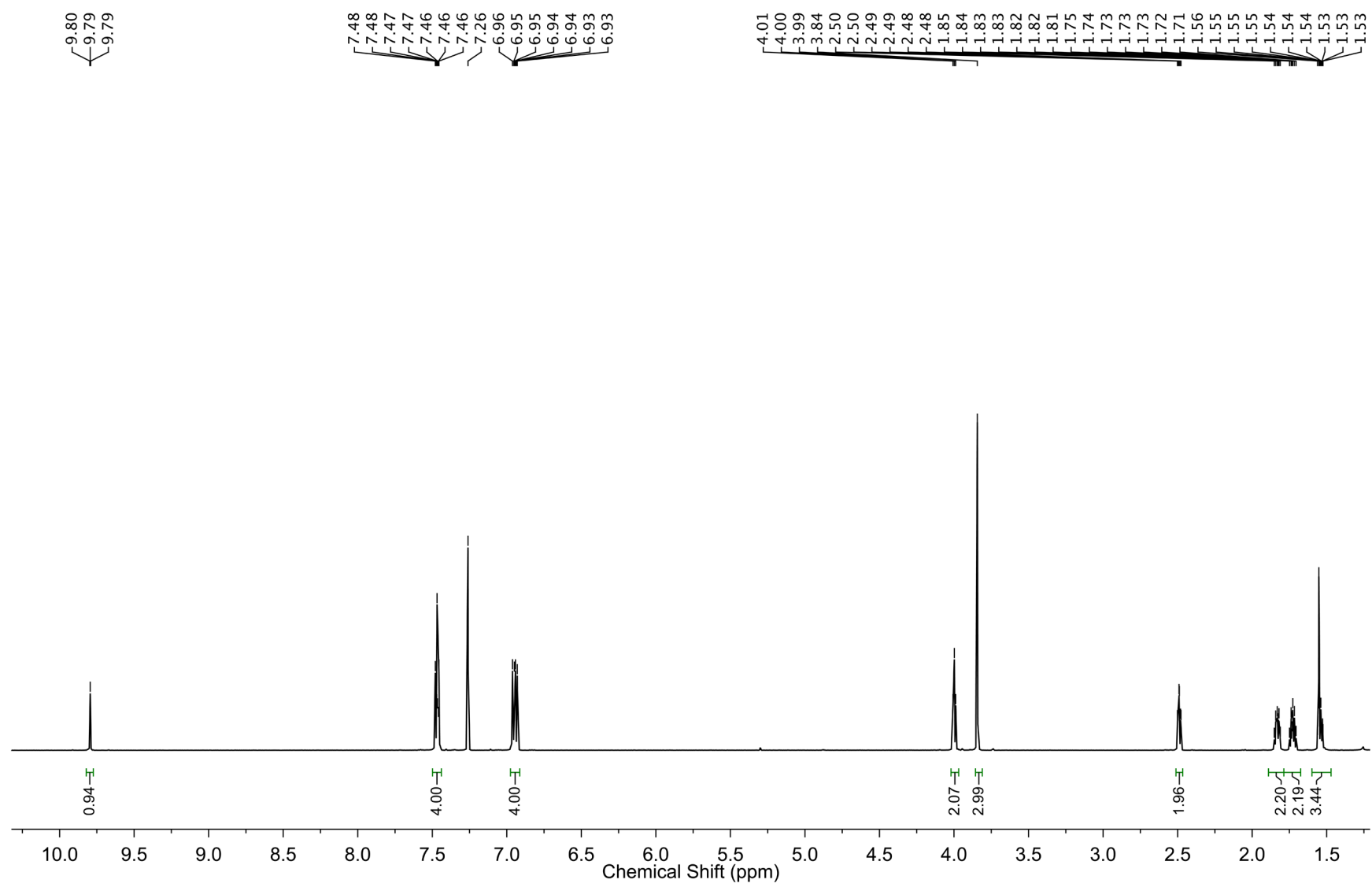
6-(4'-Methoxybiphenyl-4-oxy)hexanol (3-46)



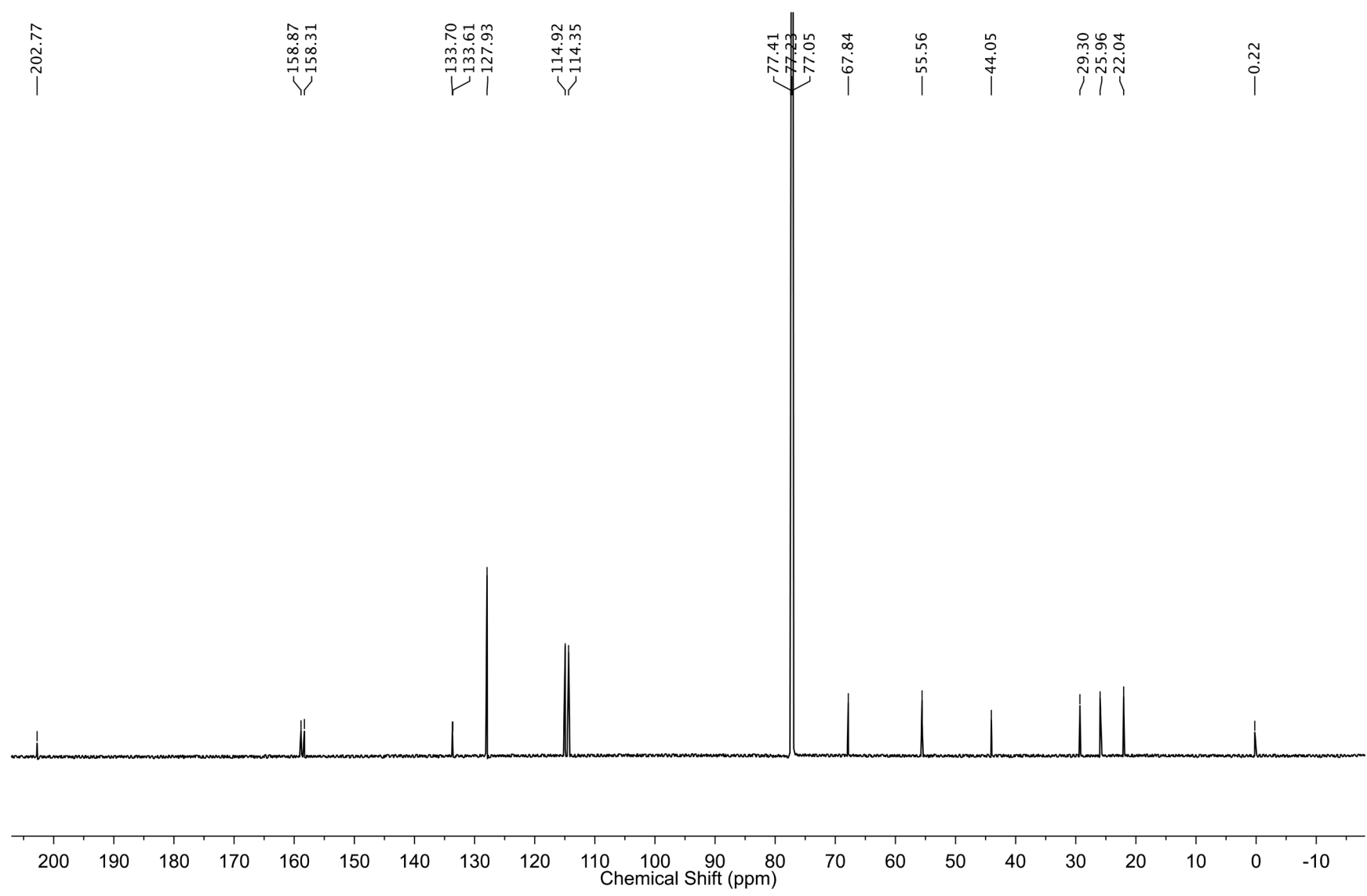
6-(4'-Methoxybiphenyl-4-oxy)hexanol (3-46)



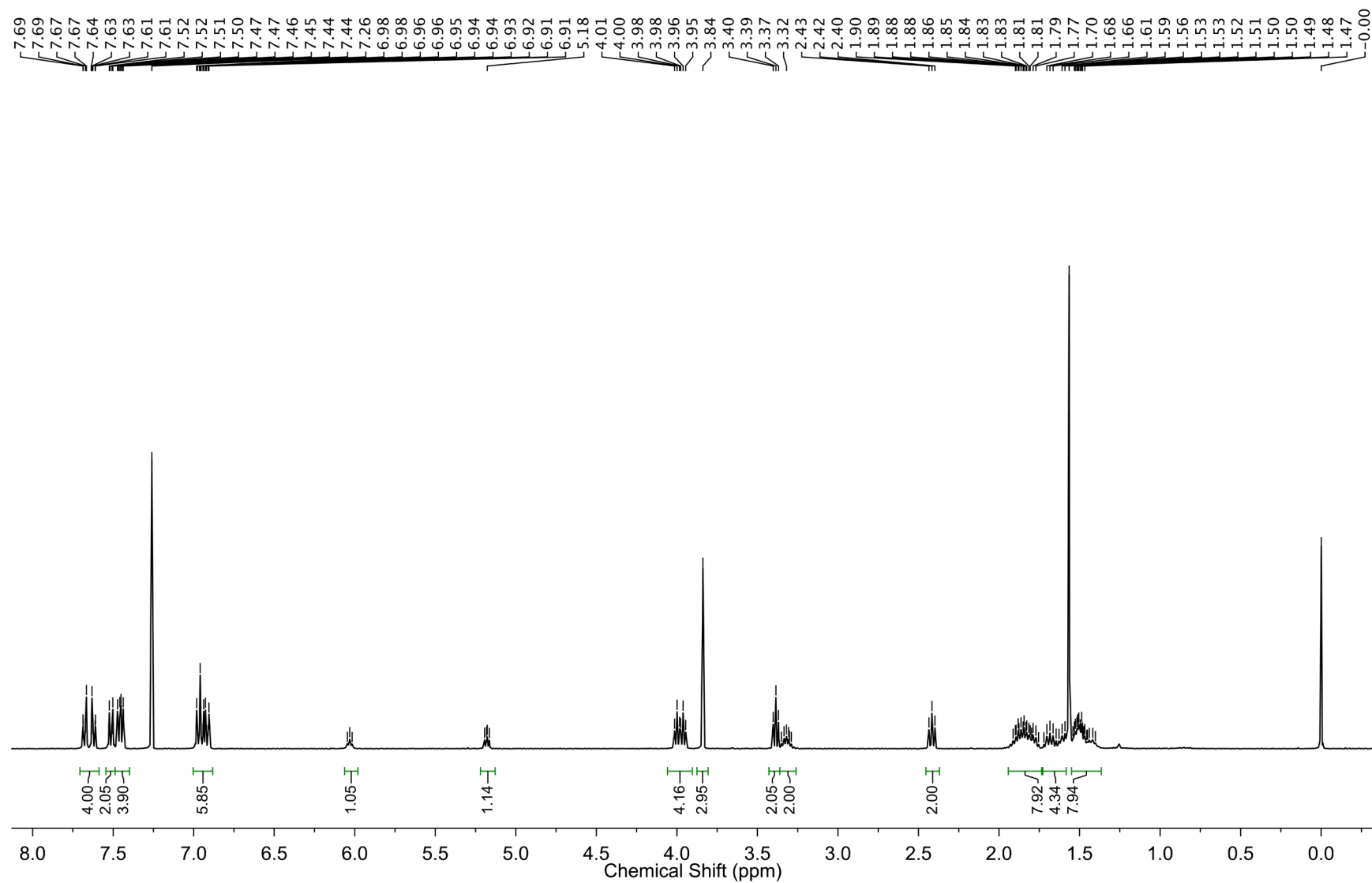
6-(4'-Methoxybiphenyl-4-oxo)hexanal (3-18)



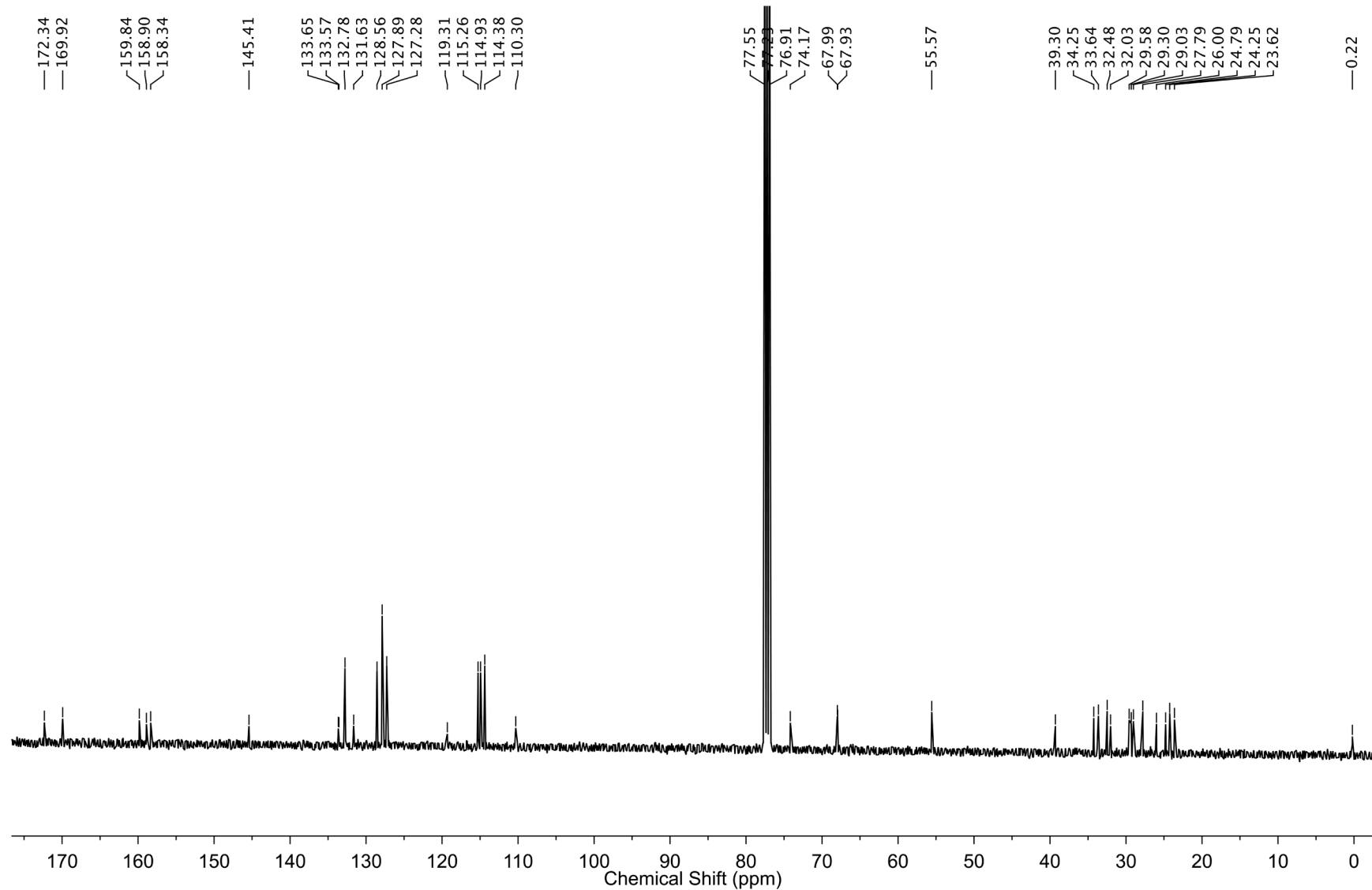
6-(4'-Methoxybiphenyl-4-oxy)hexanal (3-18)



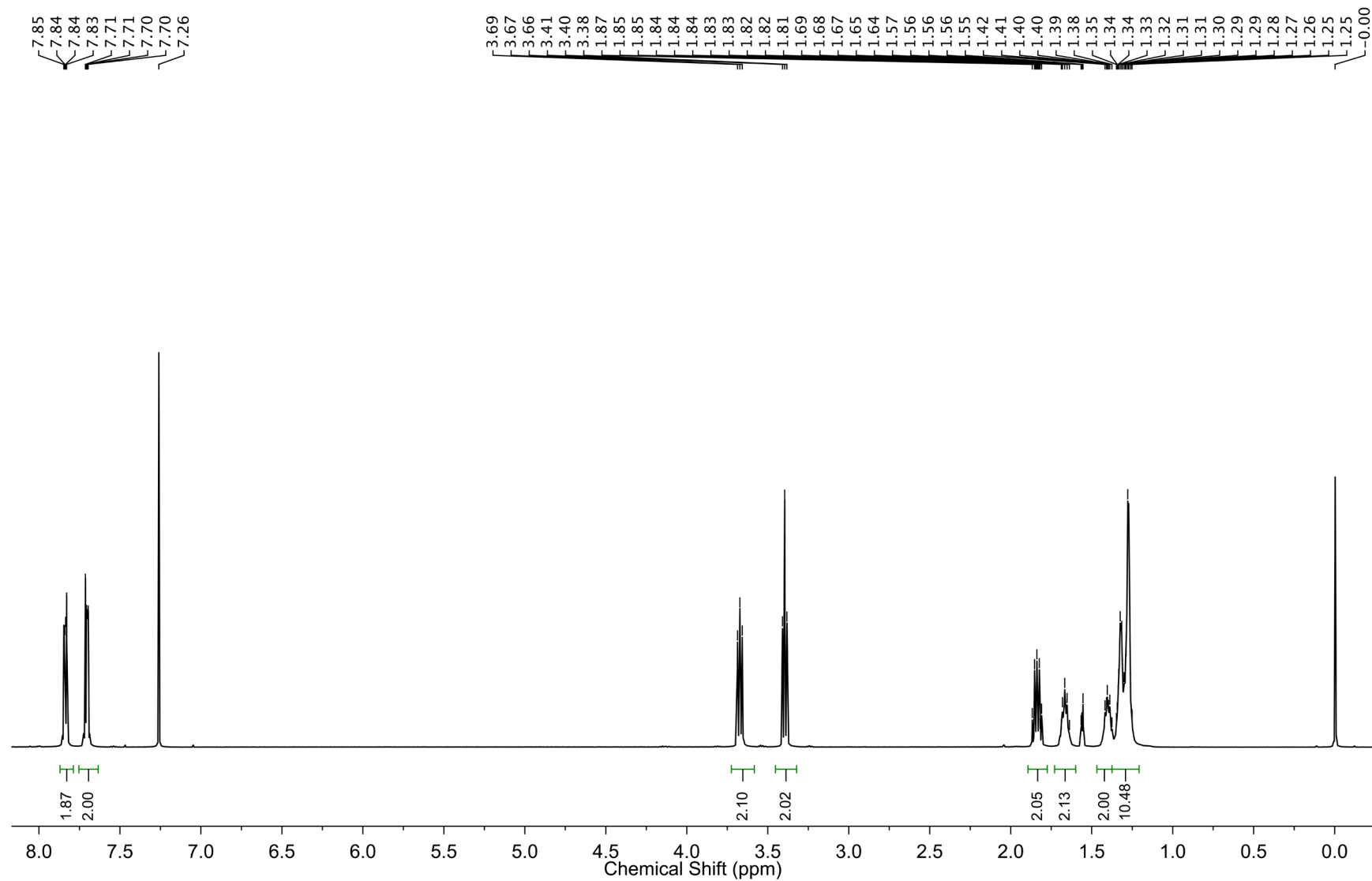
1-(5-(4'-Cyanobiphenyl-4-oxy)pentylaminocarbonyl)-6-(4'-methoxybiphenyl-4-oxy)hexyl 6-bromohexanoate (3-22)



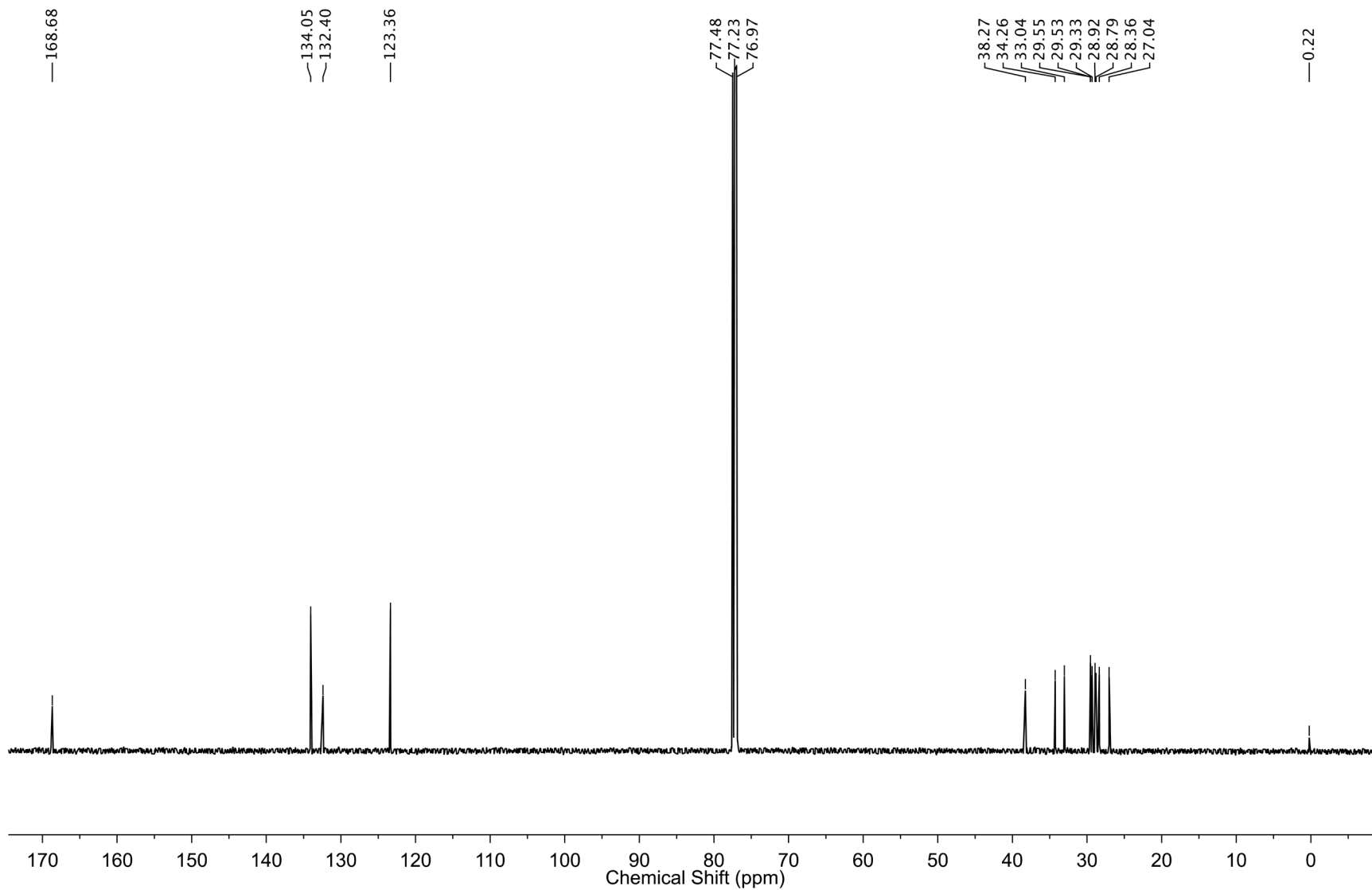
1-(5-(4'-Cyanobiphenyl-4-oxy)pentylaminocarbonyl)-6-(4'-methoxybiphenyl-4-oxy)hexyl 6-bromohexanoate (3-22)



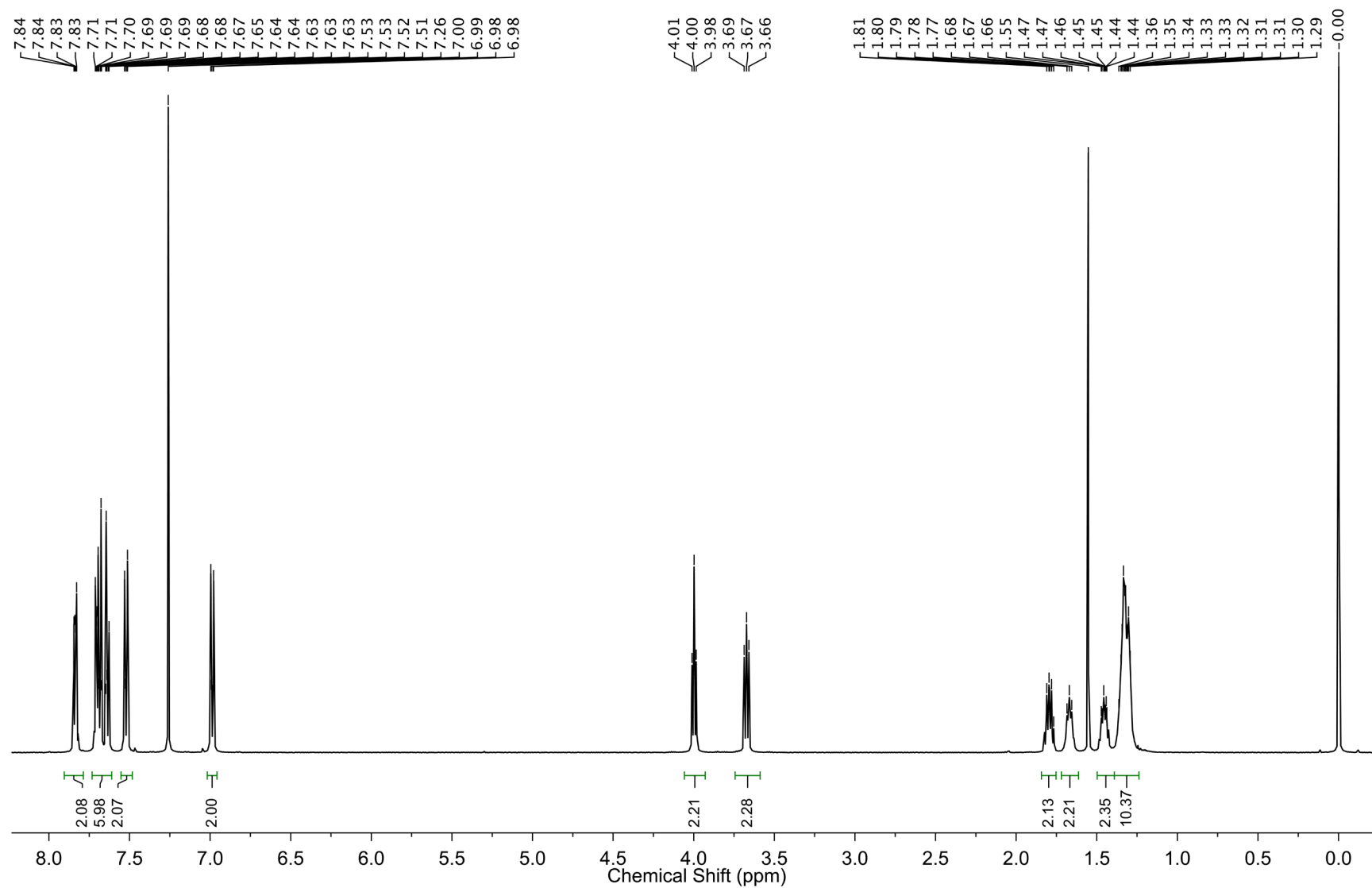
***N*-(10-Bromodecyl)phthalimide (3-47)**



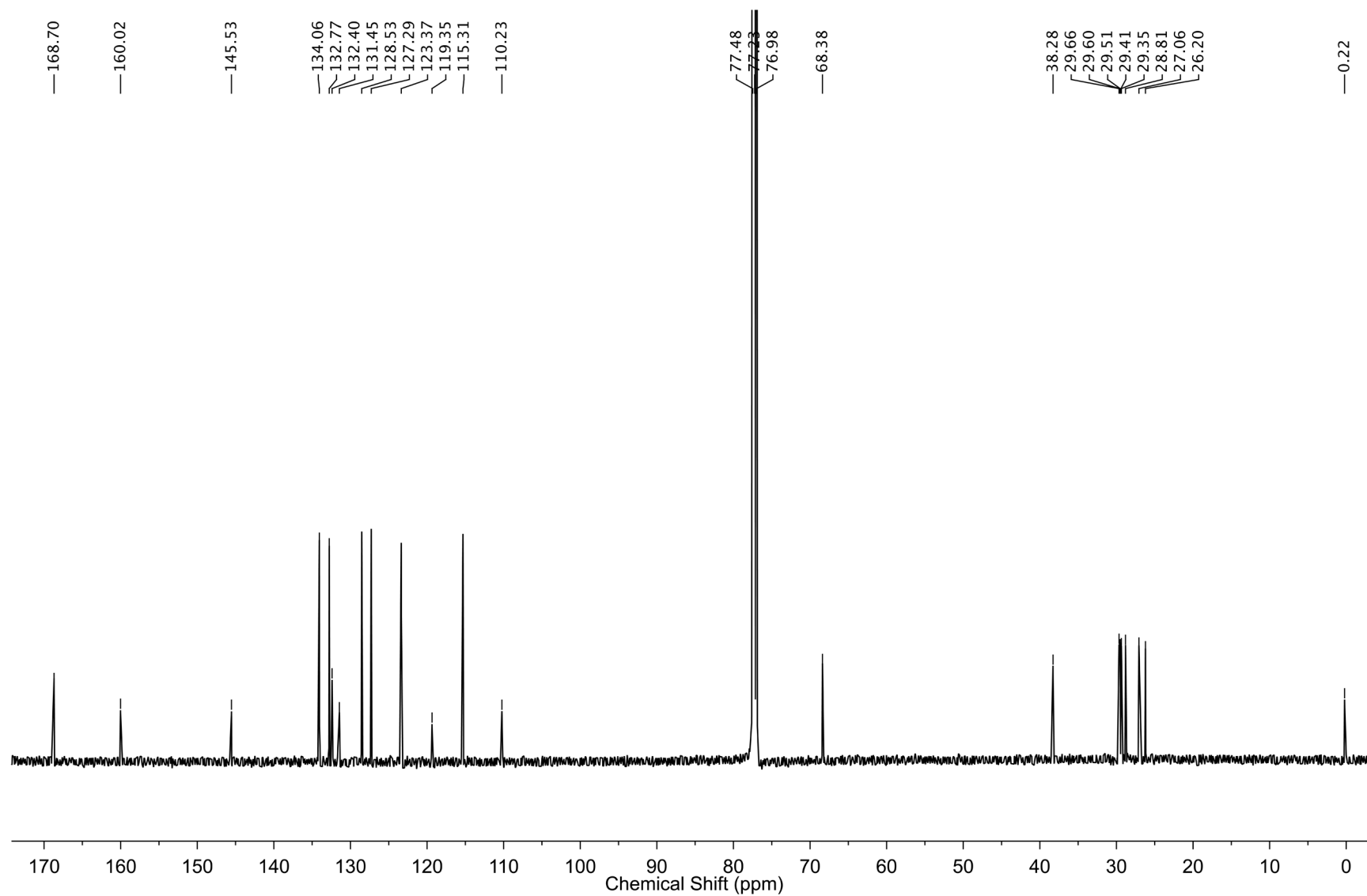
***N*-(10-Bromodecyl)phthalimide (3-47)**



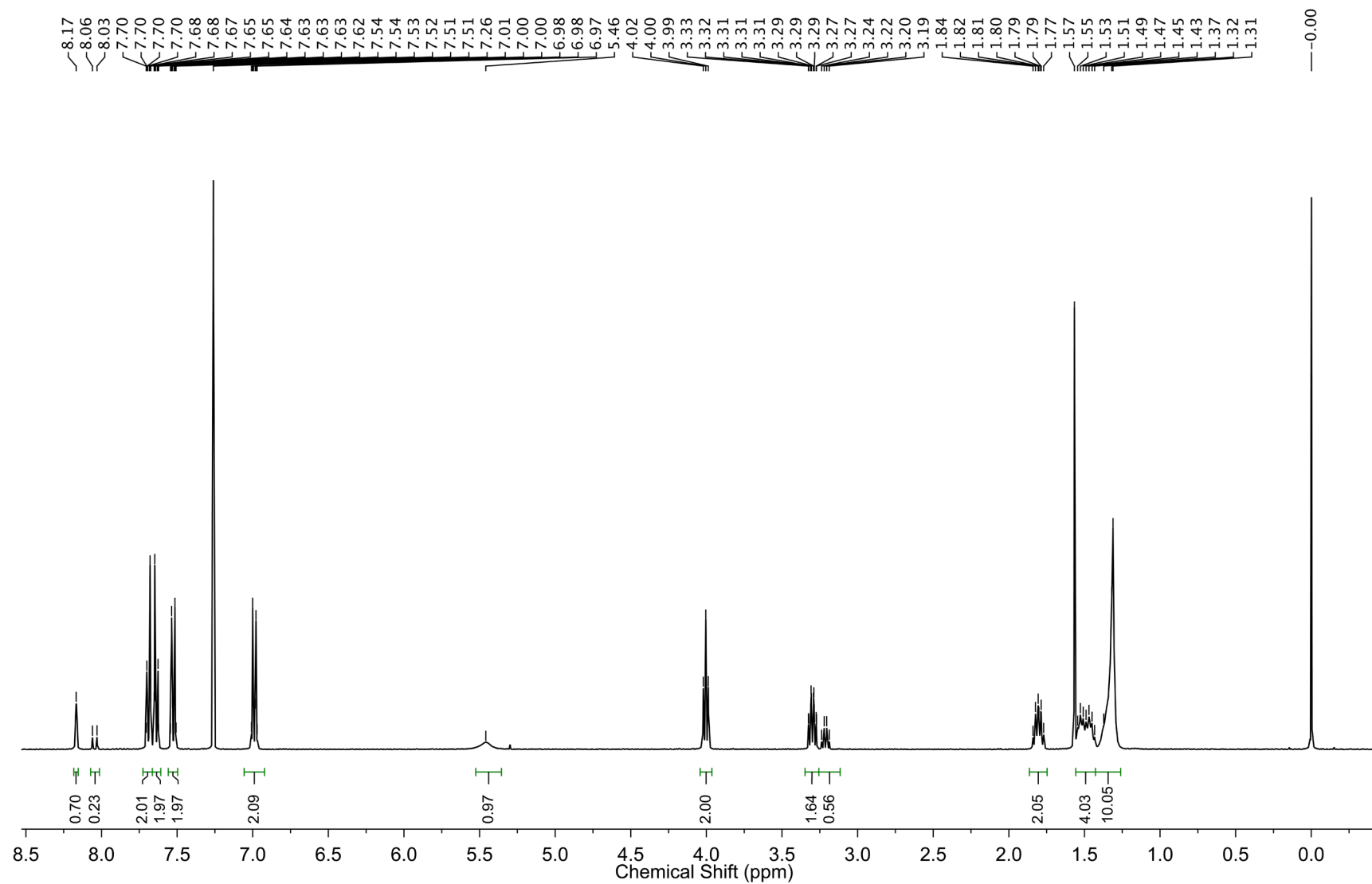
***N*-(10-(4'-Cyanobiphenyl-4-oxy)decyl)phthalimide (3-48)**



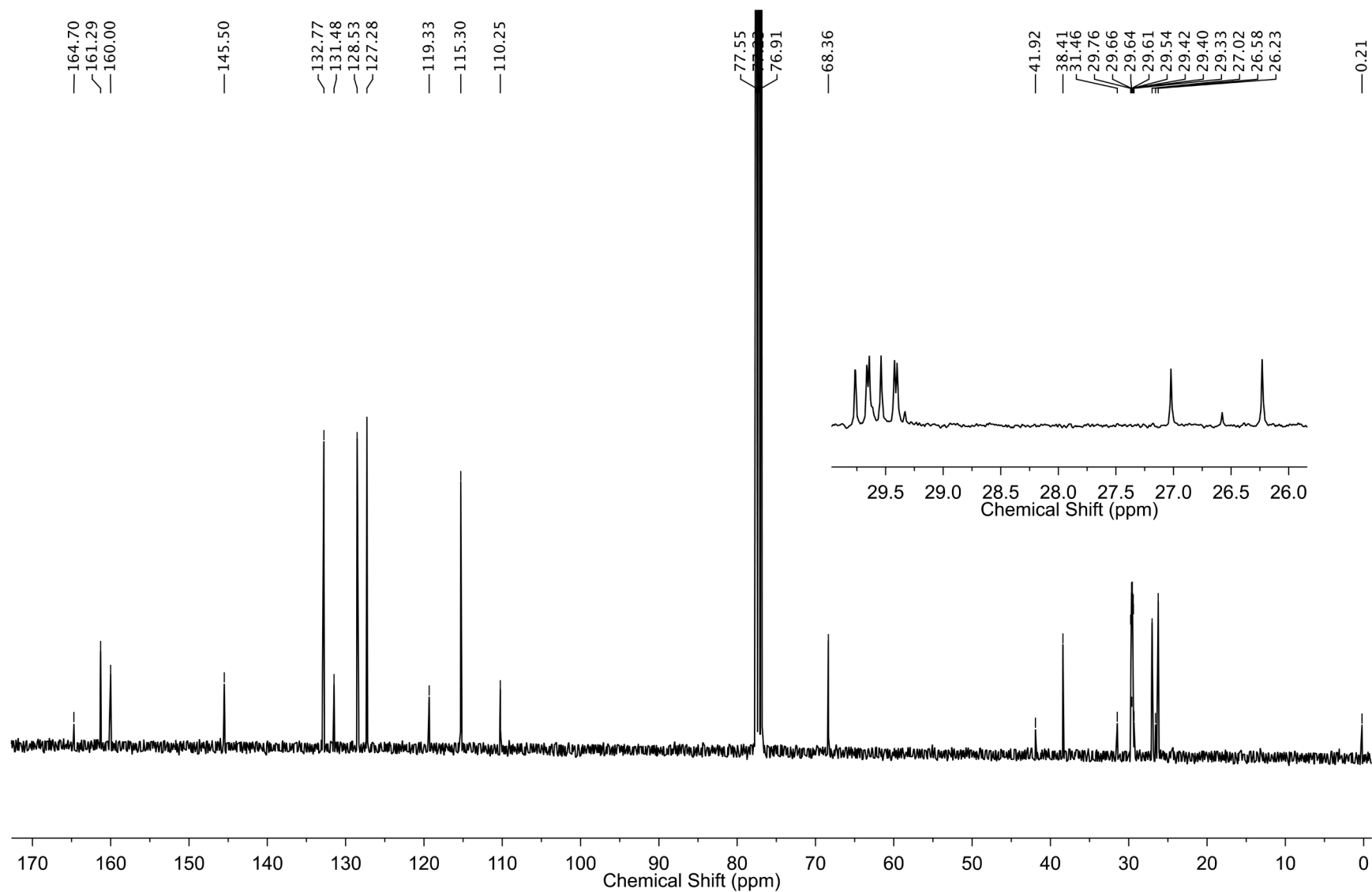
***N*-(10-(4'-Cyanobiphenyl-4-oxy)decyl)phthalimide (3-48)**



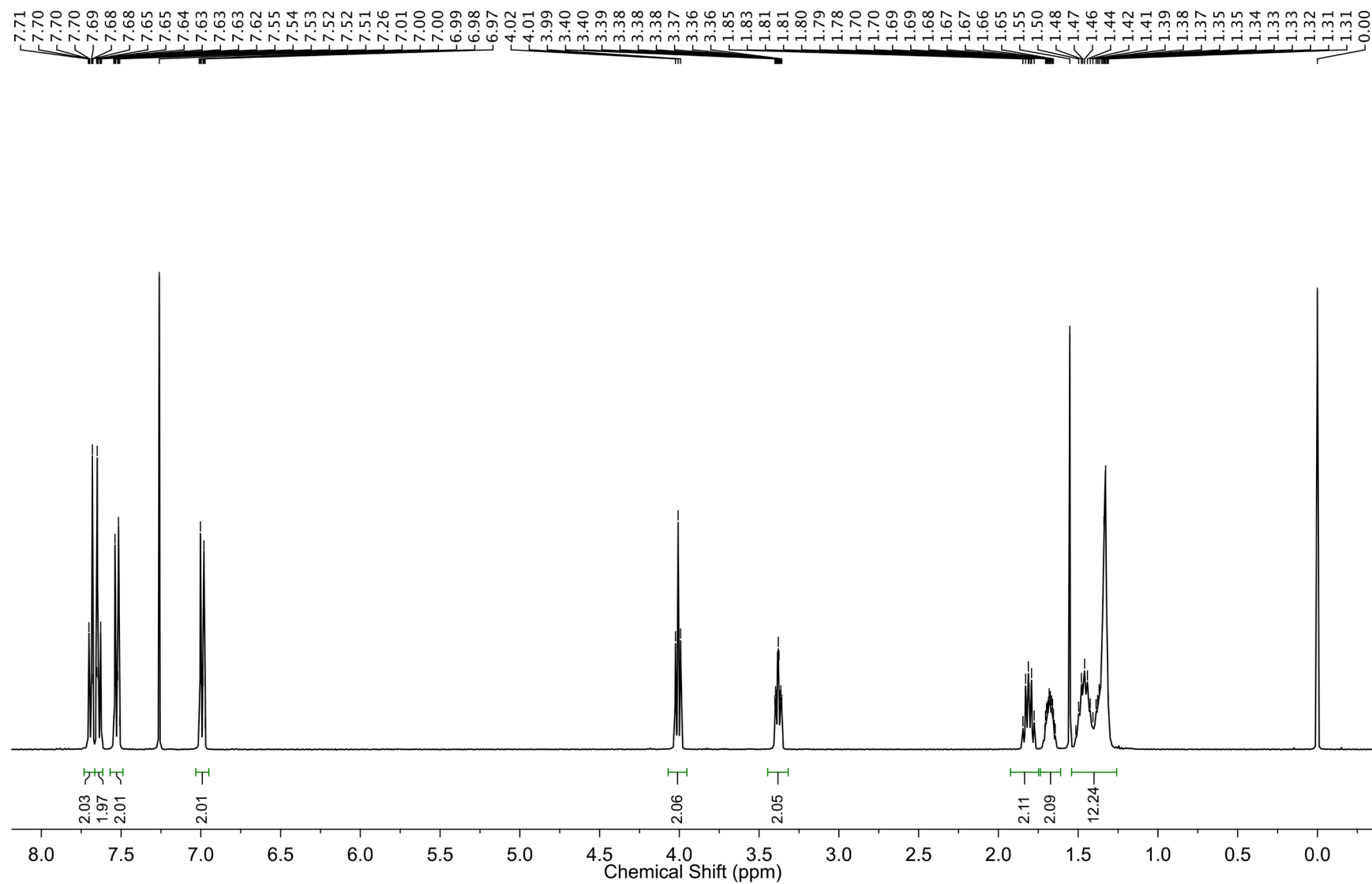
1-Formamido-10-(4'-cyanobiphenyl-4-oxy)decane (3-50)



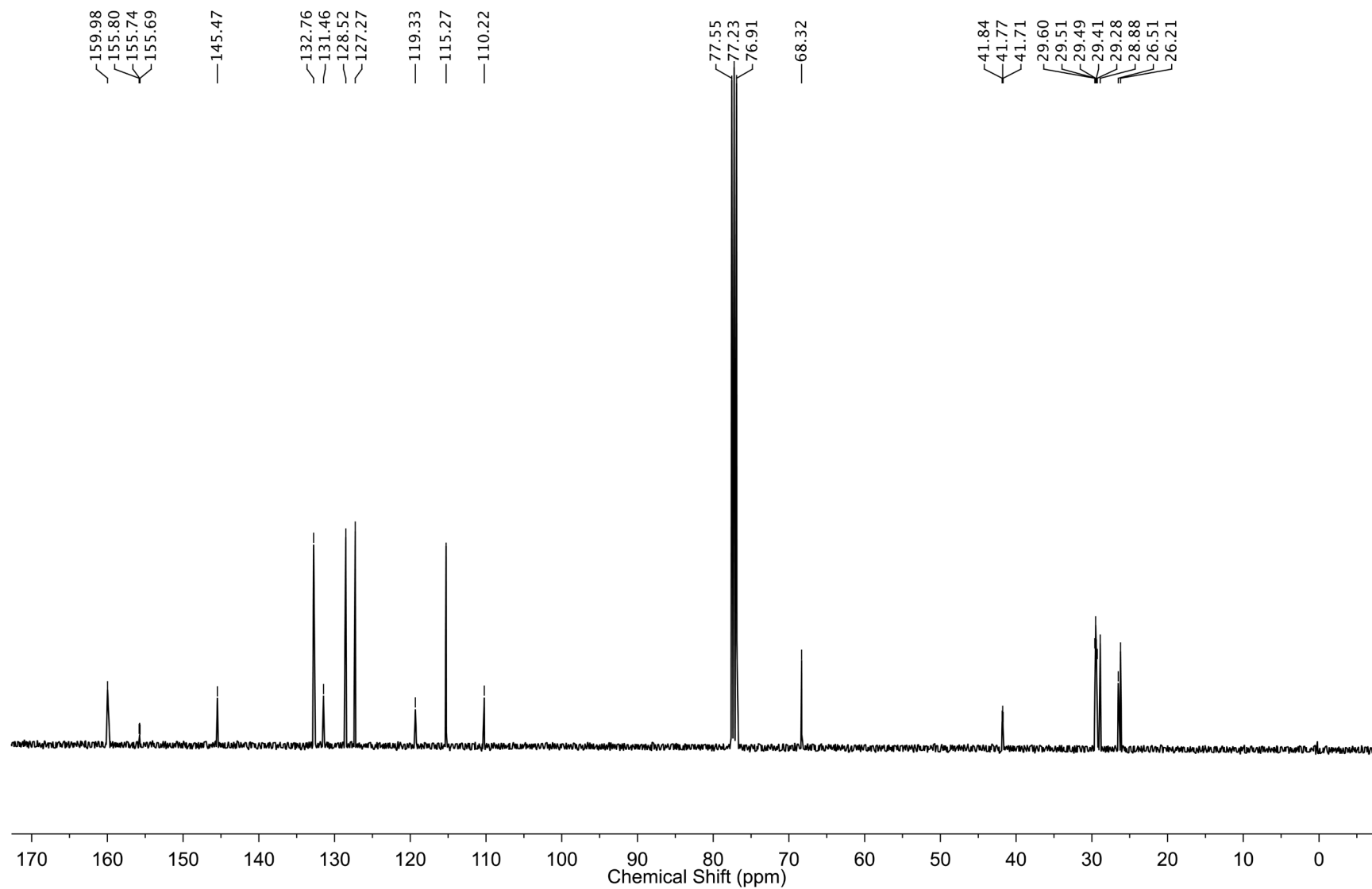
1-Formamido-10-(4'-cyanobiphenyl-4-oxy)decane (3-50)



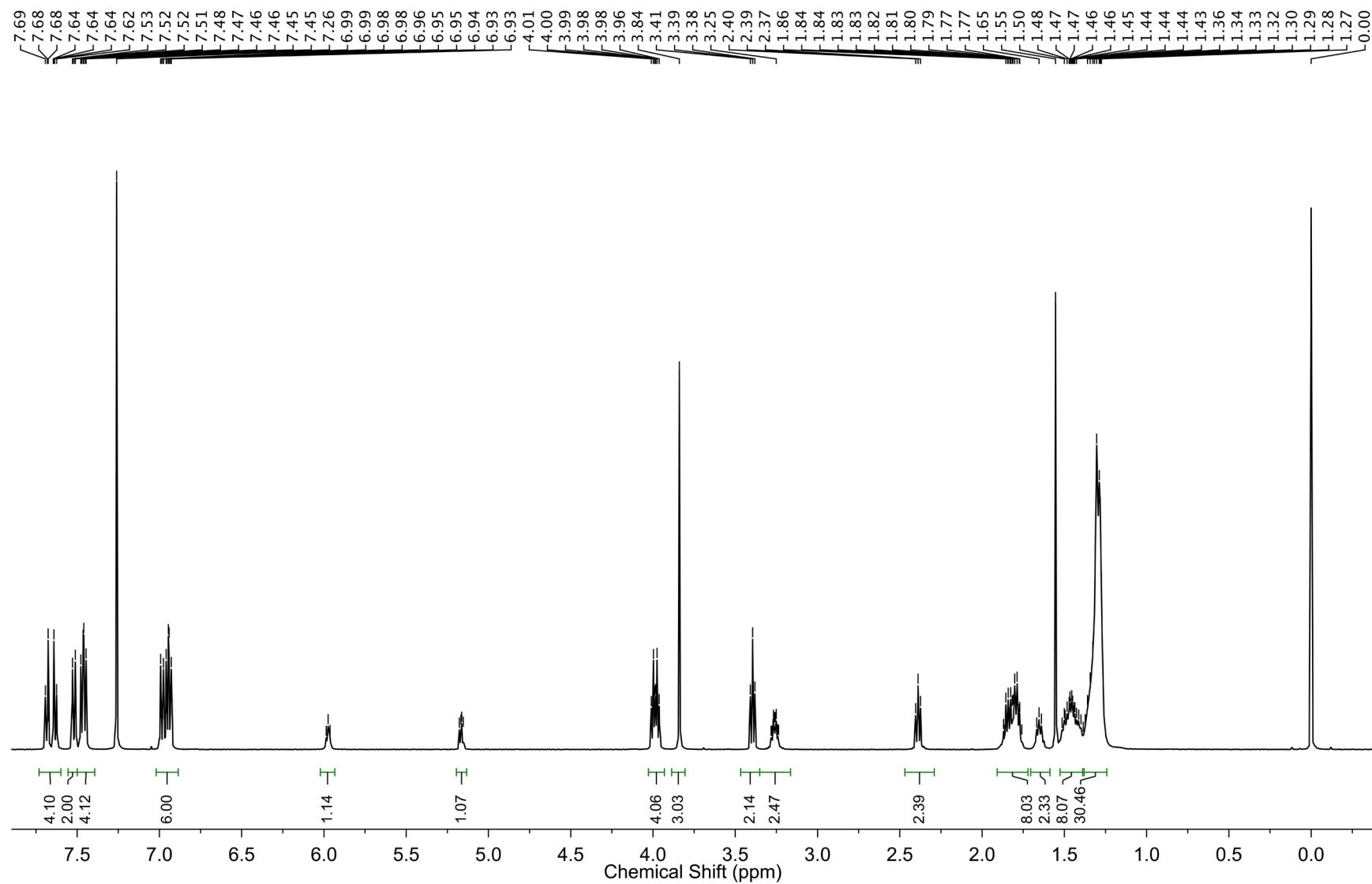
1-Isocyano-10-(4'-cyanobiphenyl-4-oxy)decane (3-21)



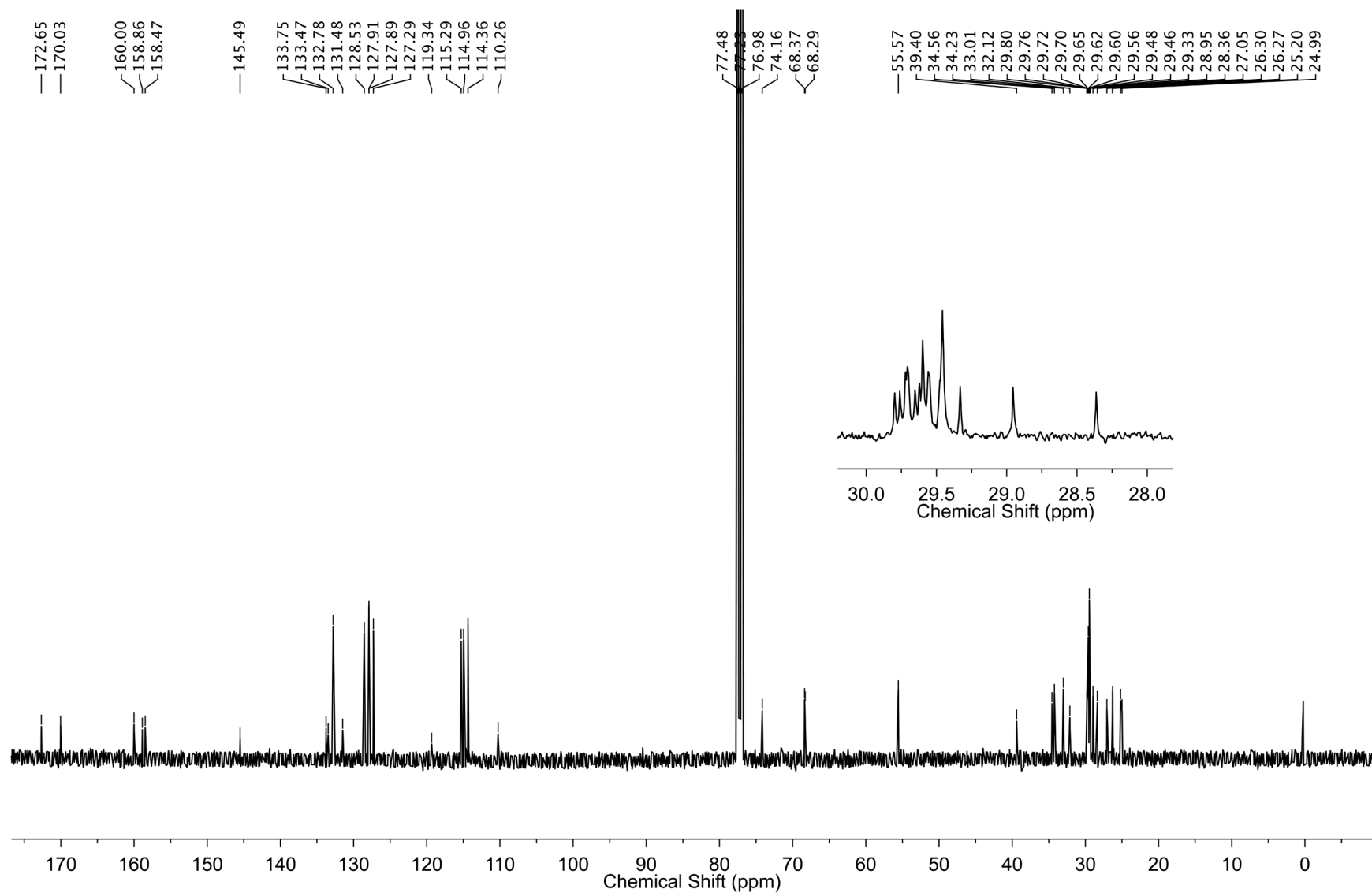
1-Isocyano-10-(4'-cyanobiphenyl-4-oxy)decane (3-21)



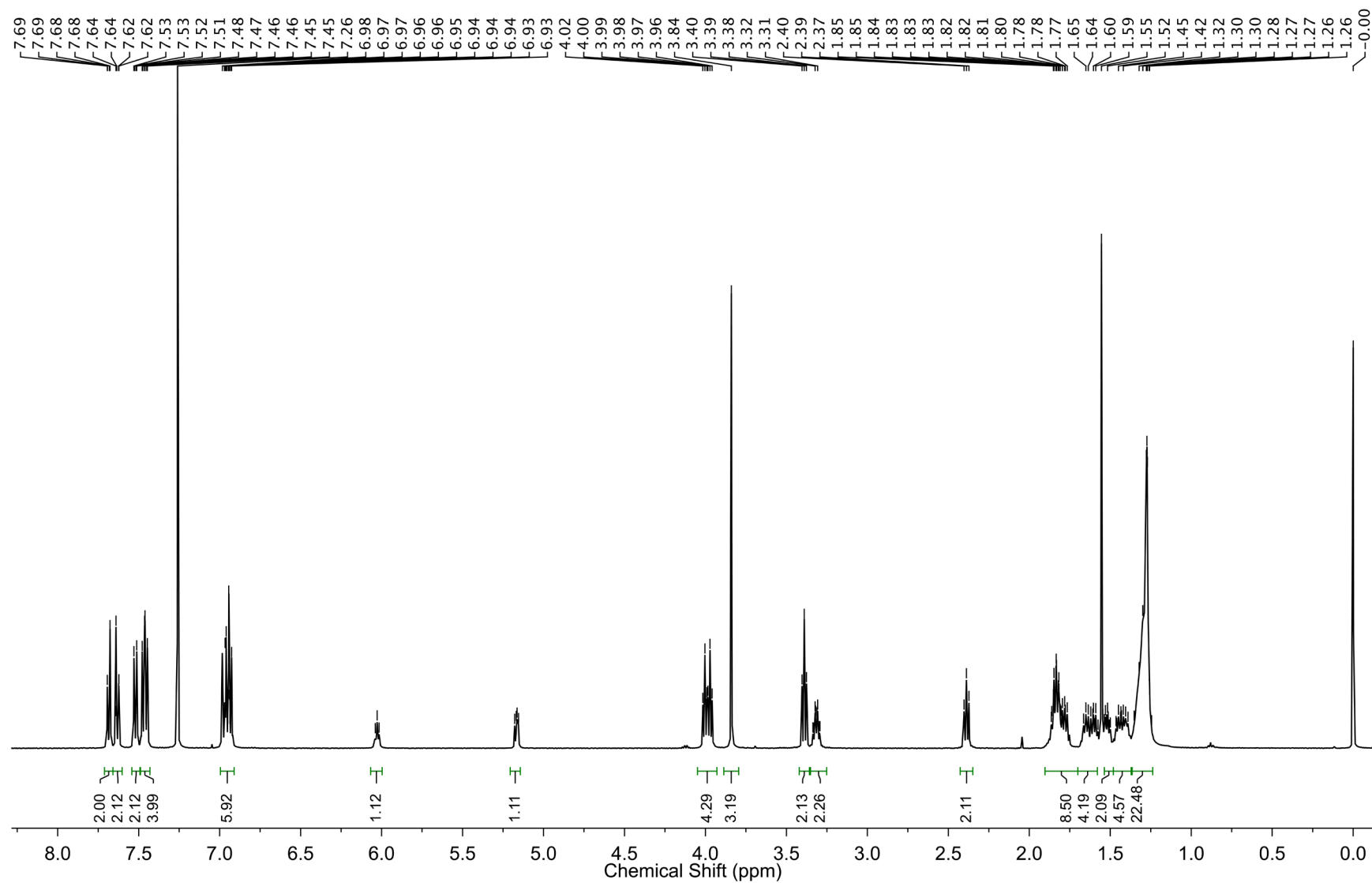
1-(10-(4'-Cyanobiphenyl-4-oxy)decylaminocarbonyl)-11-(4'-methoxybiphenyl-4-oxy)undecyl 11-bromoundecanoate (3-23)



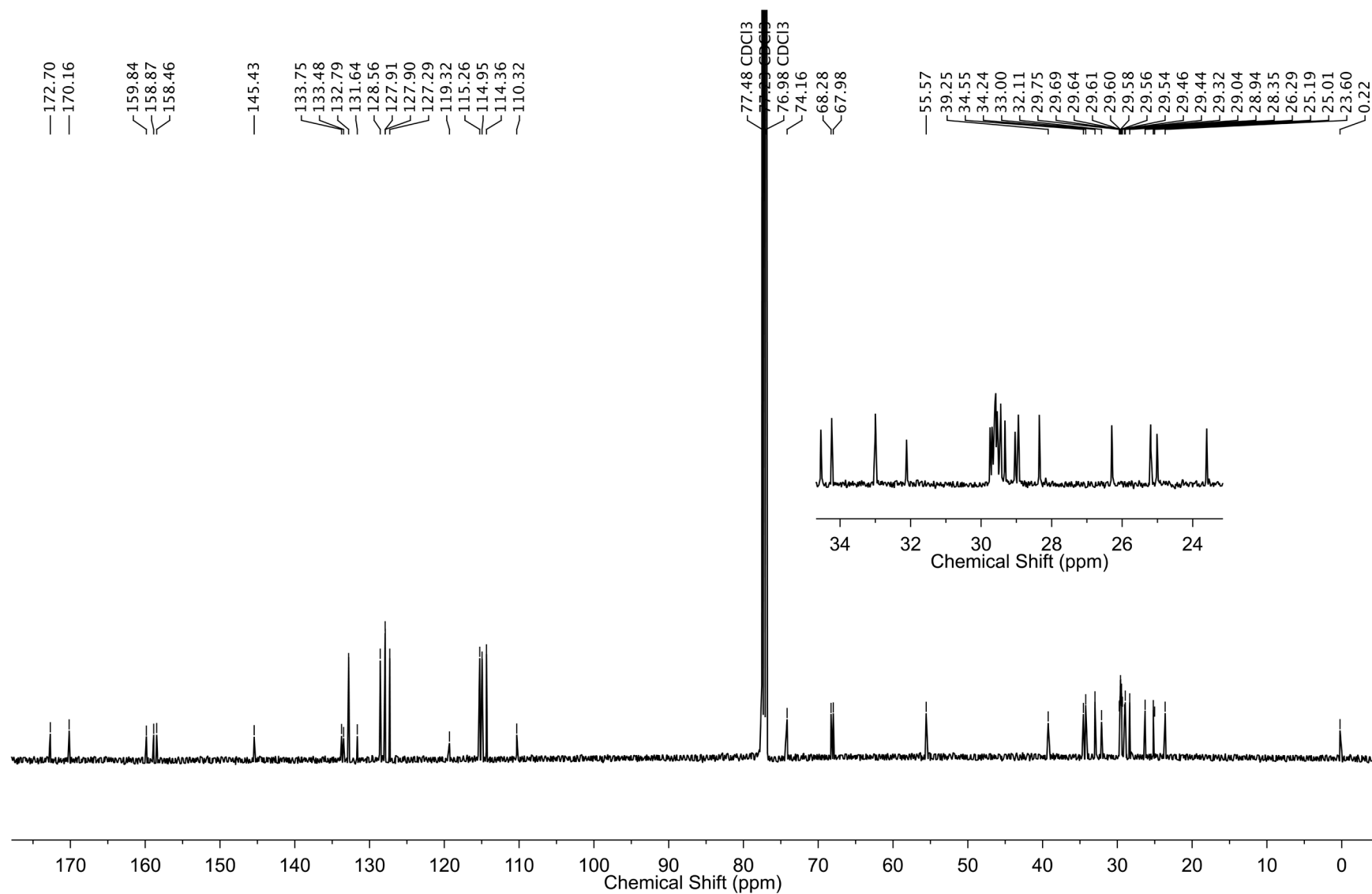
1-(10-(4'-Cyanobiphenyl-4-oxy)decylaminocarbonyl)-11-(4'-methoxybiphenyl-4-oxy)undecyl 11-bromoundecanoate (3-23)



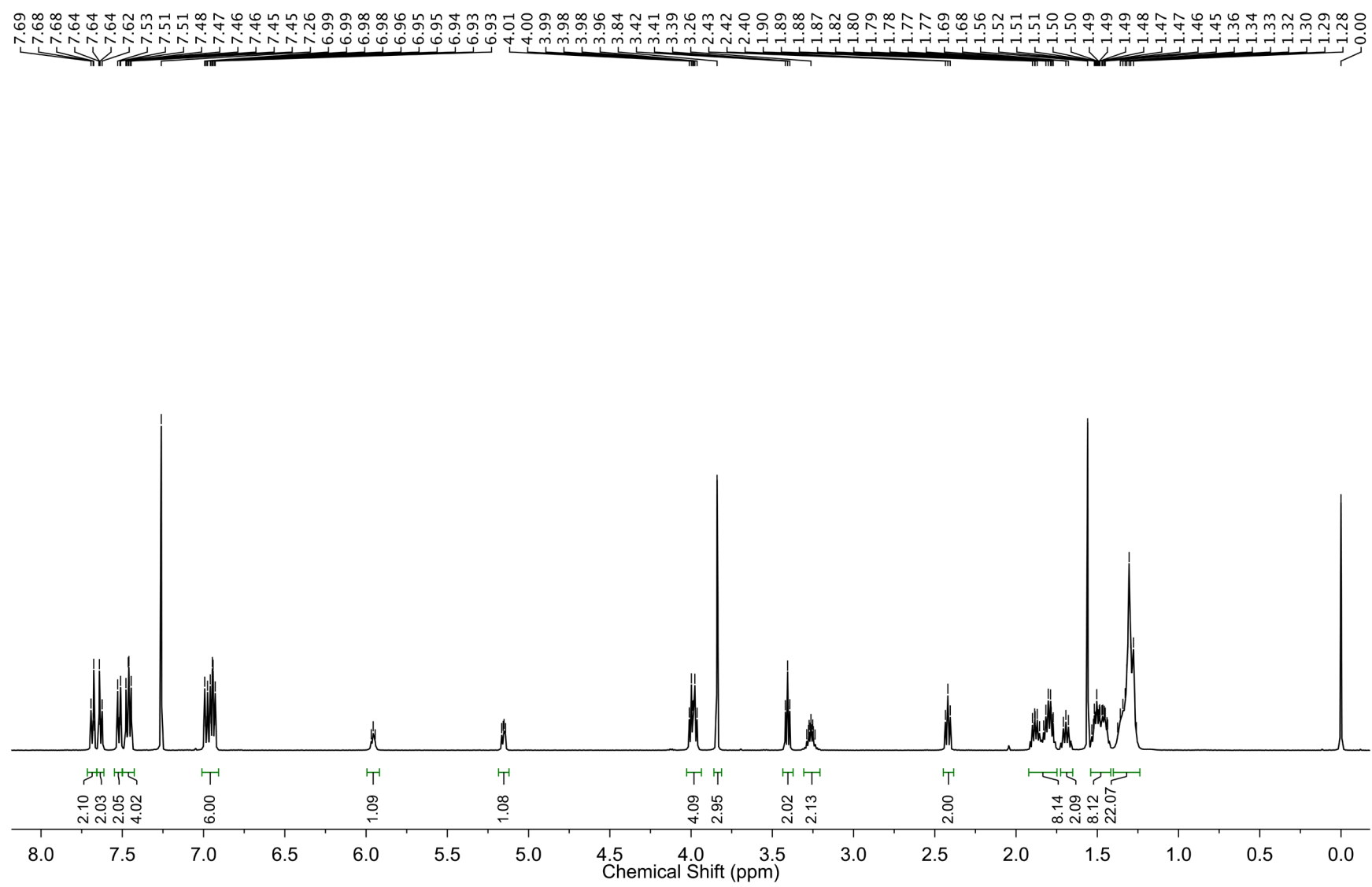
1-(5-(4'-Cyanobiphenyl-4-oxy)pentylaminocarbonyl)-11-(4'-methoxybiphenyl-4-oxy)undecyl 11-bromoundecanoate (3-24)



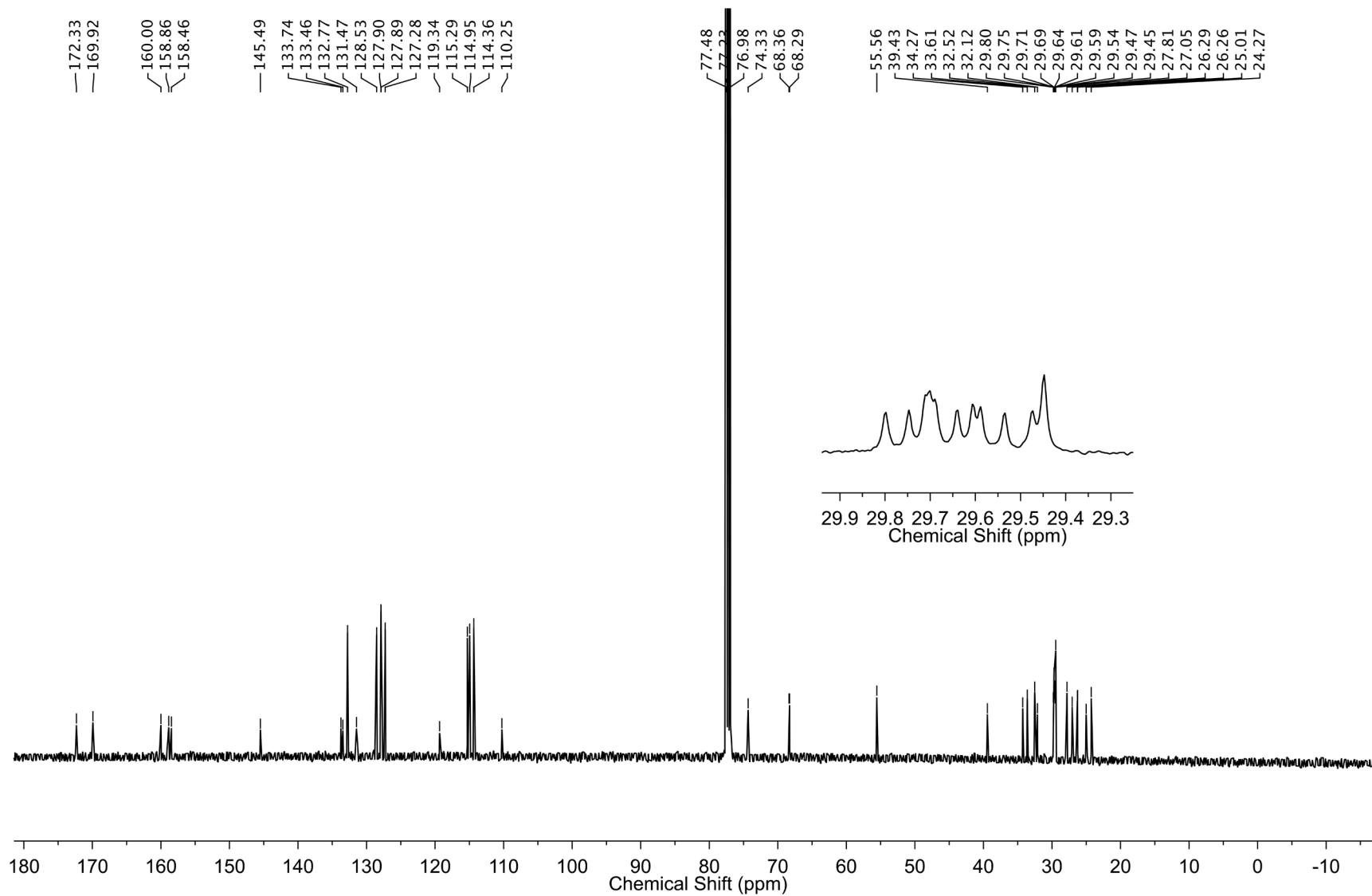
1-(5-(4'-Cyanobiphenyl-4-oxy)pentylaminocarbonyl)-11-(4'-methoxybiphenyl-4-oxy)undecyl 11-bromoundecanoate (3-24)



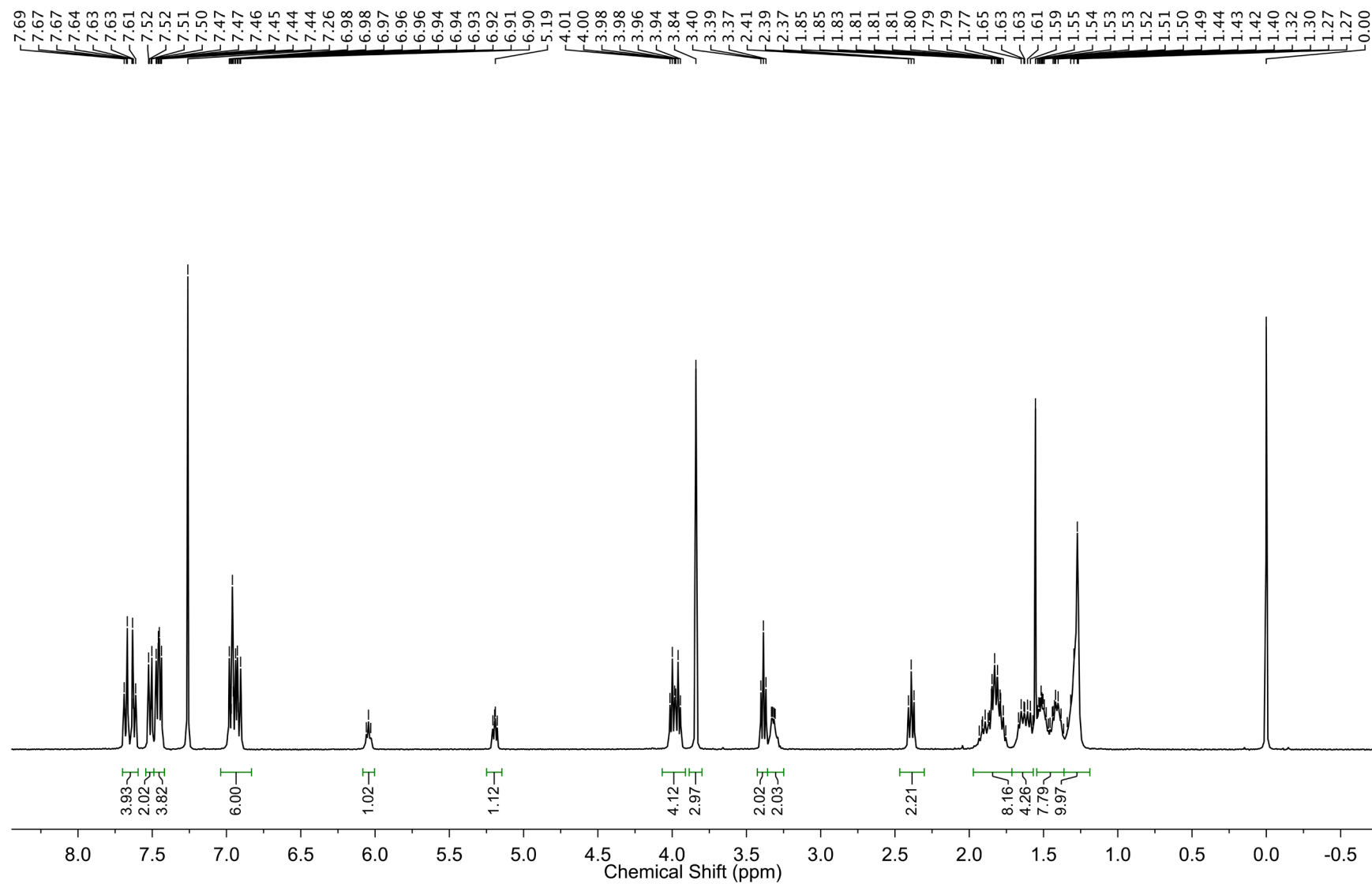
1-(10-(4'-Cyanobiphenyl-4-oxo)decylaminocarbonyl)-6-(4'-methoxybiphenyl-4-oxo)hexyl 11-bromoundecanoate (3-25)



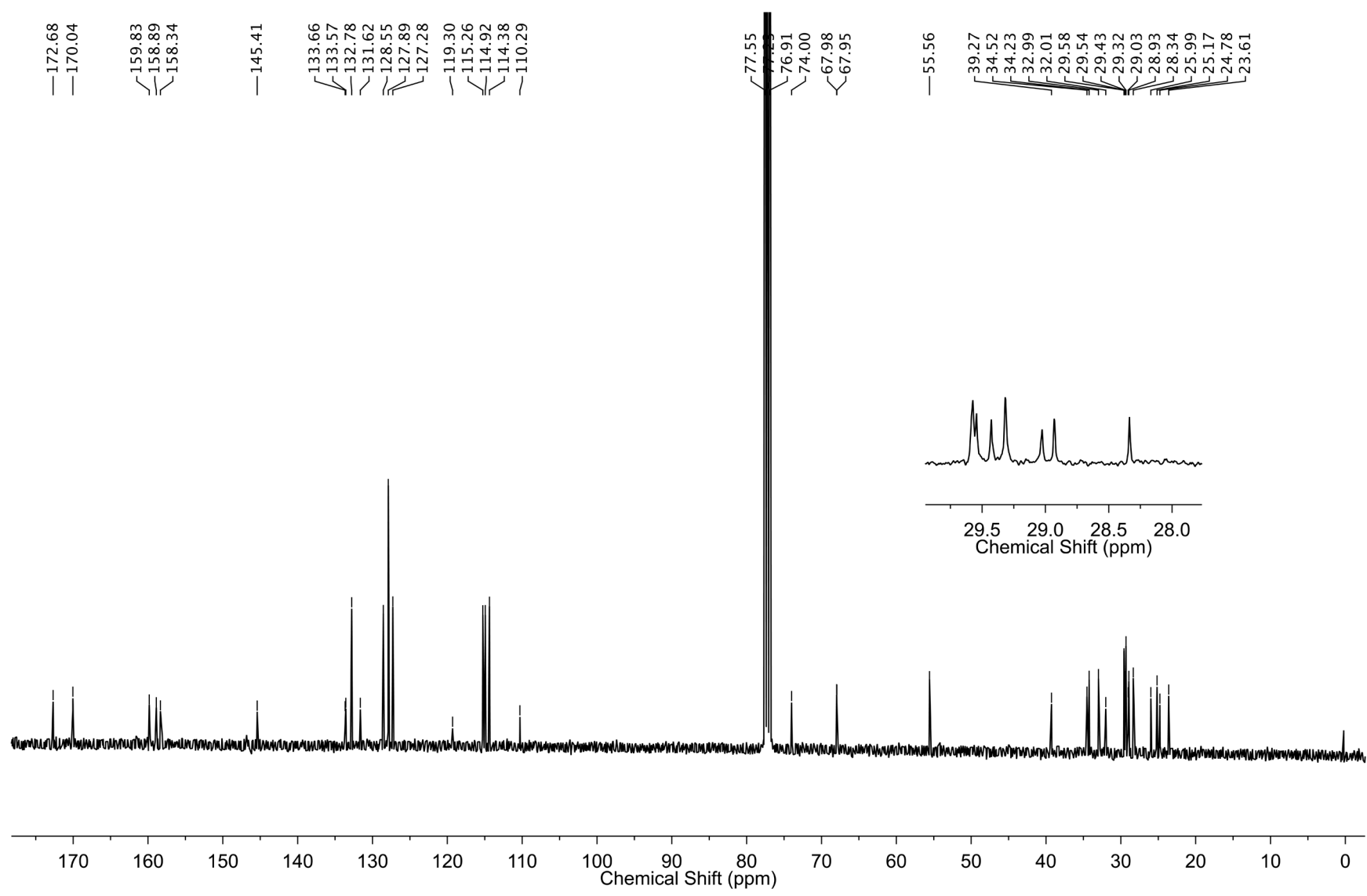
1-(10-(4'-Cyanobiphenyl-4-oxy)decylaminocarbonyl)-6-(4'-methoxybiphenyl-4-oxy)hexyl 11-bromoundecanoate (3-25)



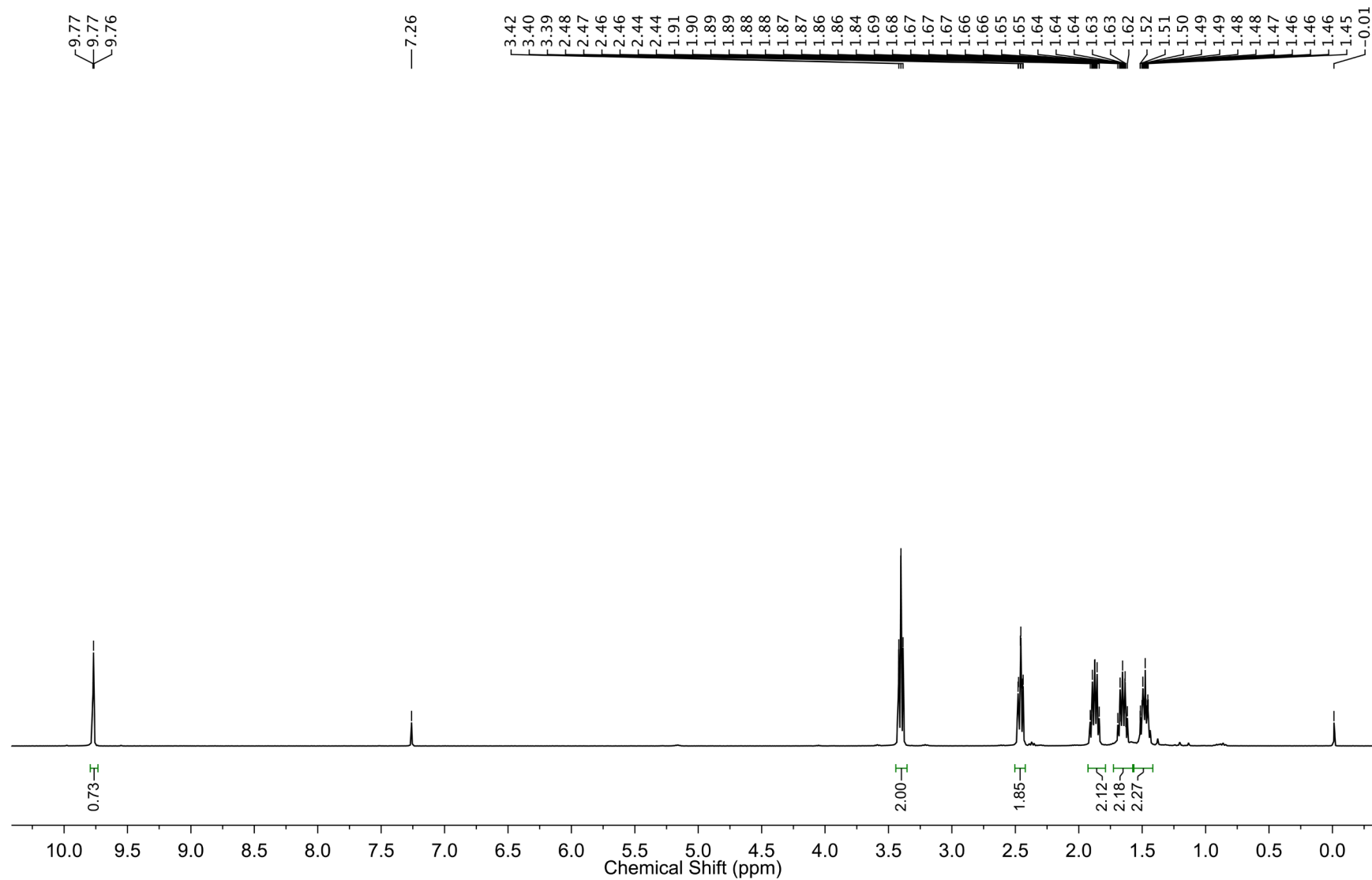
1-(5-(4'-Cyanobiphenyl-4-oxy)pentylaminocarbonyl)-6-(4'-methoxybiphenyl-4-oxy)hexyl 11-bromoundecanoate (3-26)



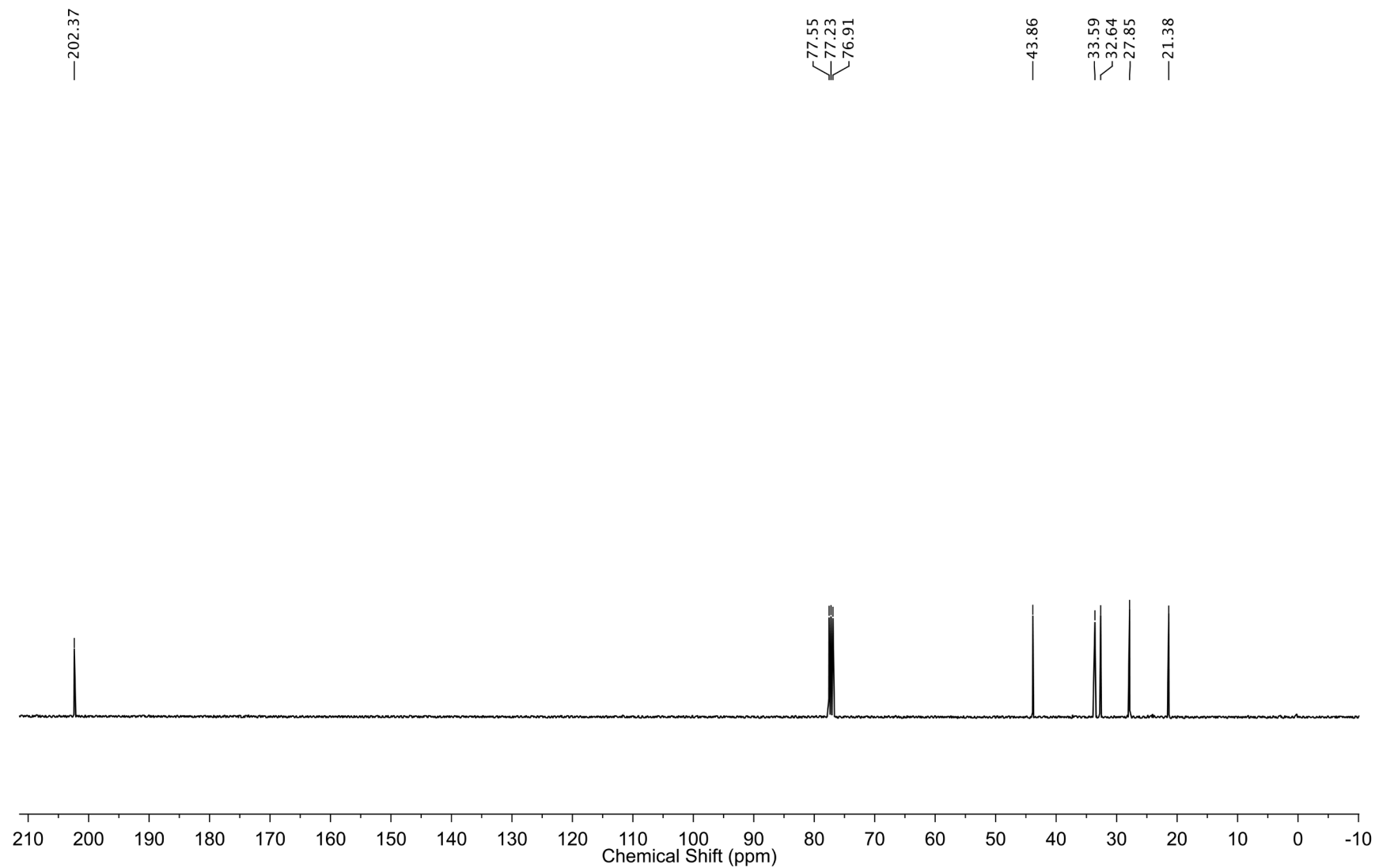
1-(5-(4'-Cyanobiphenyl-4-oxy)pentylaminocarbonyl)-6-(4'-methoxybiphenyl-4-oxy)hexyl 11-bromoundecanoate (3-26)



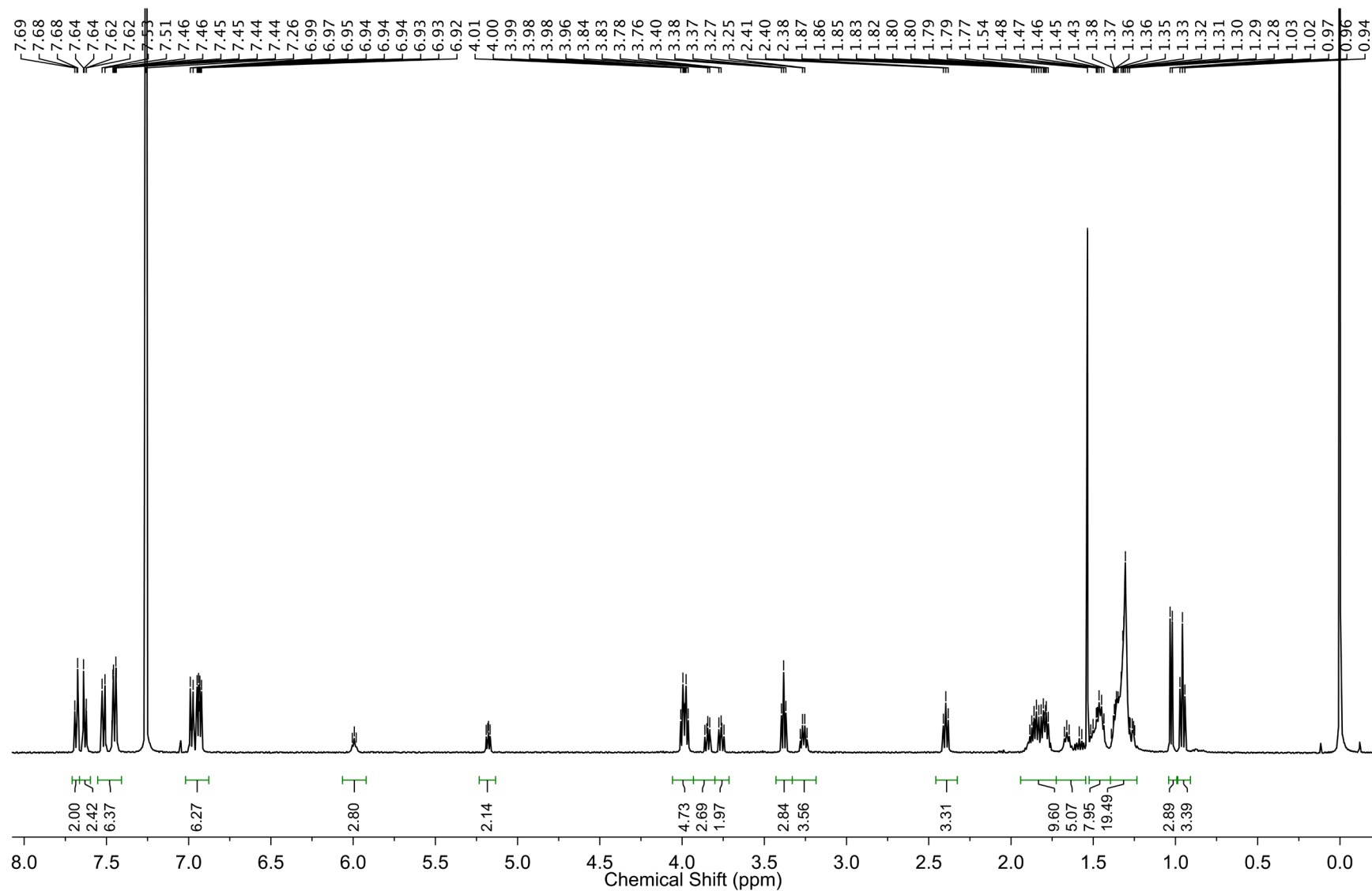
6-Bromohexanal (3-28)



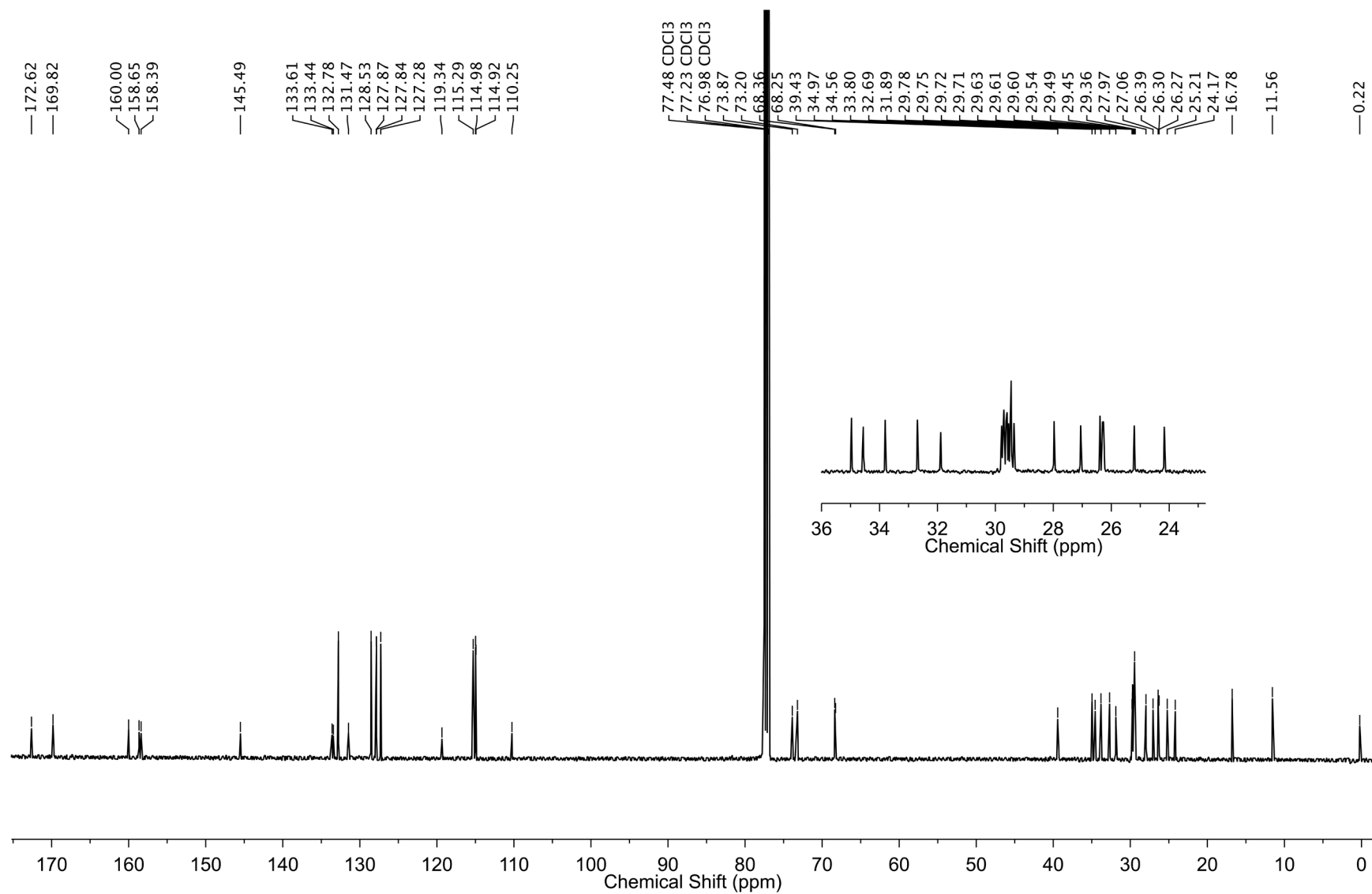
6-Bromohexanal (3-28)



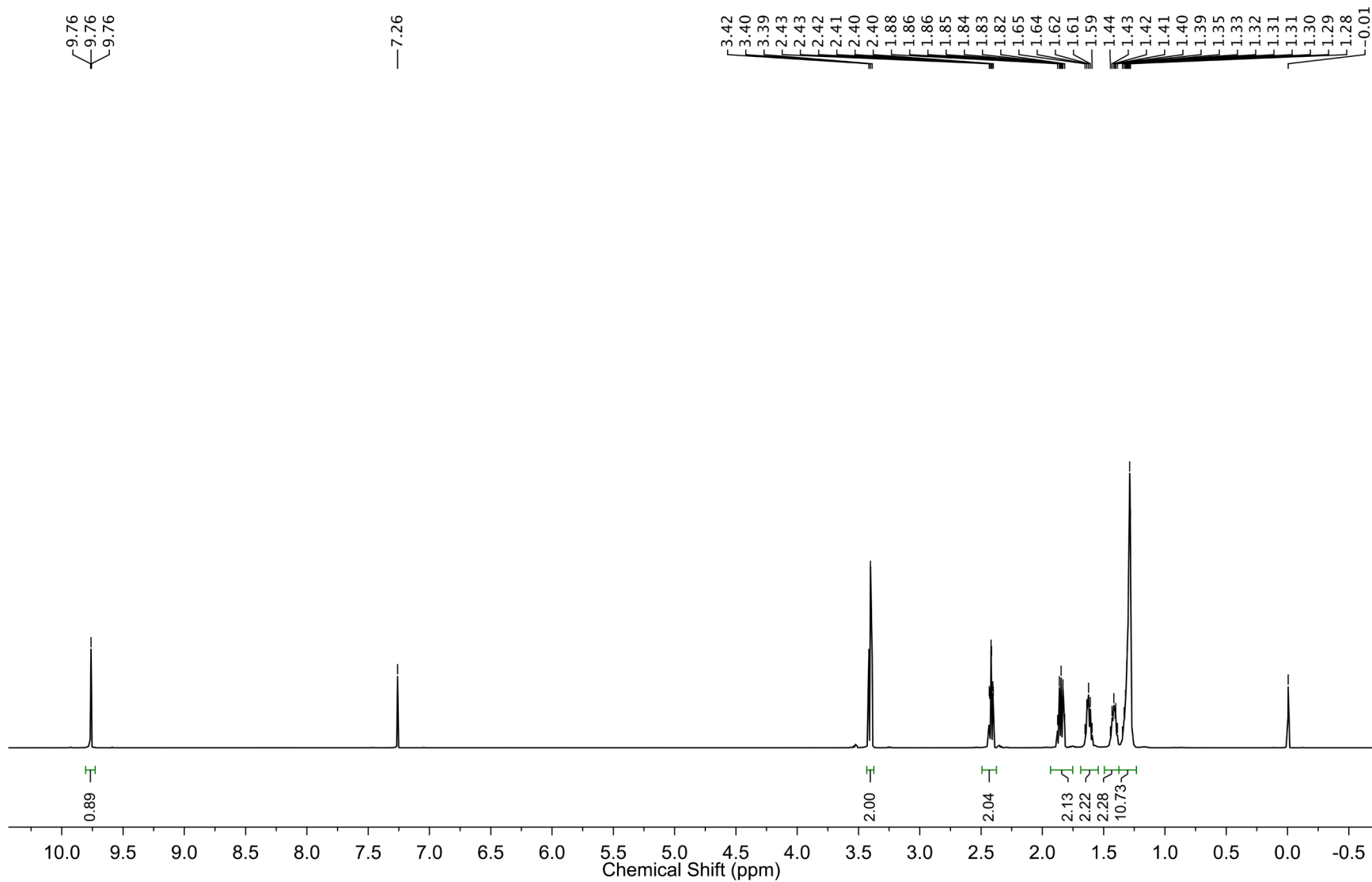
1-(10-(4'-Cyanobiphenyl-4-oxy)decylaminocarbonyl)-6-bromohexyl 6-(4'-((S)-2-methylbutoxy)biphenyl-4-oxy)hexanoate (3-30)



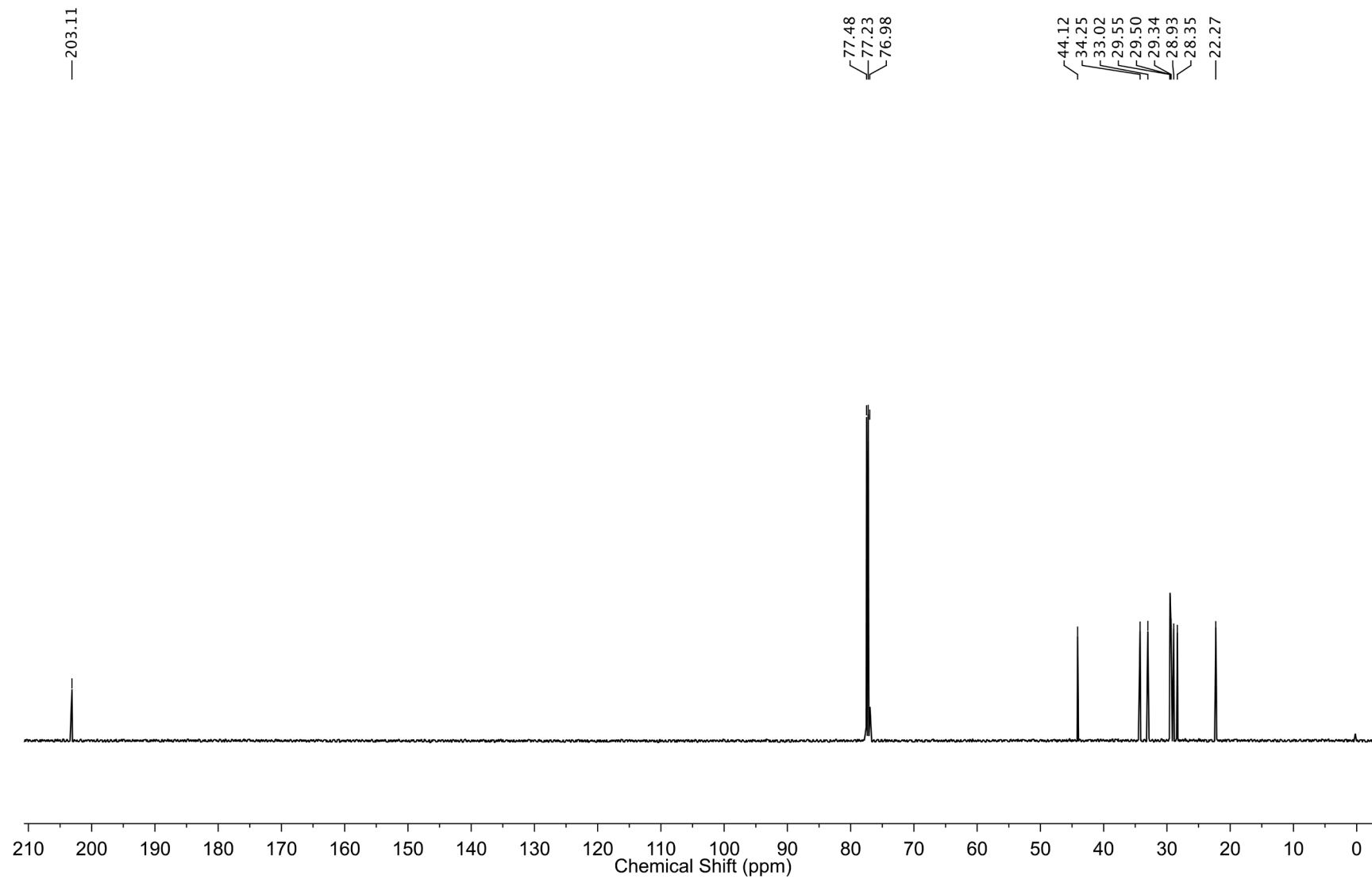
1-(10-(4'-Cyanobiphenyl-4-oxy)decylaminocarbonyl)-6-bromohexyl 6-(4'-((S)-2-methylbutoxy)biphenyl-4-oxy)hexanoate (3-30)



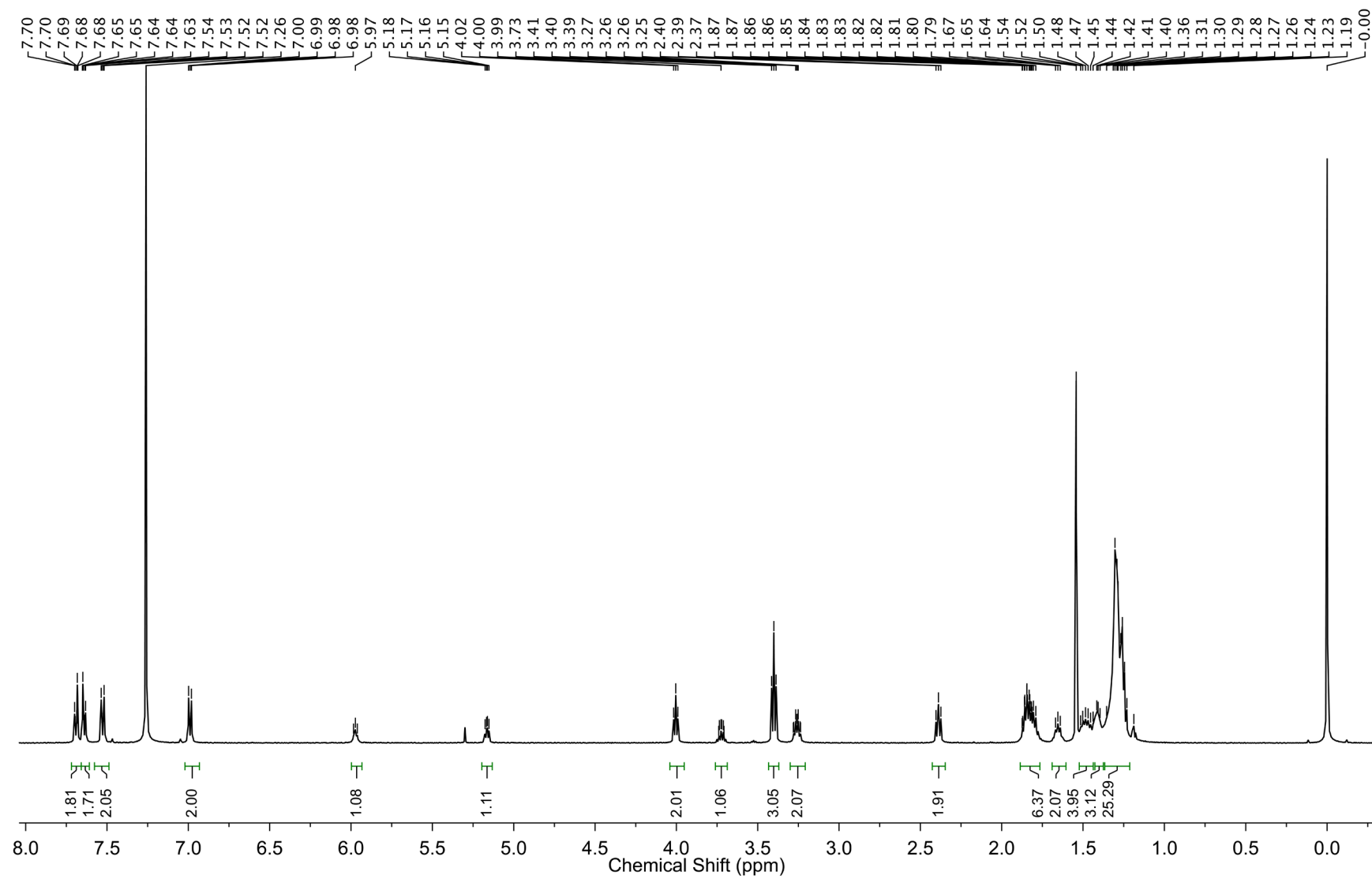
11-Bromoundecanal (3-32)



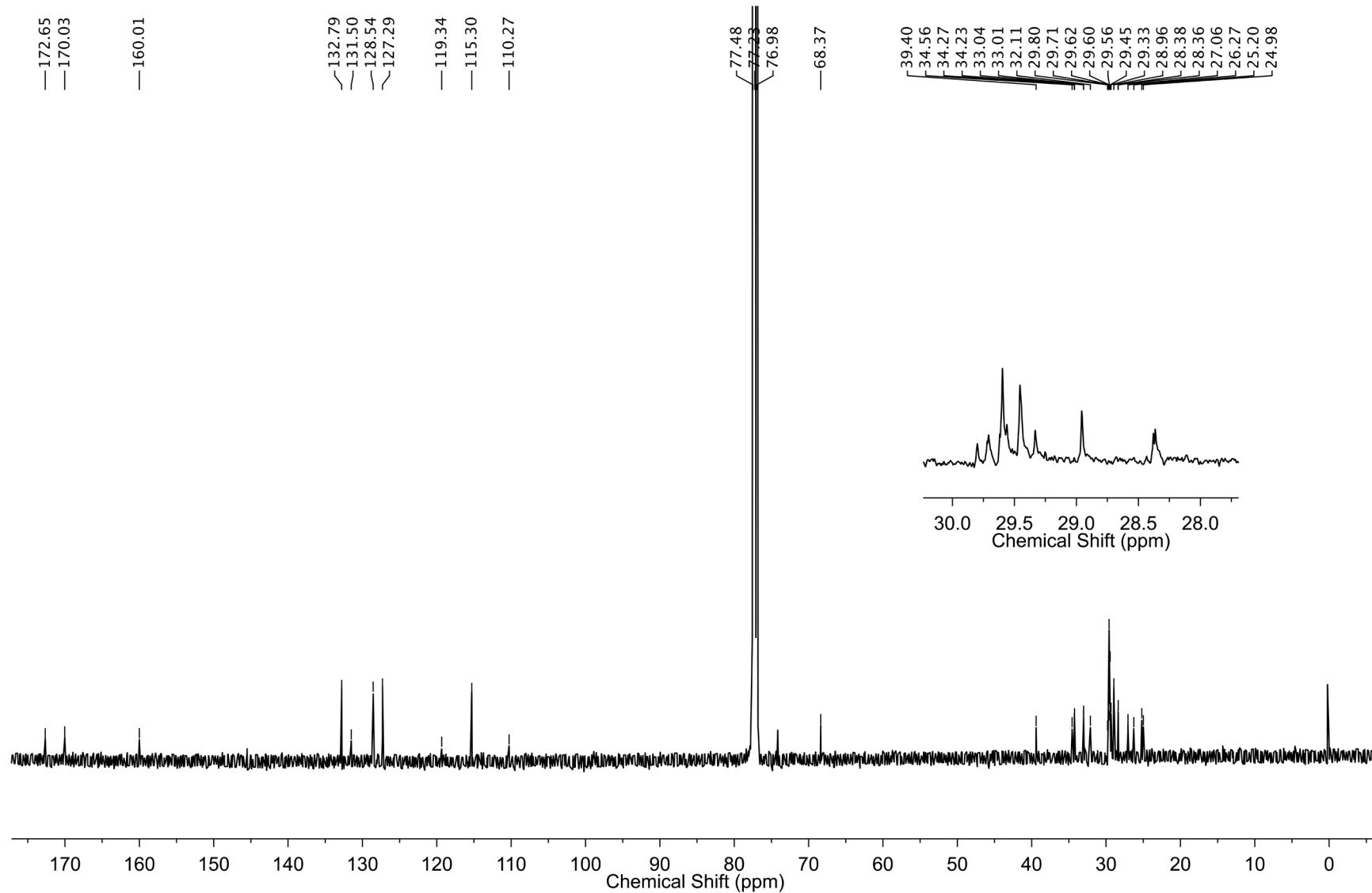
11-Bromoundecanal (3-32)



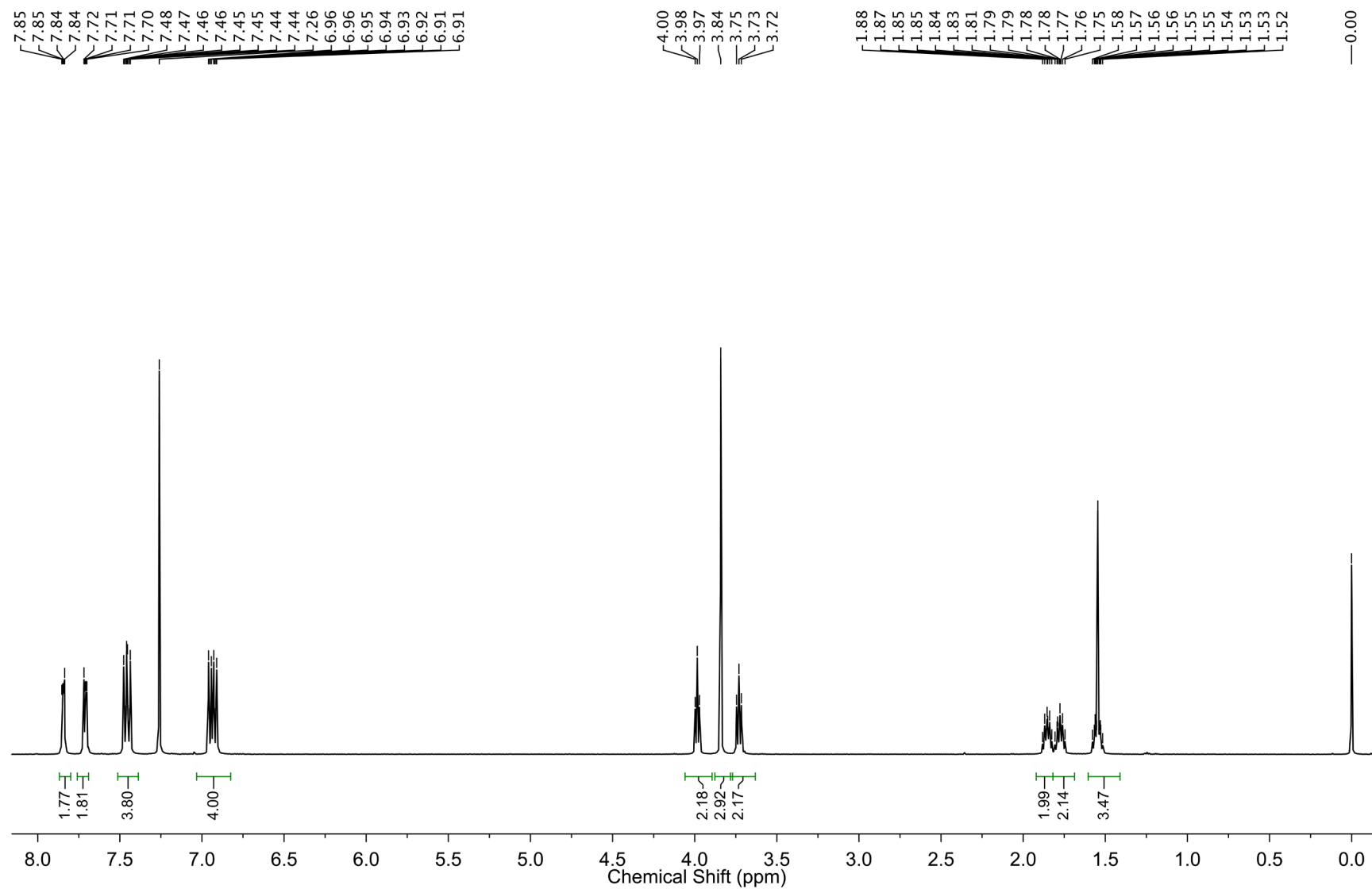
1-(10-(4'-Cyanobiphenyl-4-oxy)decylaminocarbonyl)-11bromoundecyl 11bromoundecanoate (3-37)



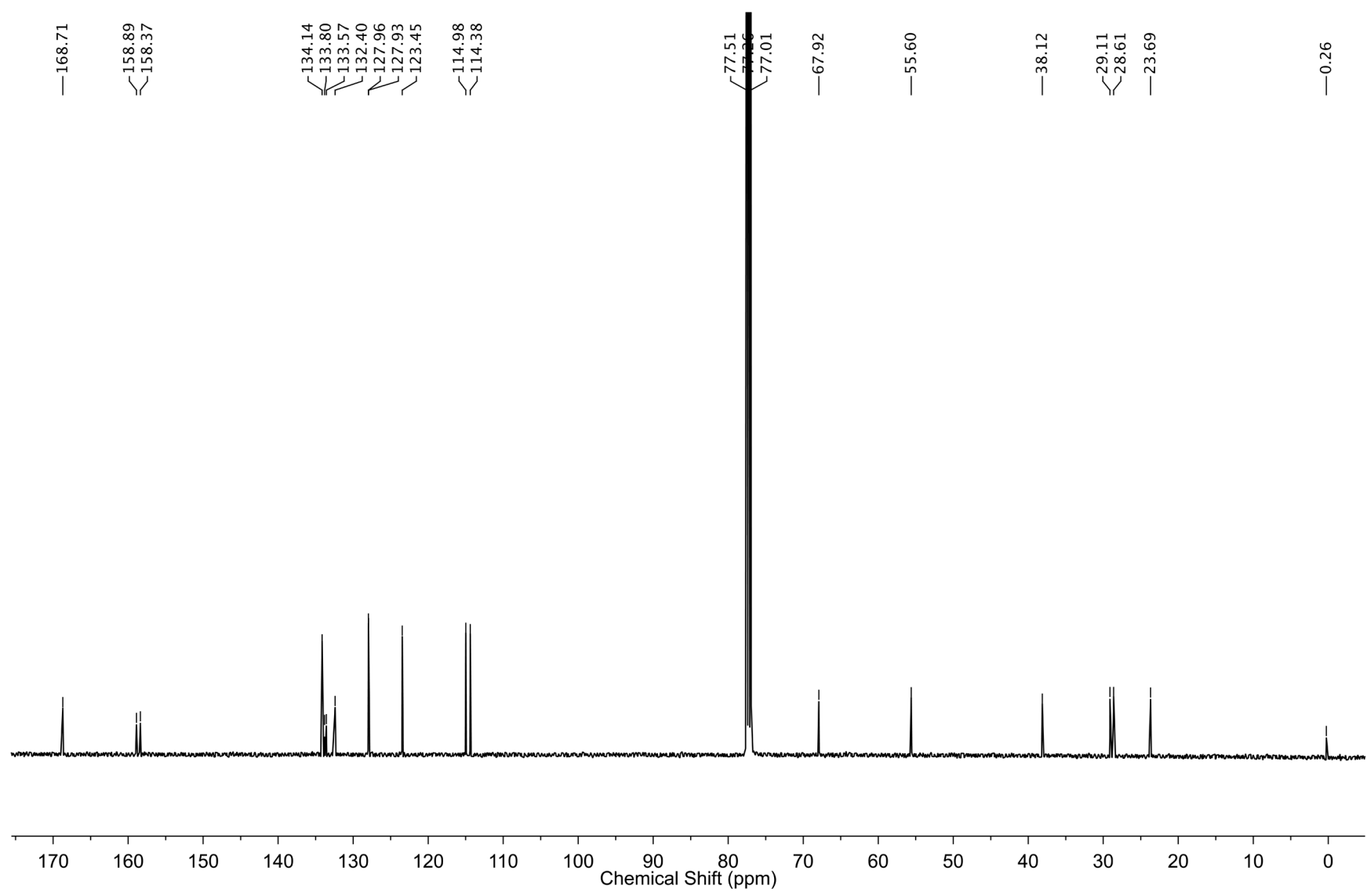
1-(10-(4'-Cyanobiphenyl-4-oxy)decylaminocarbonyl)-11bromoundecyl 11bromoundecanoate (3-37)



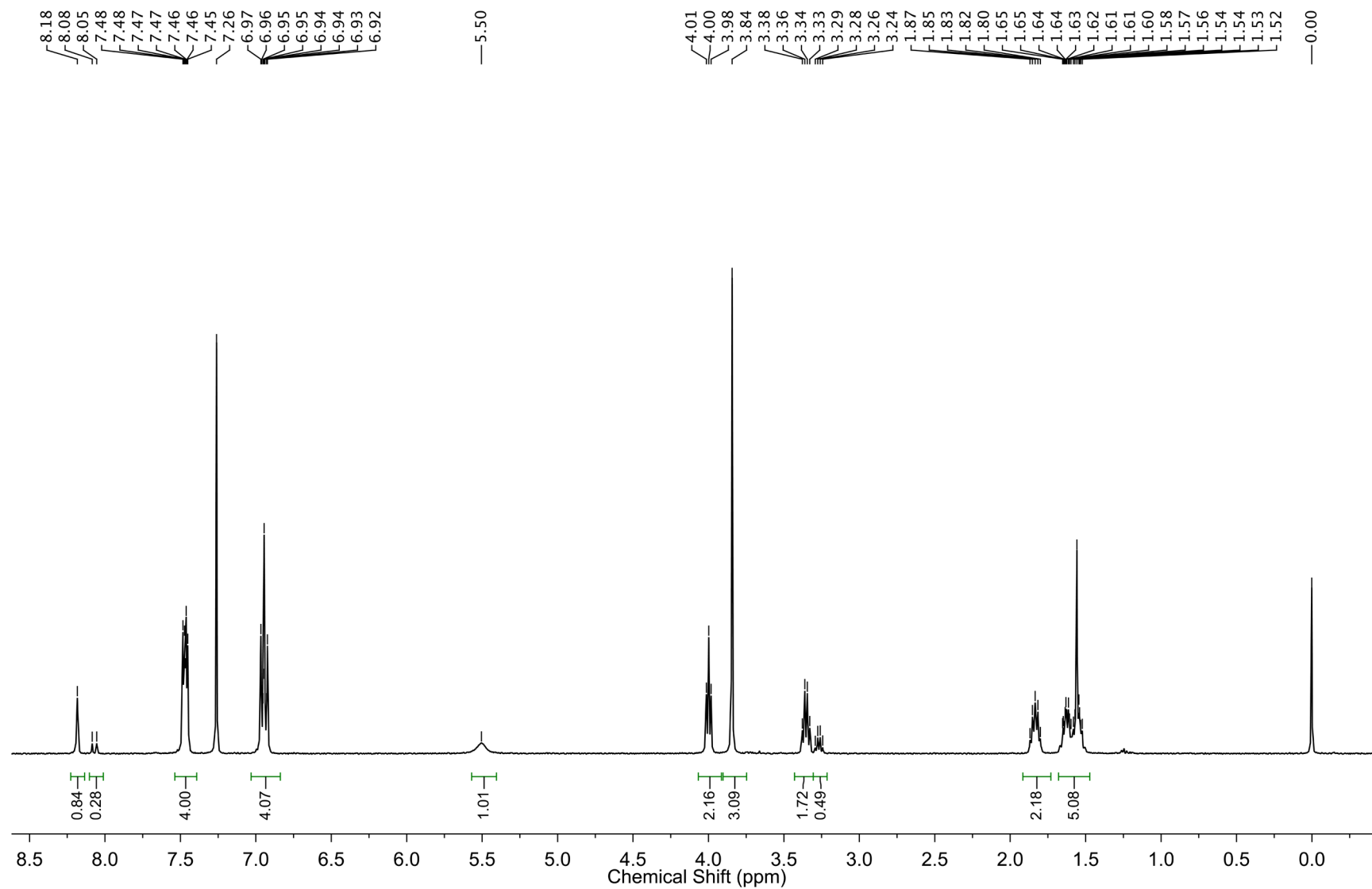
***N*-(5-(4'-Methoxybiphenyl-4-oxy)pentyl)phthalimide (3-51)**



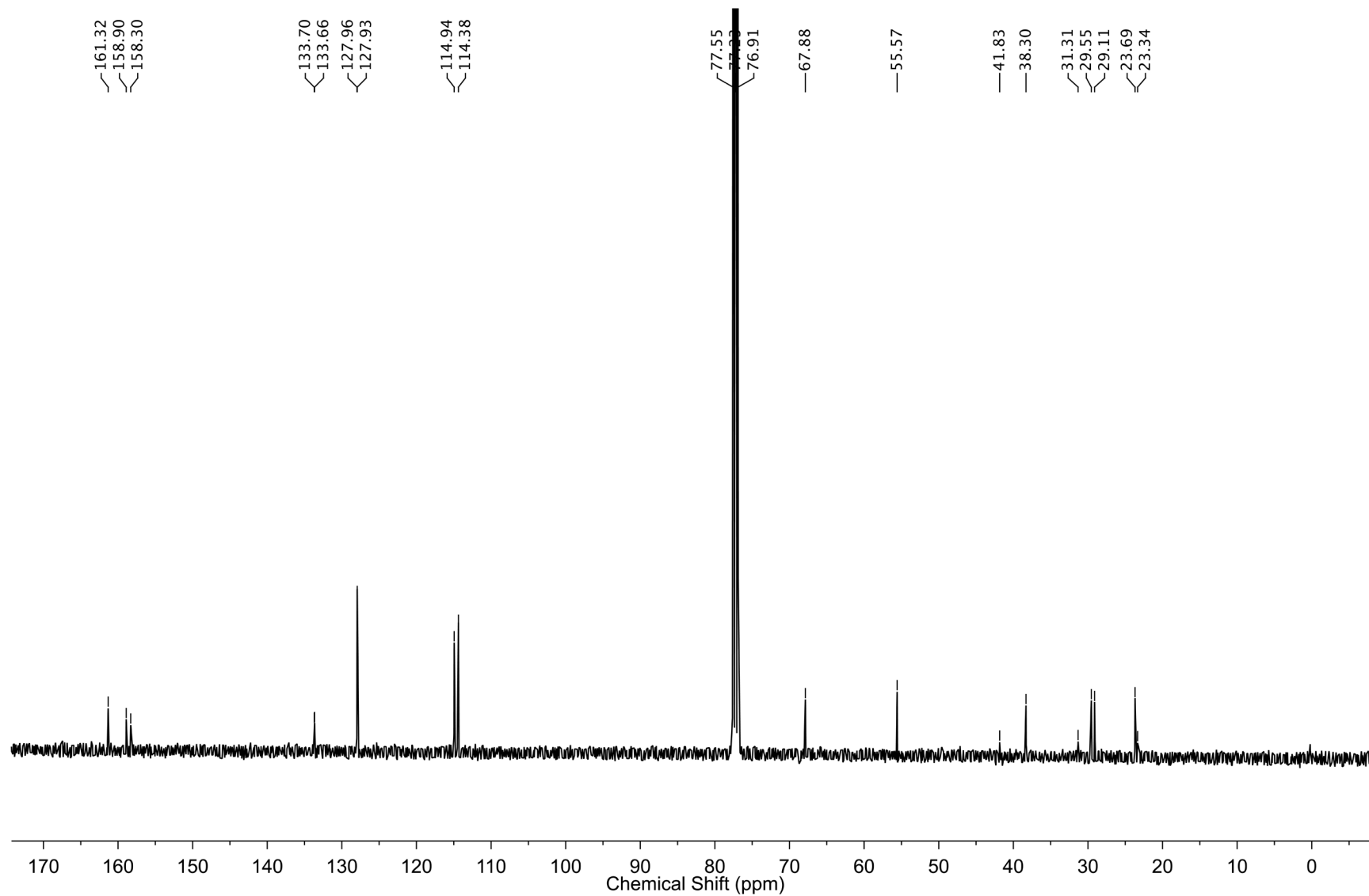
***N*-(5-(4'-Methoxybiphenyl-4-oxy)pentyl)phthalimide (3-51)**



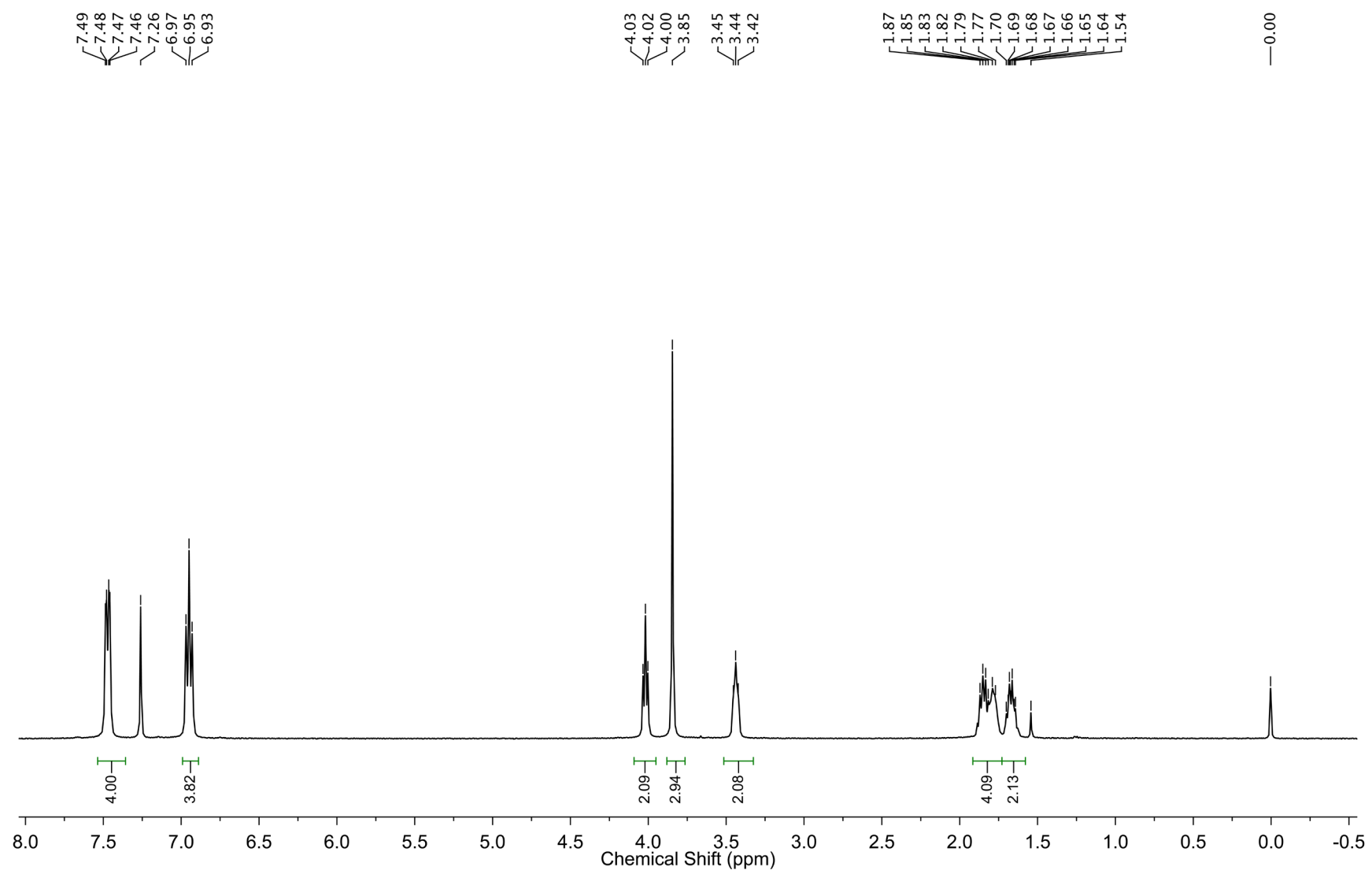
1-Formamido-5-(4'-methoxybiphenyl-4-oxy)pentane (3-53)



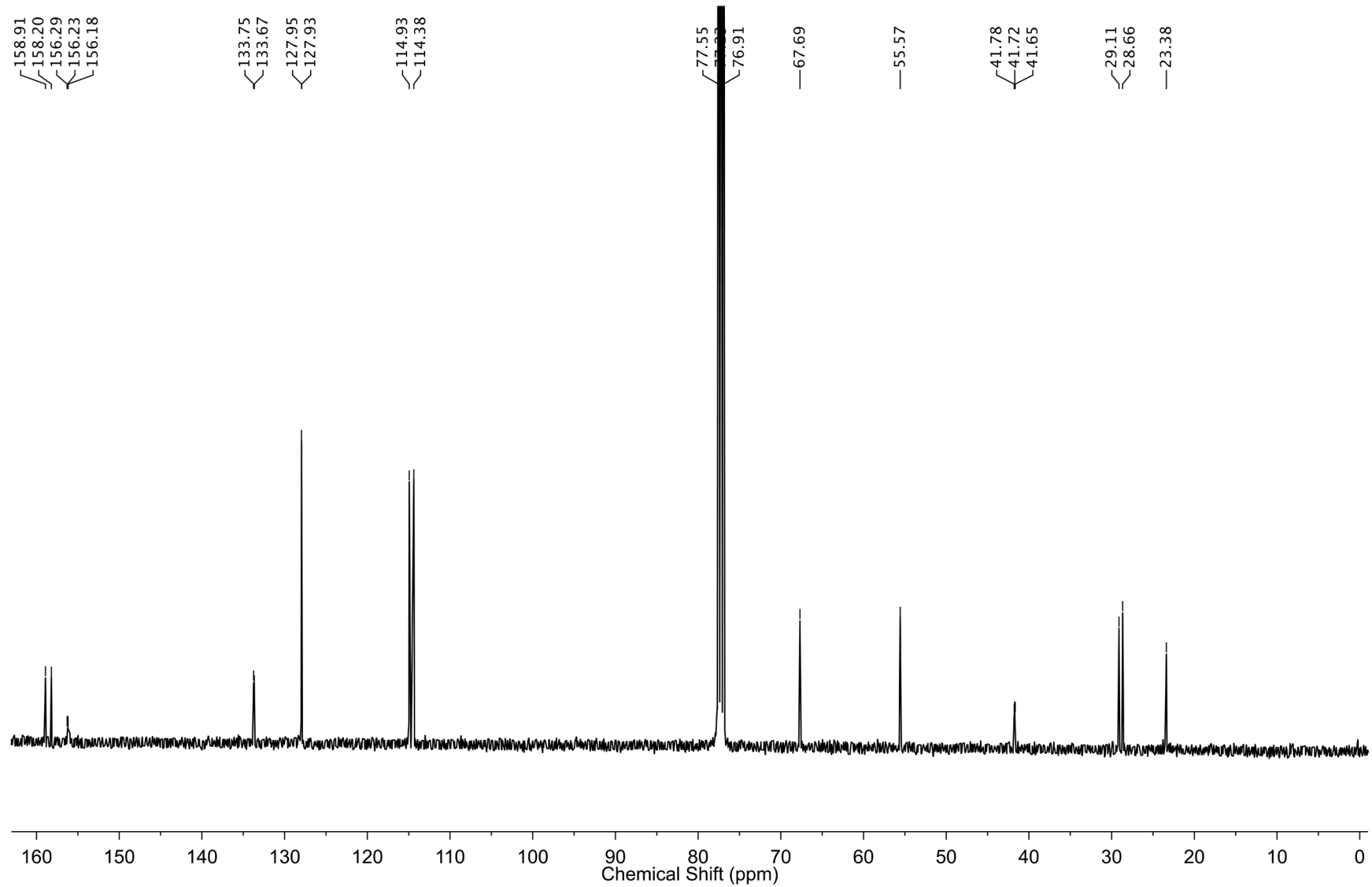
1-Formamido-5-(4'-methoxybiphenyl-4-oxy)pentane (3-53)



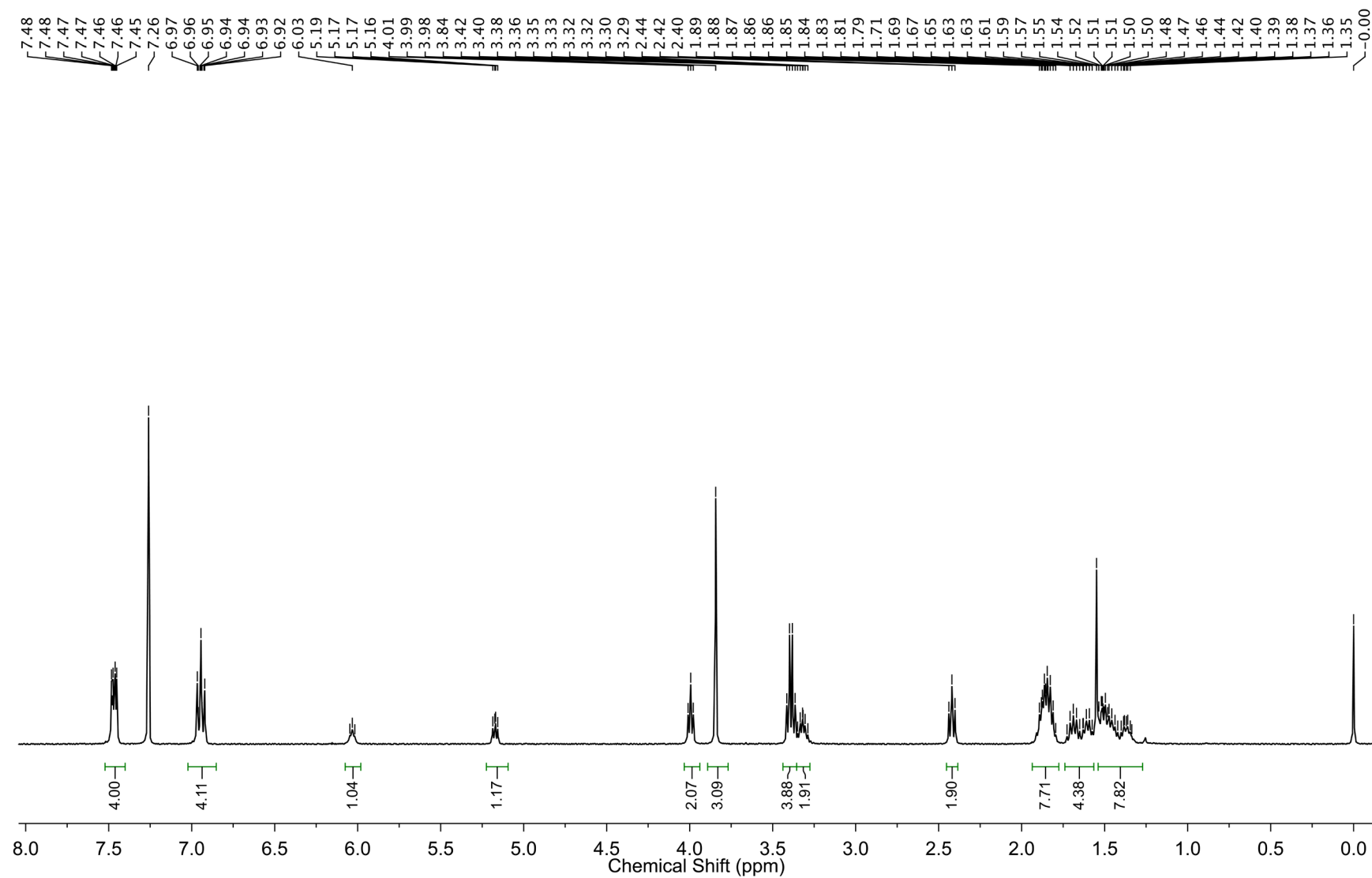
1-Isocyano-5-(4'-methoxybiphenyl-4-oxy)pentane (3-33)



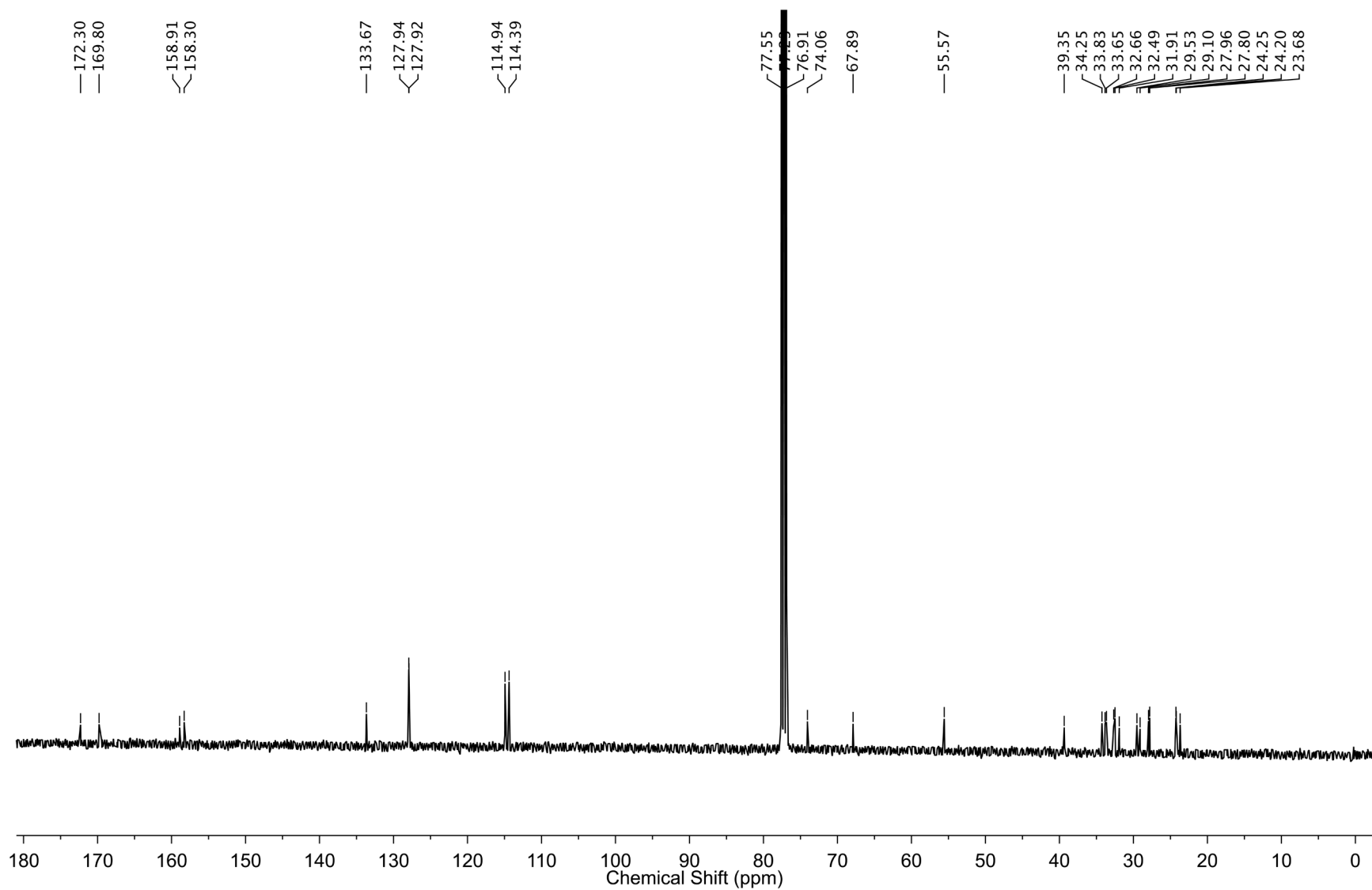
1-Isocyano-5-(4'-methoxybiphenyl-4-oxy)pentane (3-33)



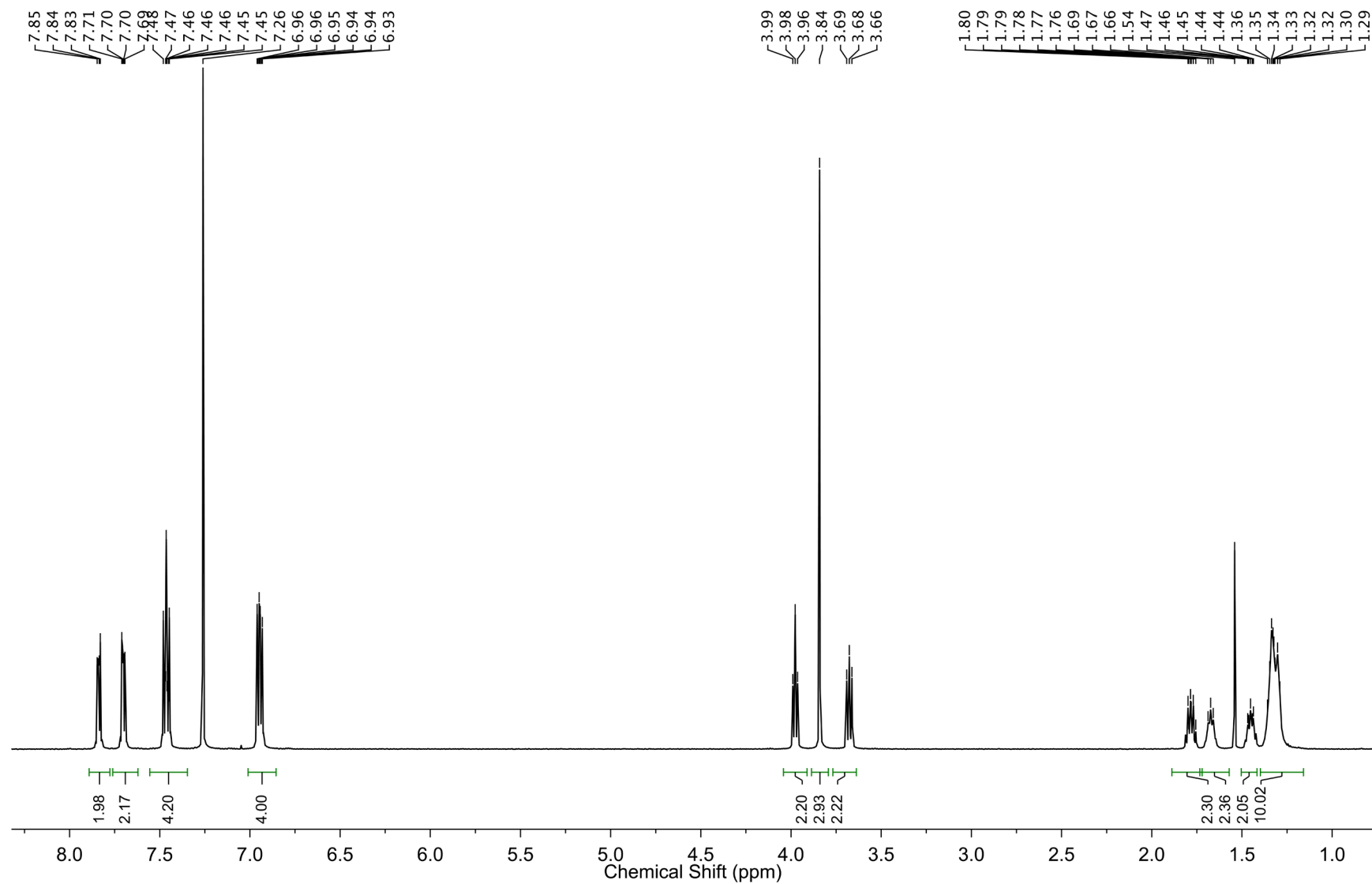
1-(5-(4'-((S)-2-Methylbutoxy)biphenyl-4-oxy)pentylaminocarbonyl)-6-bromohexyl 6-bromohexanoate (3-38)



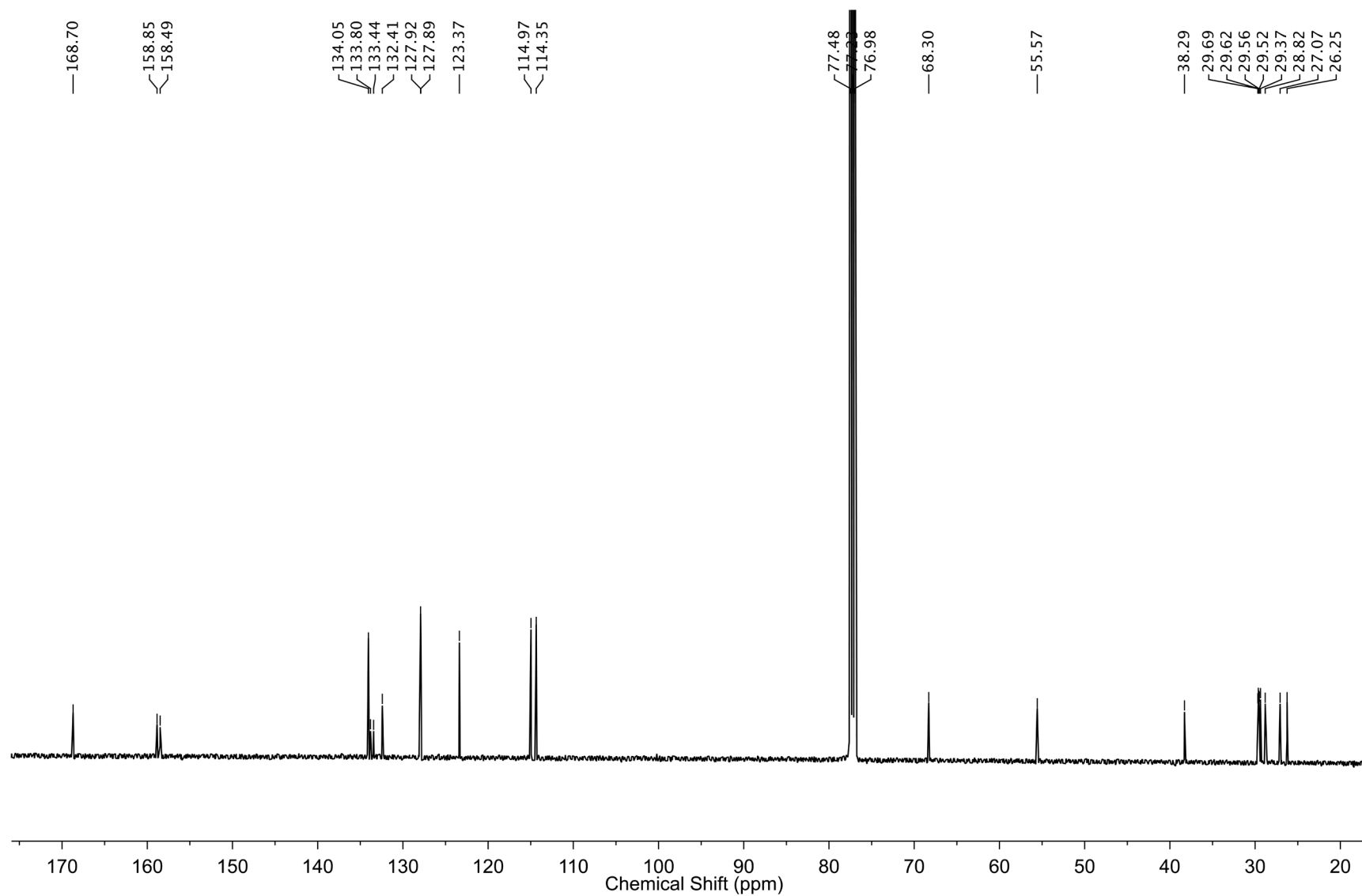
1-(5-(4'-((S)-2-Methylbutoxy)biphenyl-4-oxy)pentylaminocarbonyl)-6-bromohexyl 6-bromohexanoate (3-38)



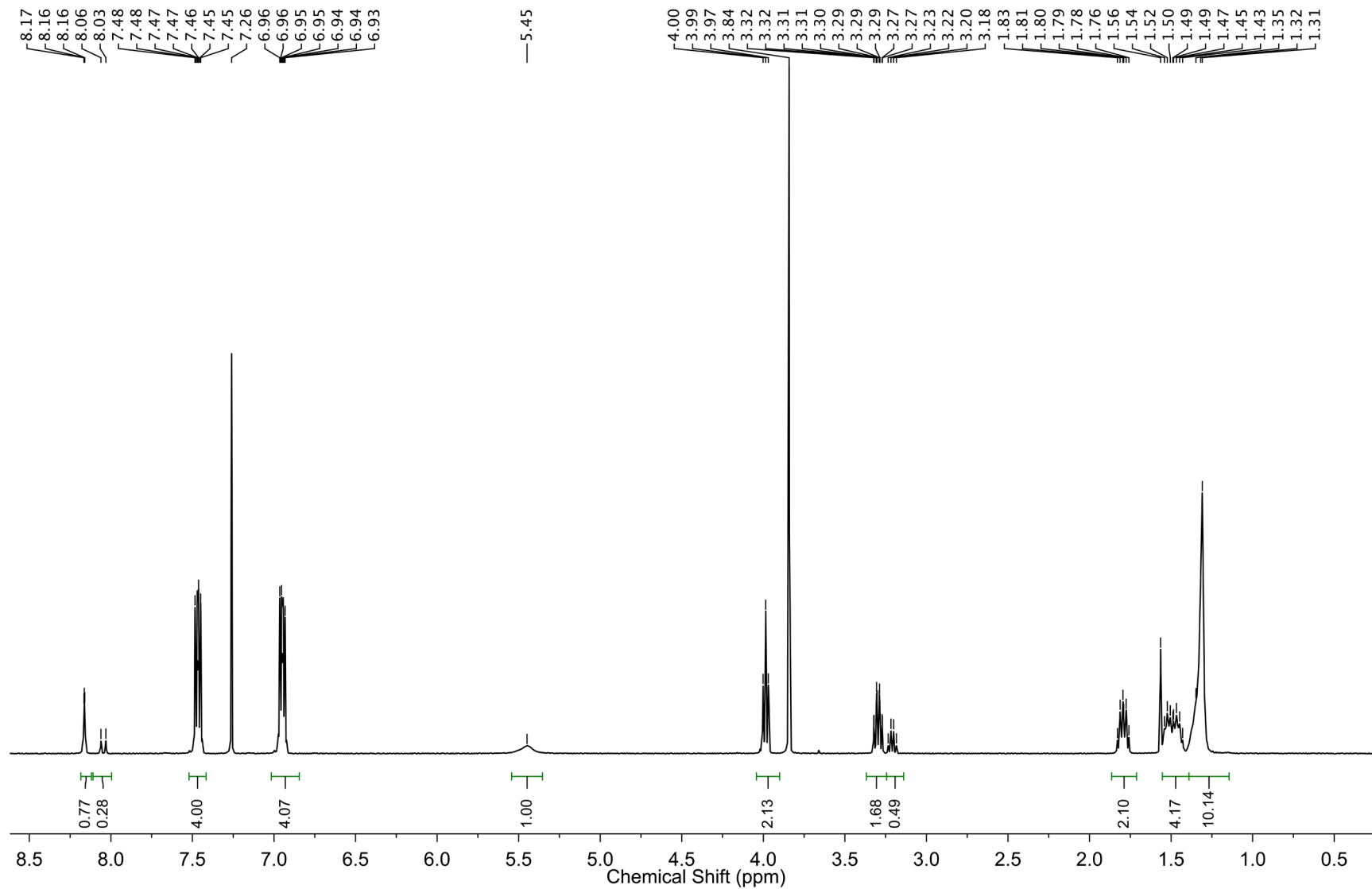
***N*-(10-(4'-methoxybiphenyl-4-oxy)decyl)phthalimide (3-54)**



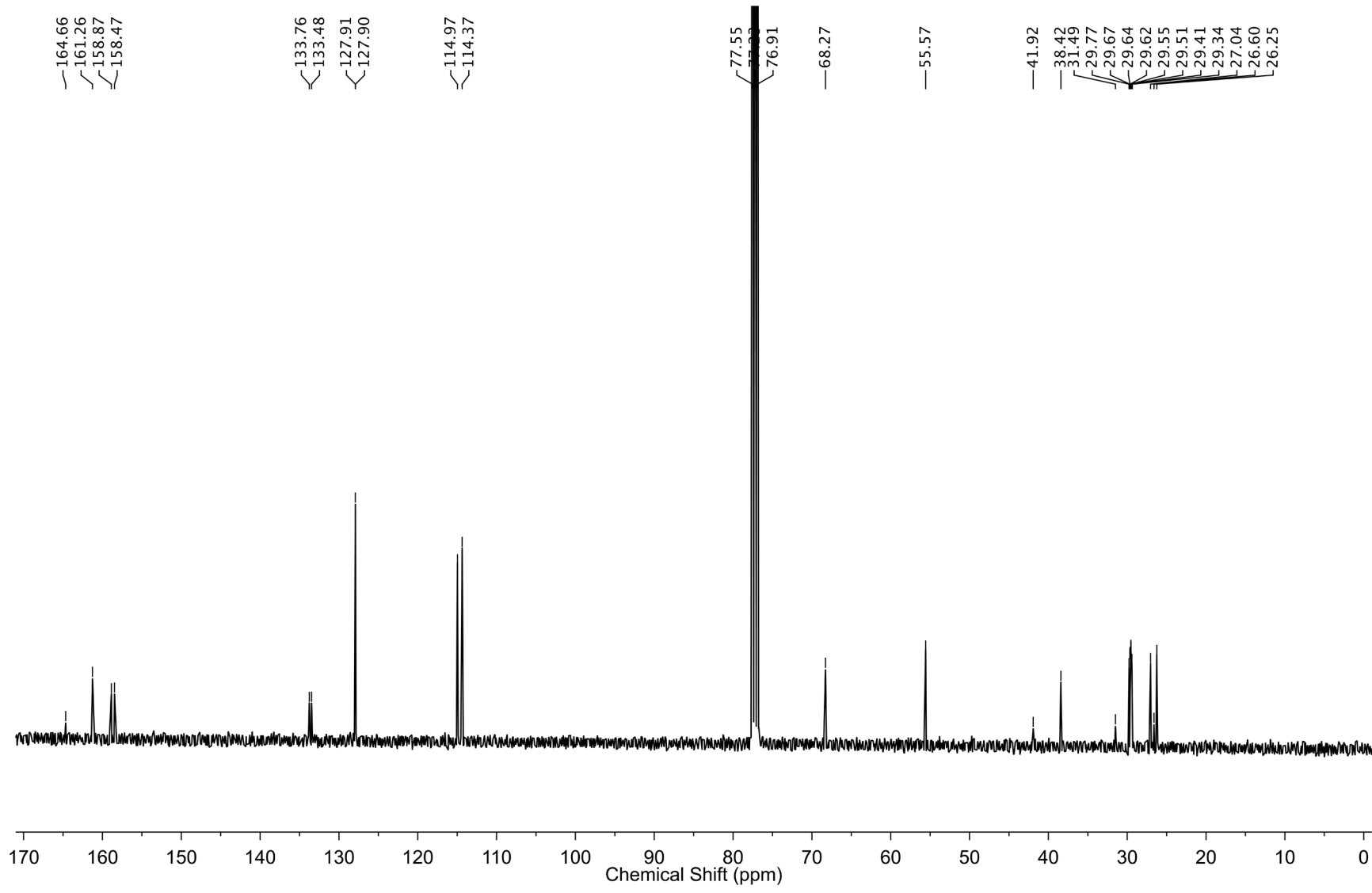
***N*-(10-(4'-methoxybiphenyl-4-oxy)decyl)phthalimide (3-54)**



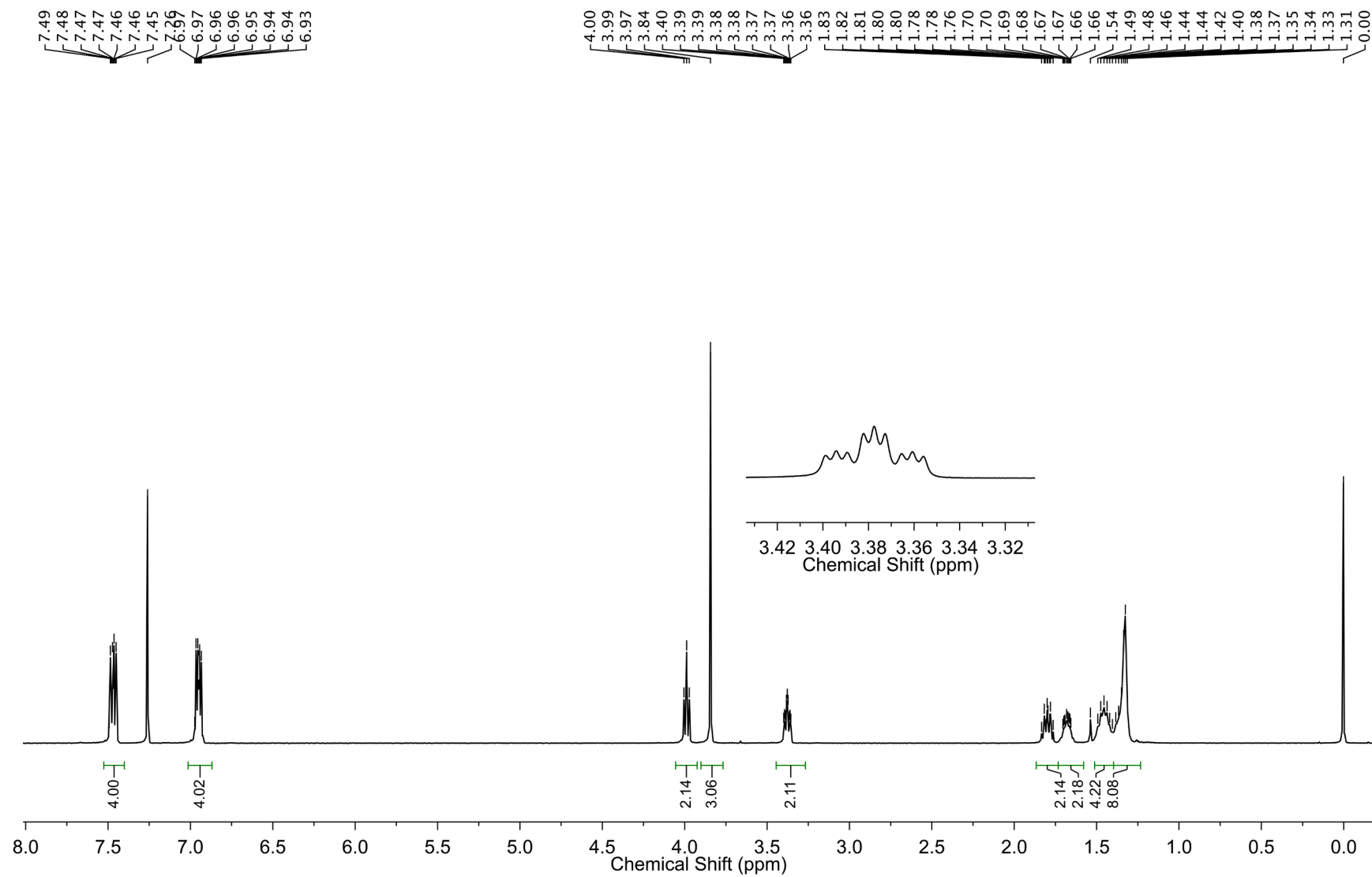
1-Formamido-10-(4'-methoxybiphenyl-4-oxy)decane (3-56)



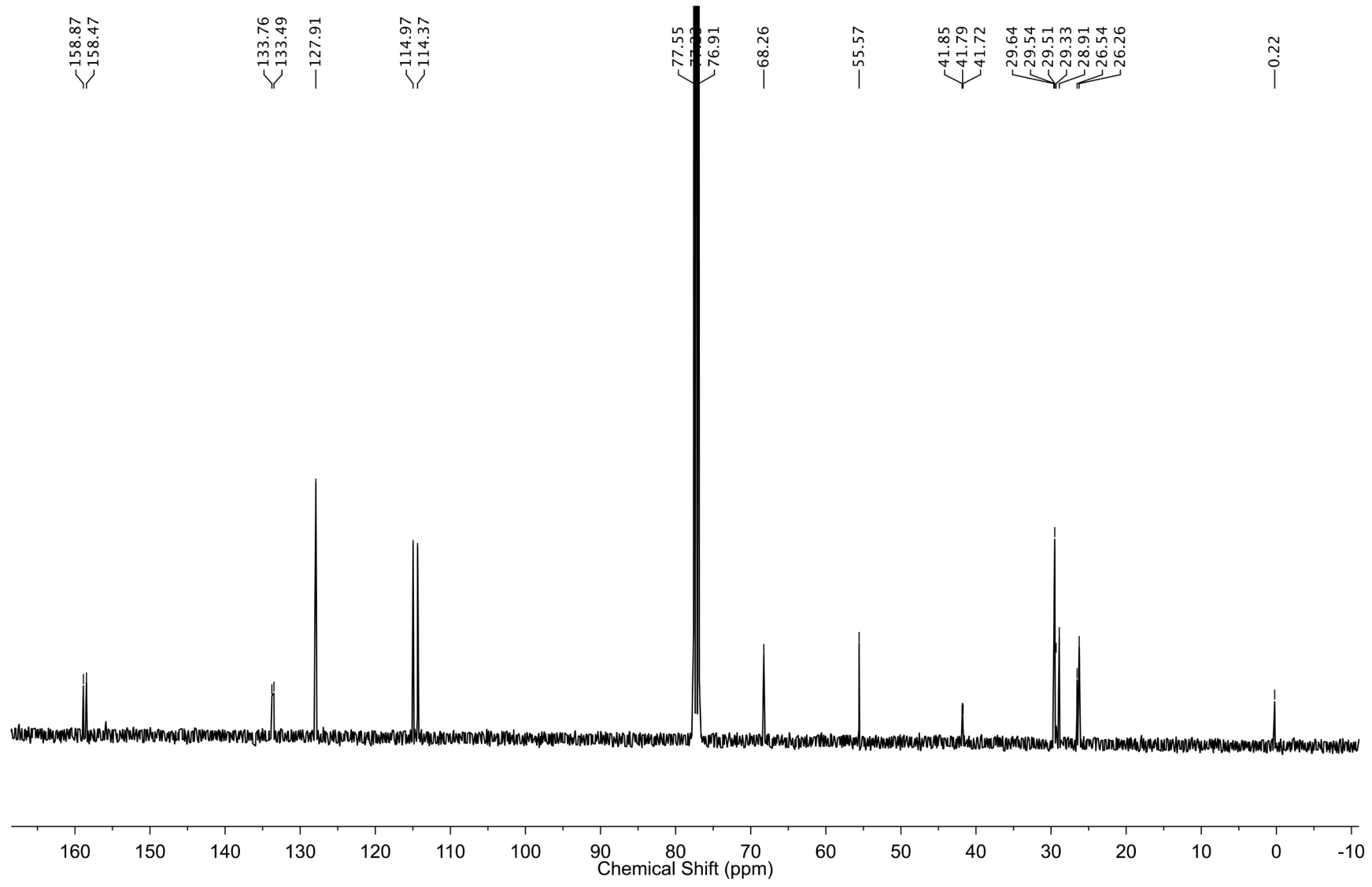
1-Formamido-10-(4'-methoxybiphenyl-4-oxy)decane (3-56)



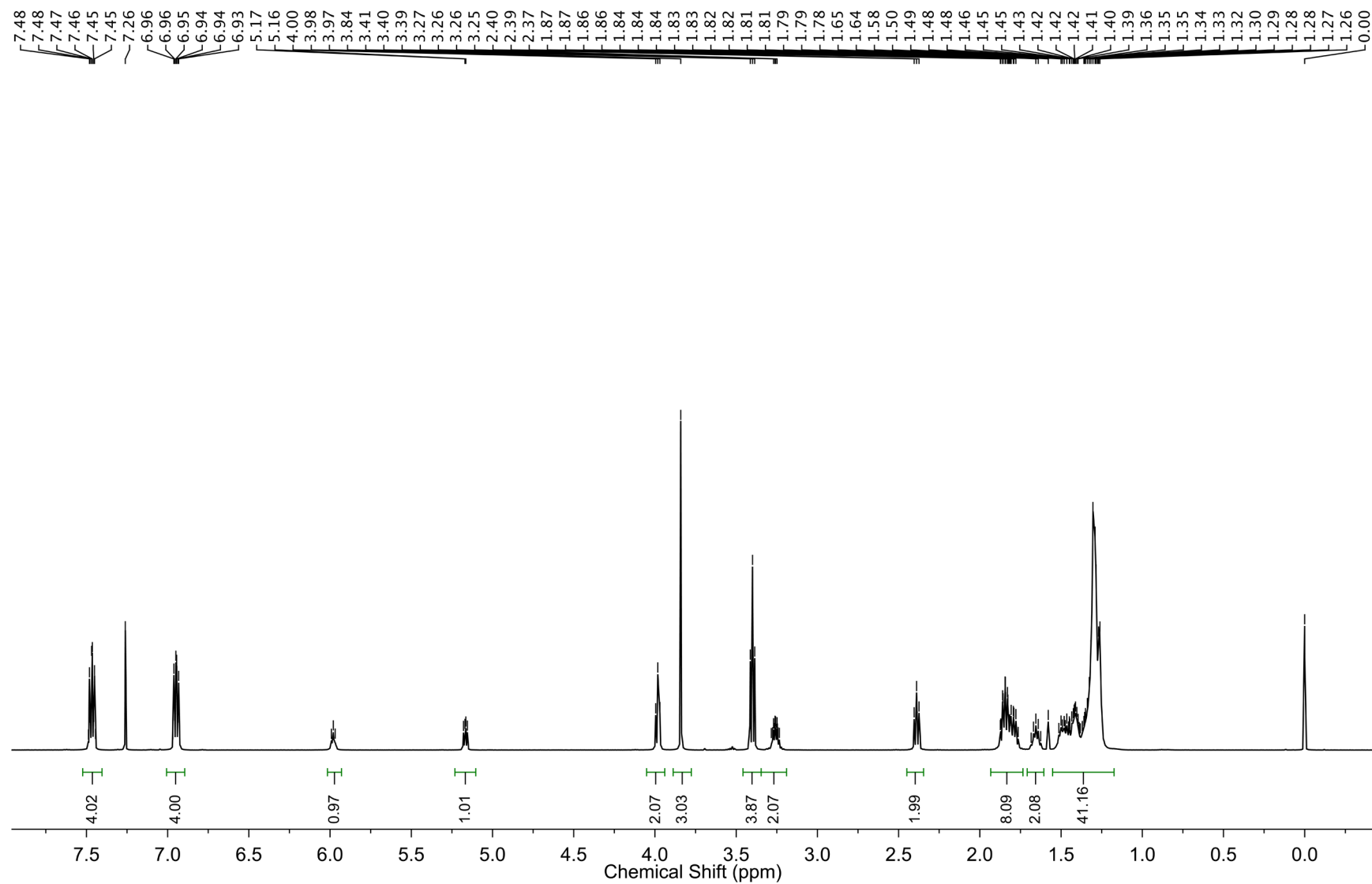
1-Isocyano-10-(4'-methoxybiphenyl-4-oxy)decane (3-34)



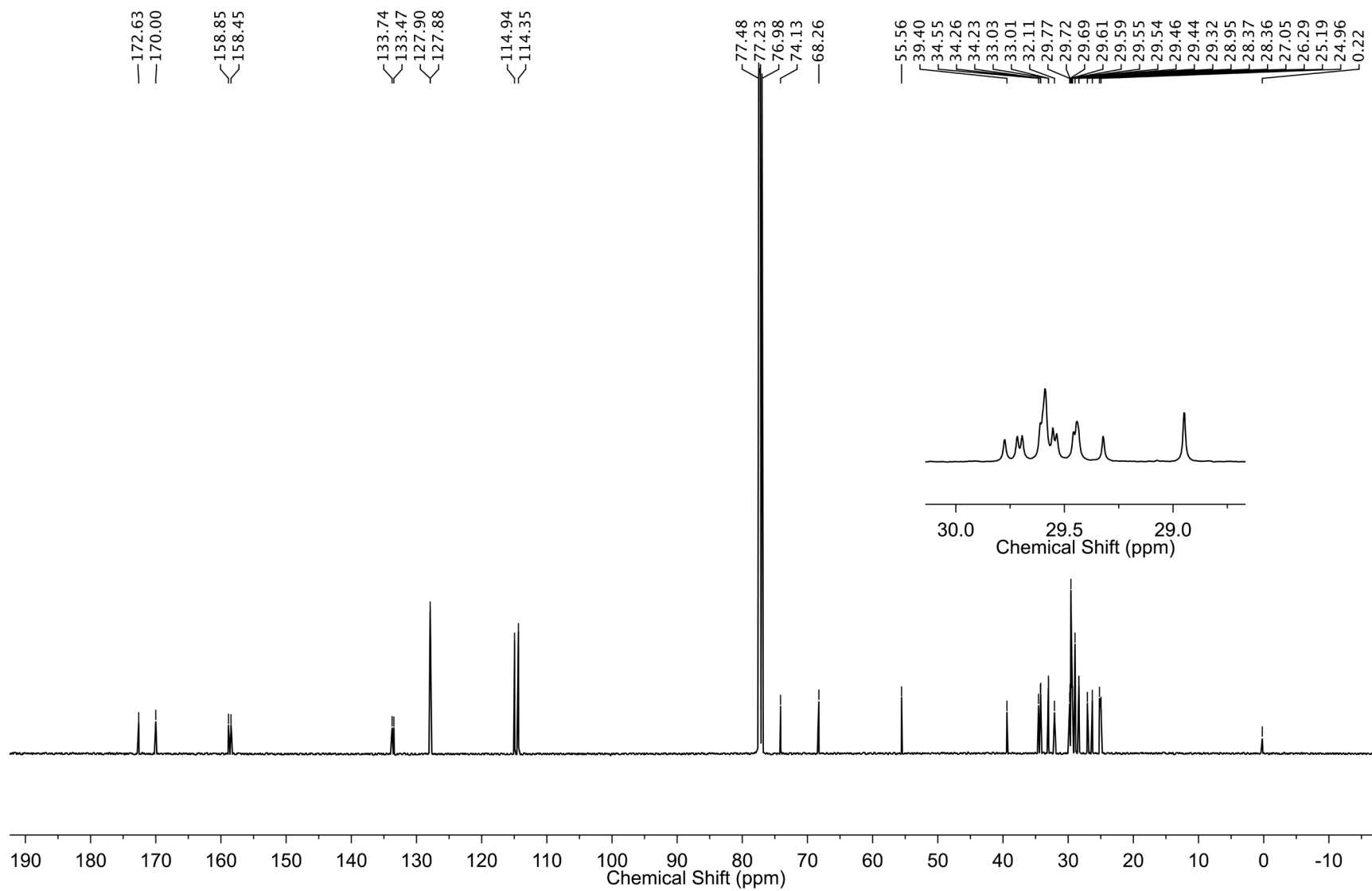
1-Isocyano-10-(4'-methoxybiphenyl-4-oxy)decane (3-34)



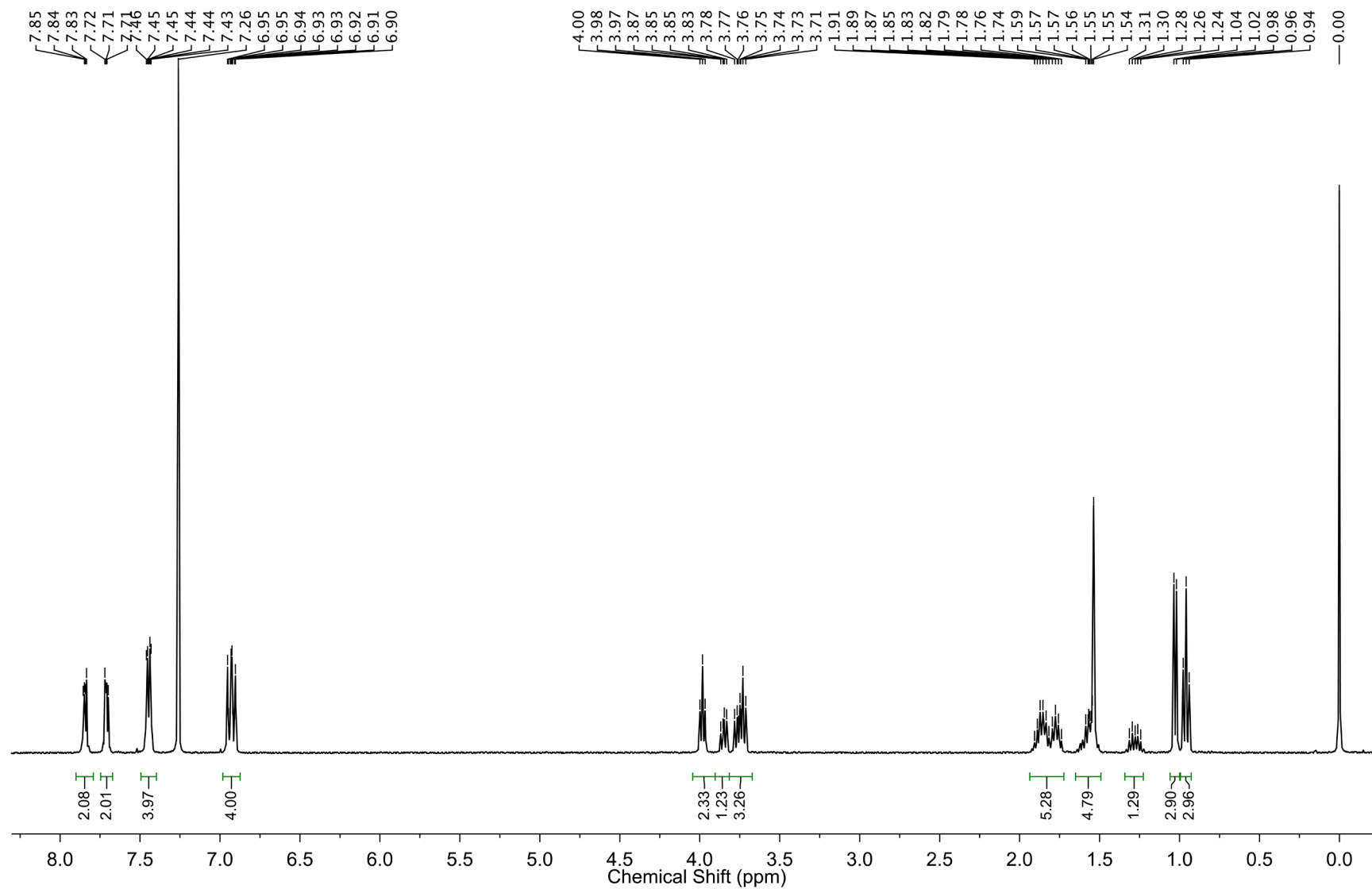
1-(10-(4'-Methoxybiphenyl-4-oxo)decylaminocarbonyl)-11-bromoundecyl 11-bromoundecanoate (3-39)



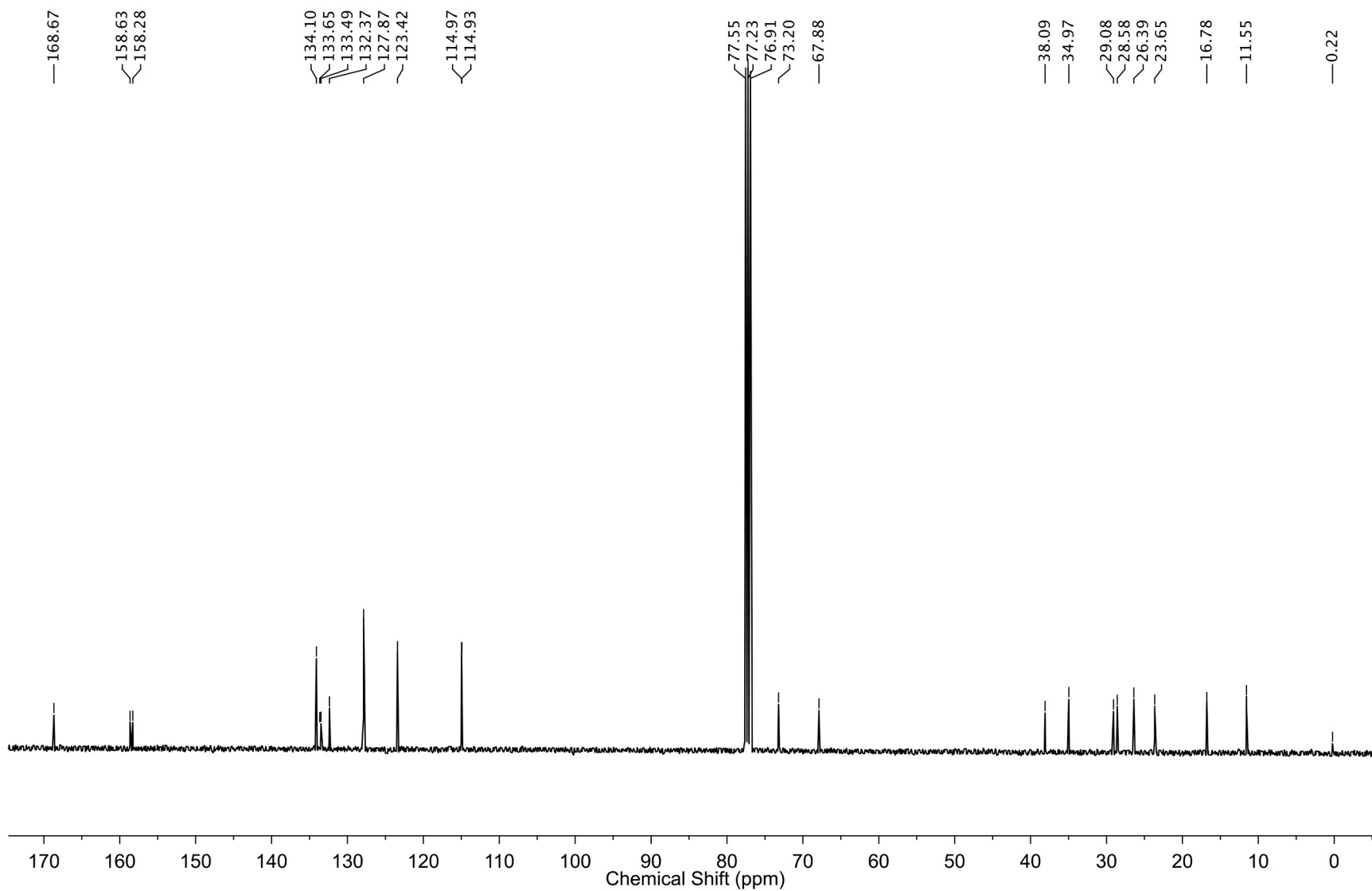
1-(10-(4'-Methoxybiphenyl-4-oxy)decylaminocarbonyl)-11-bromoundecyl 11-bromoundecanoate (3-39)



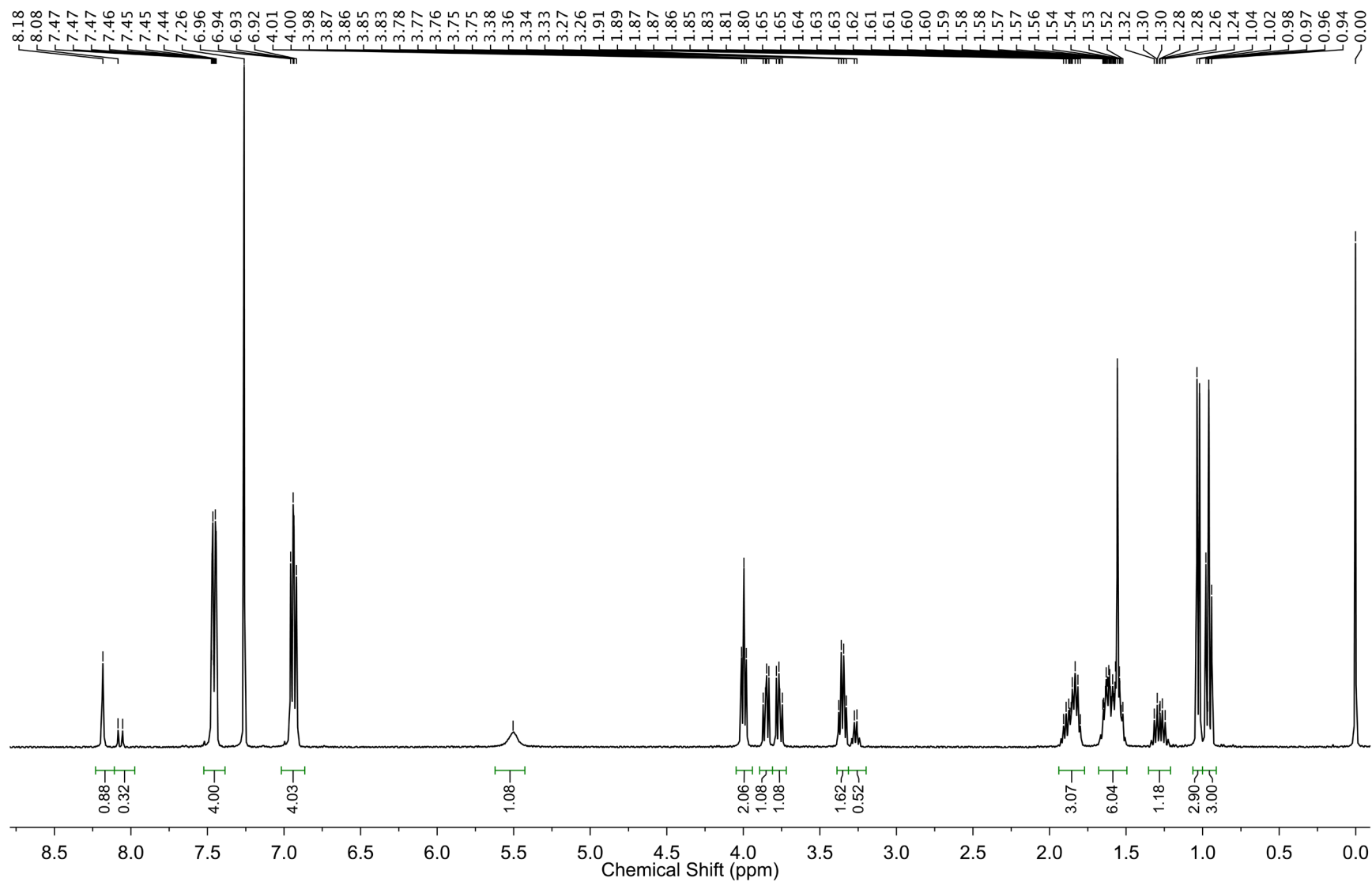
***N*-[5-(4'-((*S*)-2-methylbutoxy)biphenyl-4-oxypentyl)phthalimide] (3-57)**



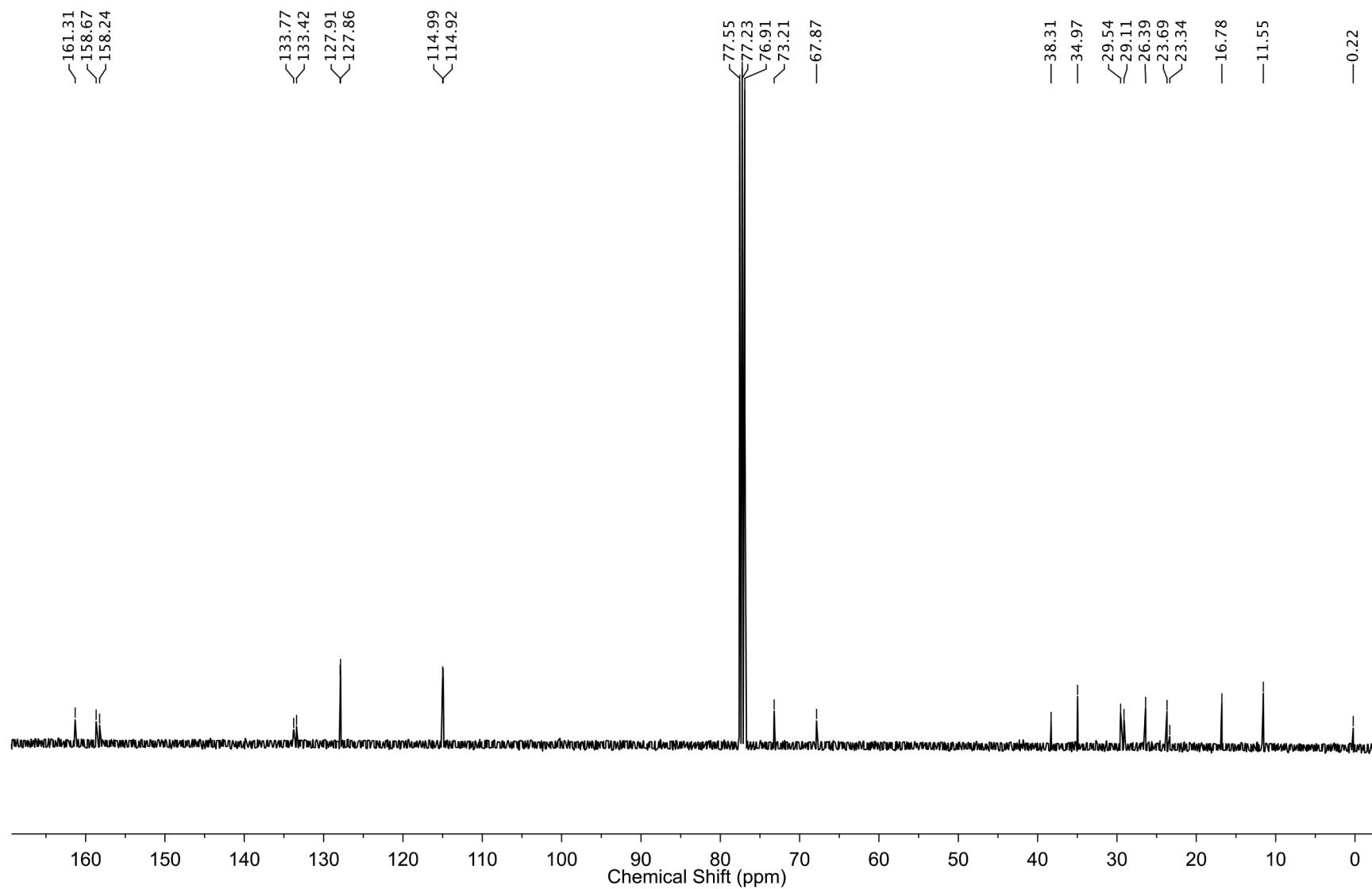
***N*-[5-(4'-((*S*)-2-methylbutoxy)biphenyl-4-oxypentyl)phthalimide (3-57)**



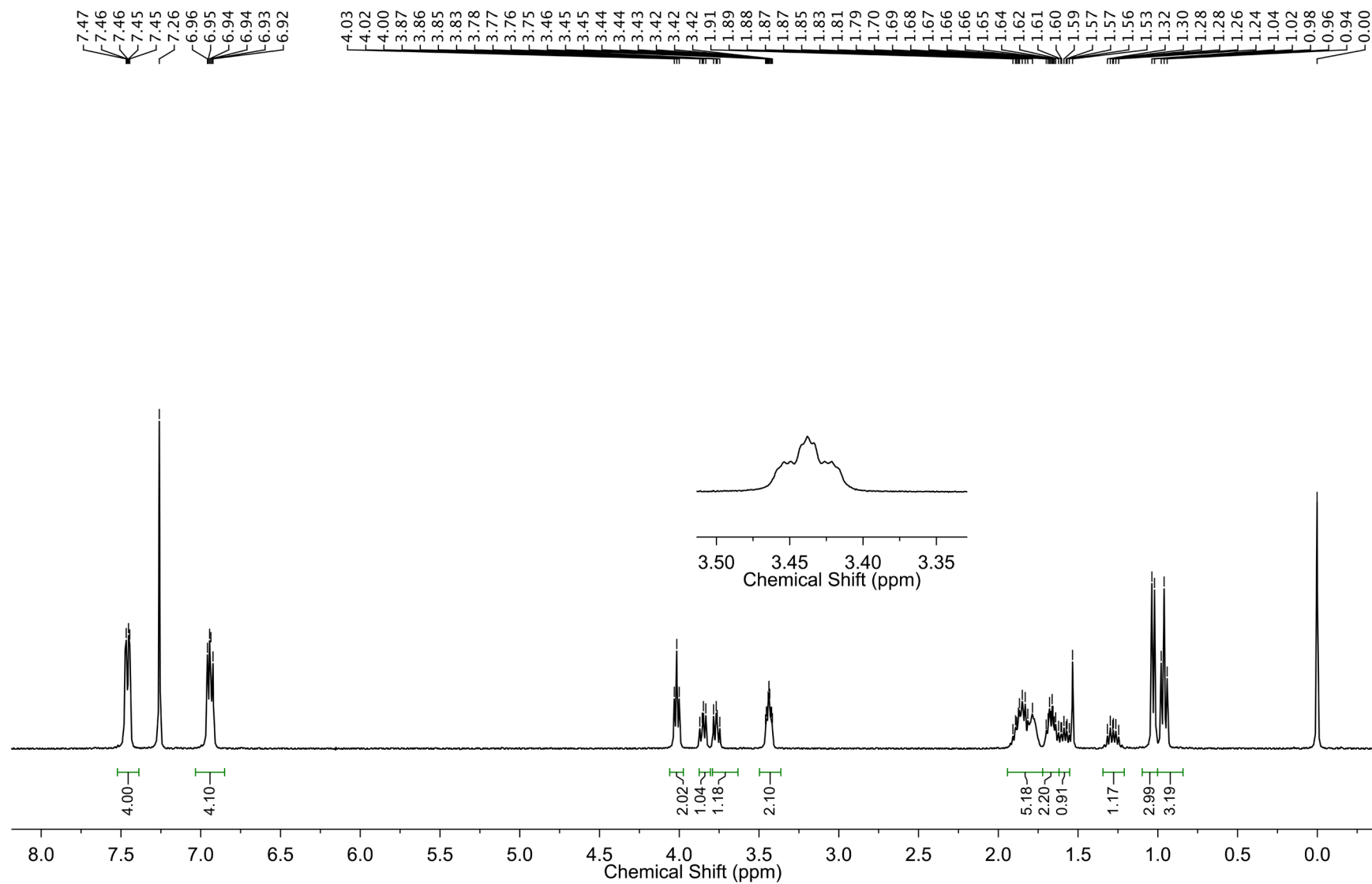
1-Formamido-5-(4'-((S)-2-methylbutoxy)biphenyl-4-oxy)pentane (3-59)



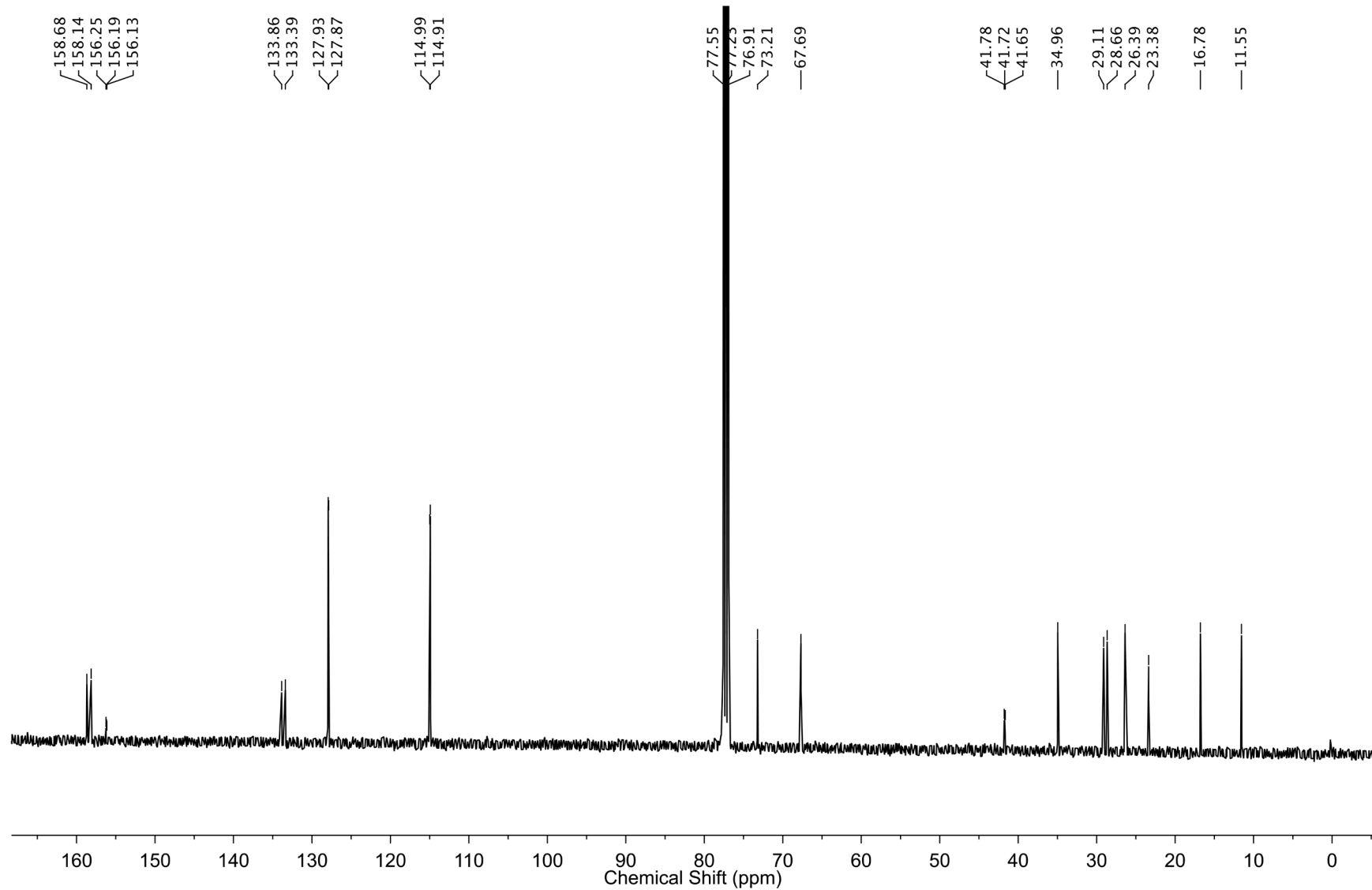
1-Formamido-5-(4'-((*S*)-2-methylbutoxy)biphenyl-4-oxy)pentane (3-59)



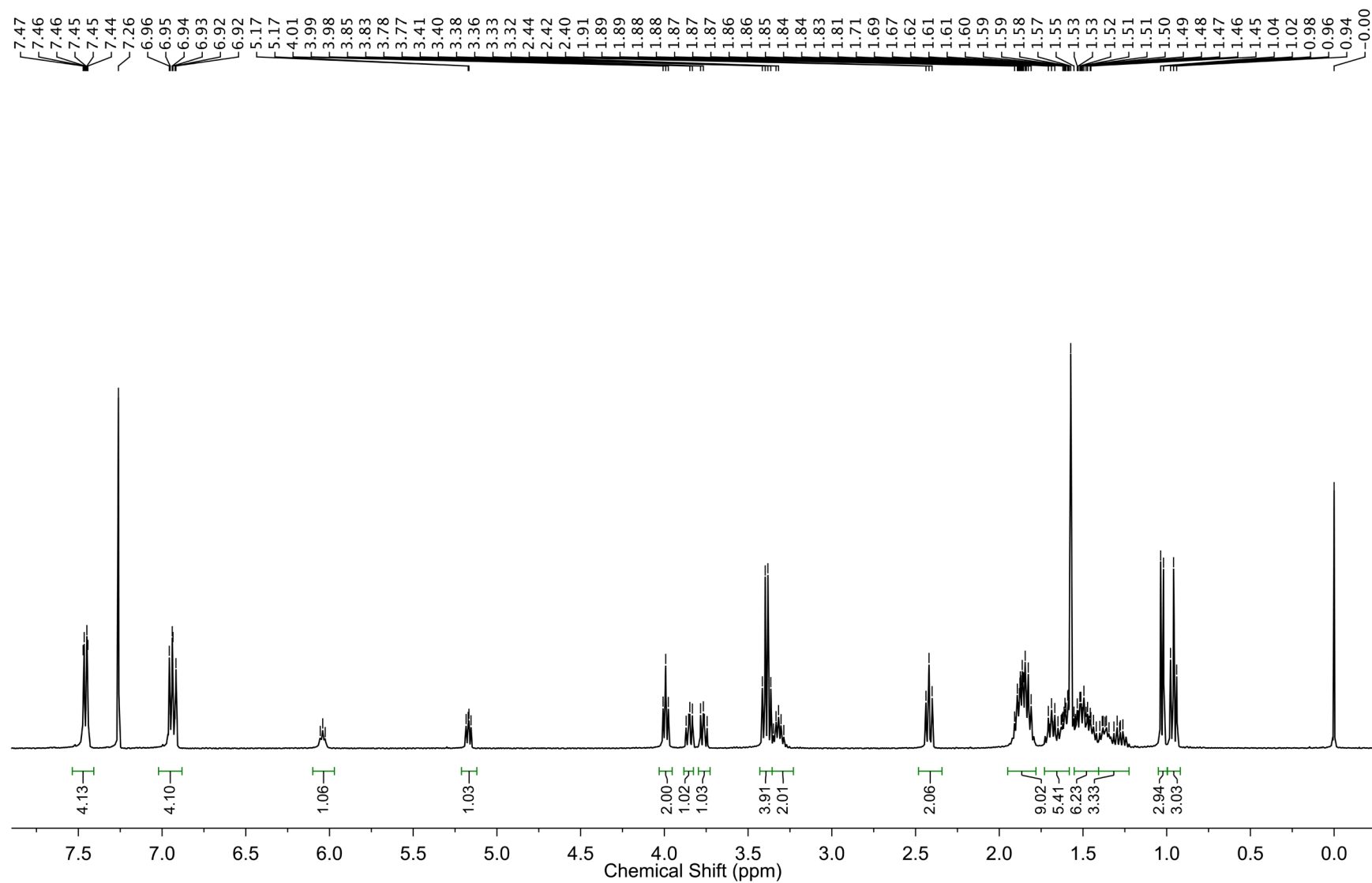
1-Isocyano-5-(4'-((S)-2-methylbutoxy)biphenyl-4-oxy)pentane (3-35)



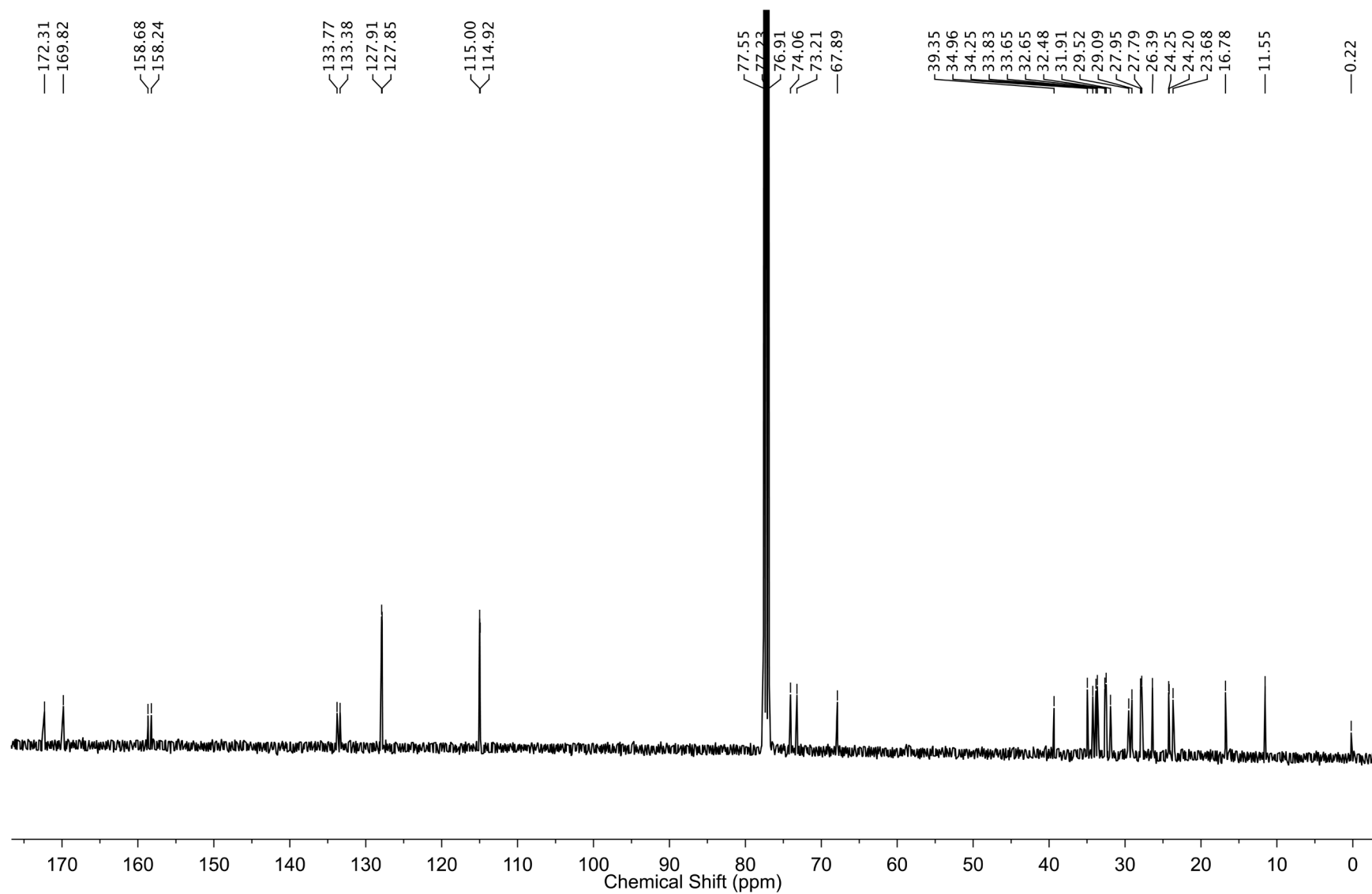
1-Isocyano-5-(4'-((*S*)-2-methylbutoxy)biphenyl-4-oxy)pentane (3-35)



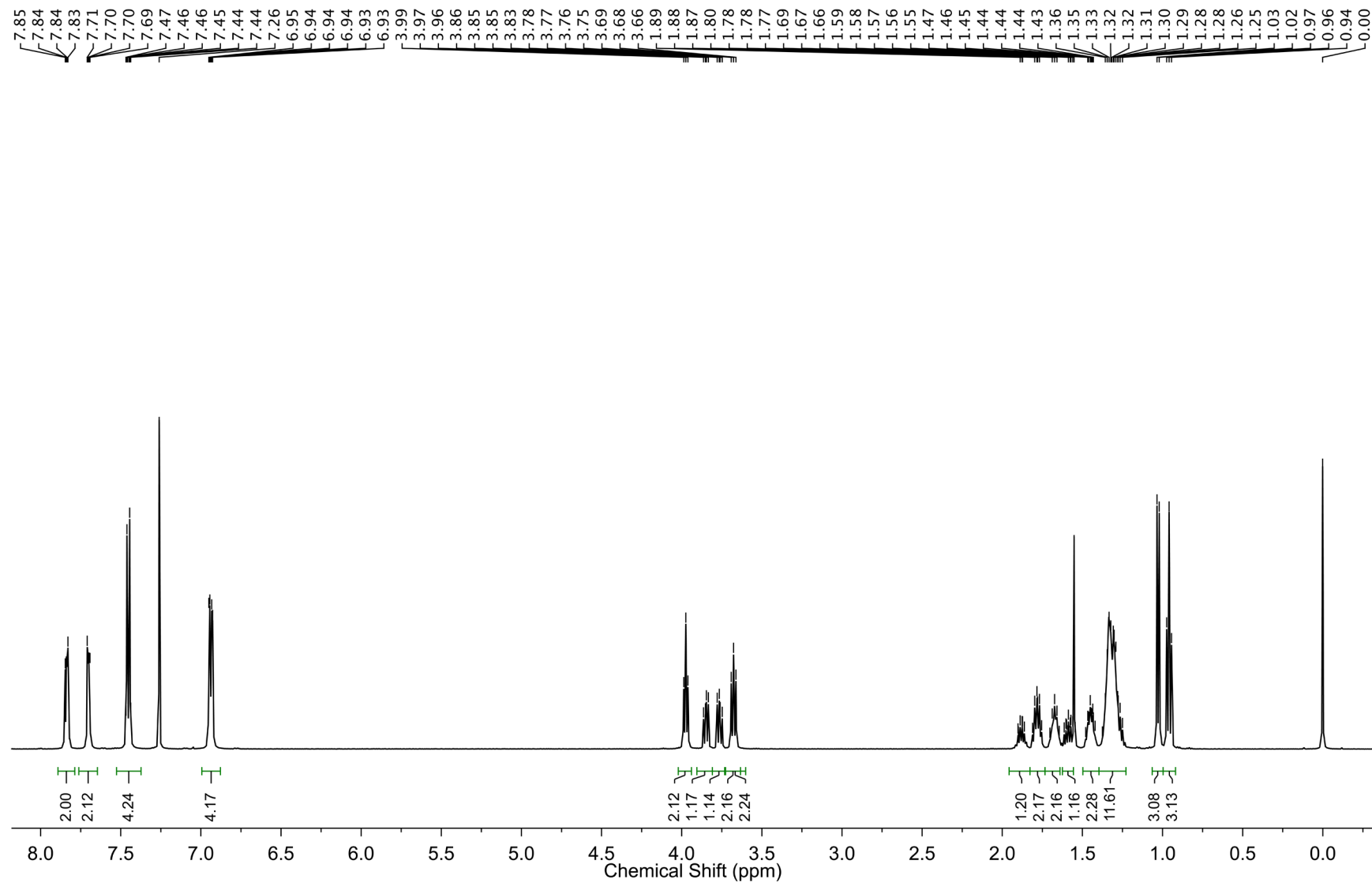
1-(5-(4'-((S)-2-Methylbutoxy)biphenyl-4-oxy)pentylaminocarbonyl)-6-bromohexyl 6-bromohexanoate (3-40)



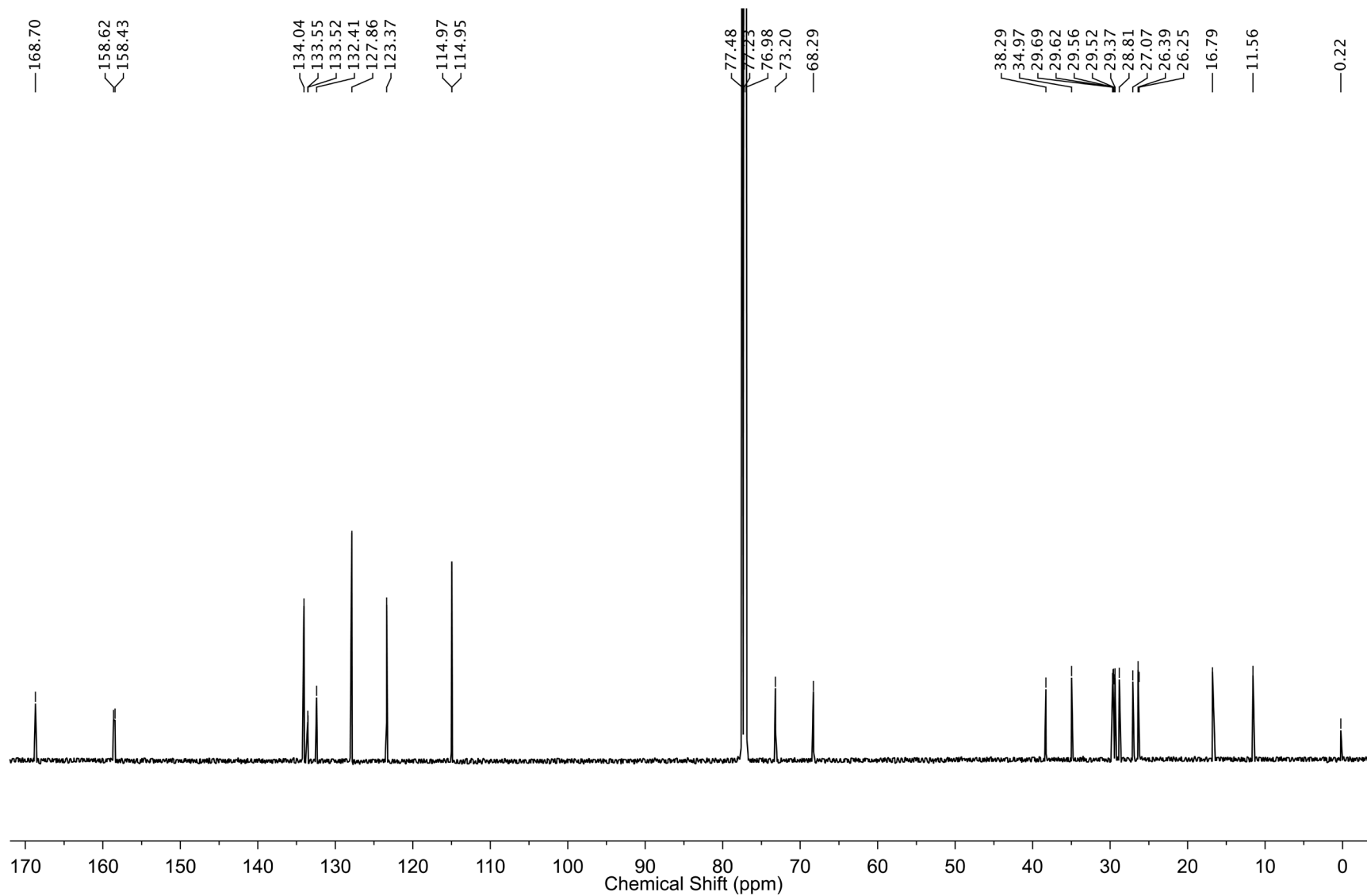
1-(5-(4'-((S)-2-Methylbutoxy)biphenyl-4-oxy)pentylaminocarbonyl)-6-bromohexyl 6-bromohexanoate (3-40)



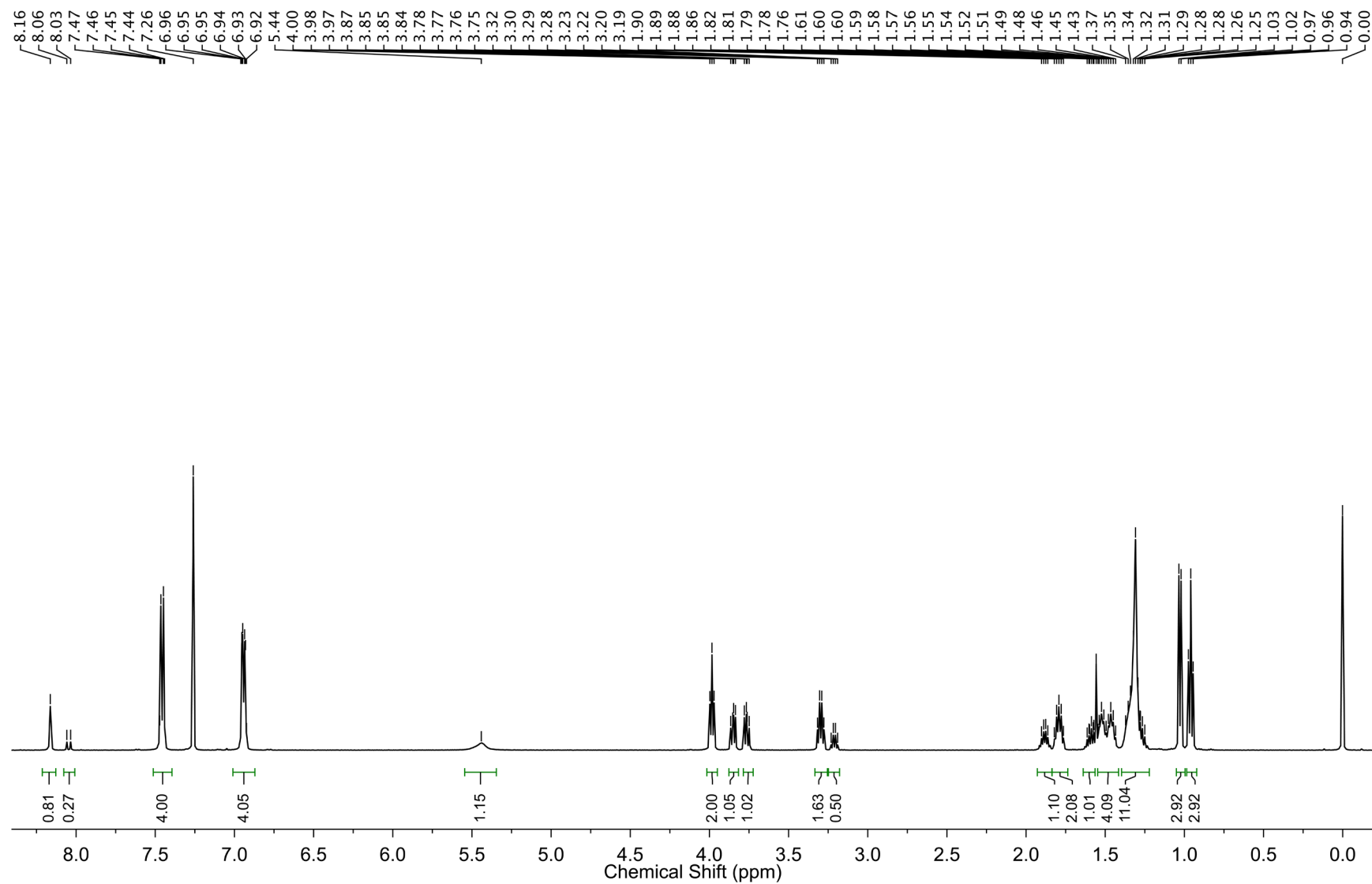
***N*-[10-(4'-((*S*)-2-methylbutoxy)biphenyl-4-oxy)decyl]phthalimide (3-60)**



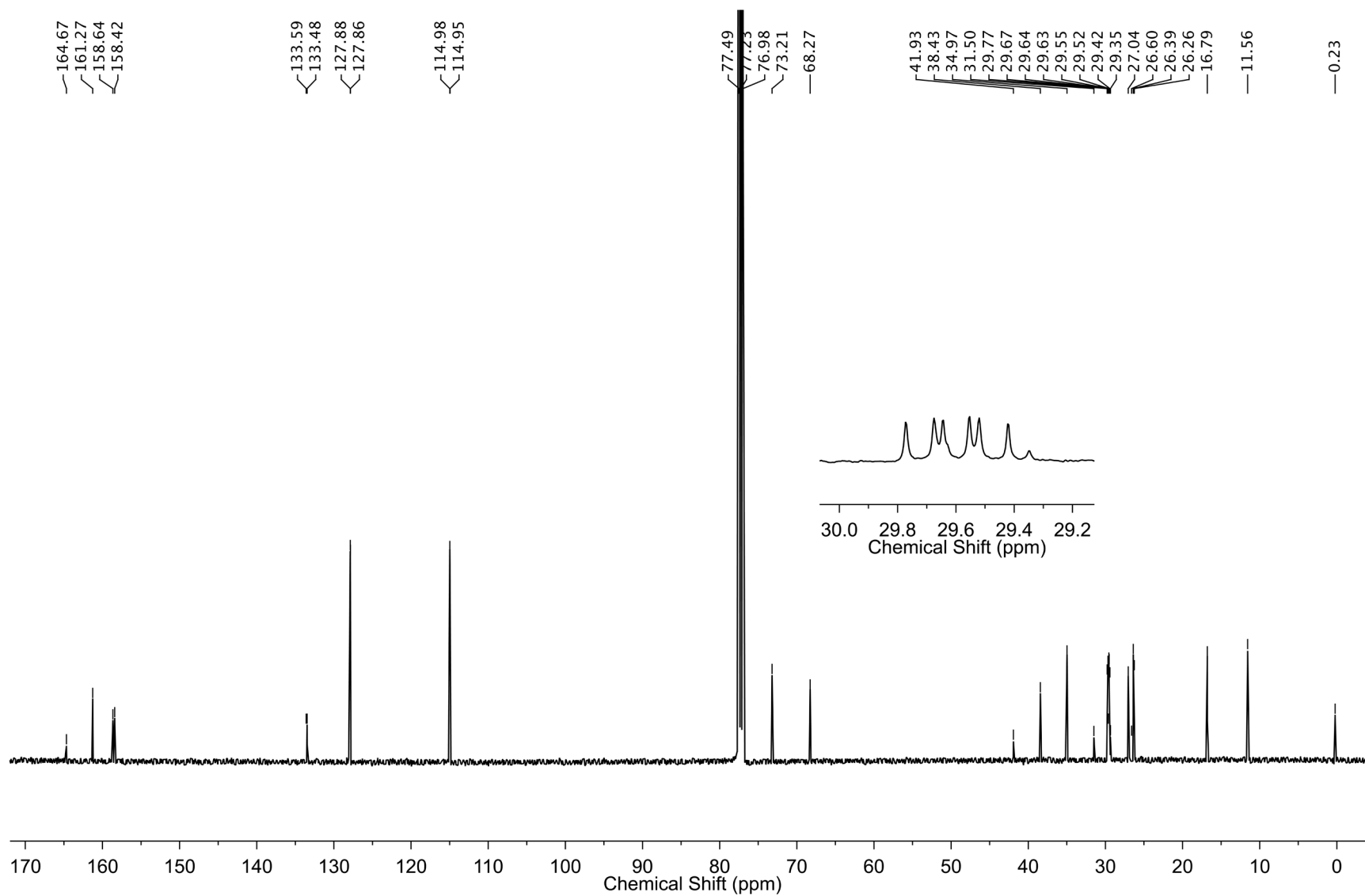
***N*-[10-(4'-((*S*)-2-methylbutoxy)biphenyl-4-oxy)decyl]phthalimide (3-60)**



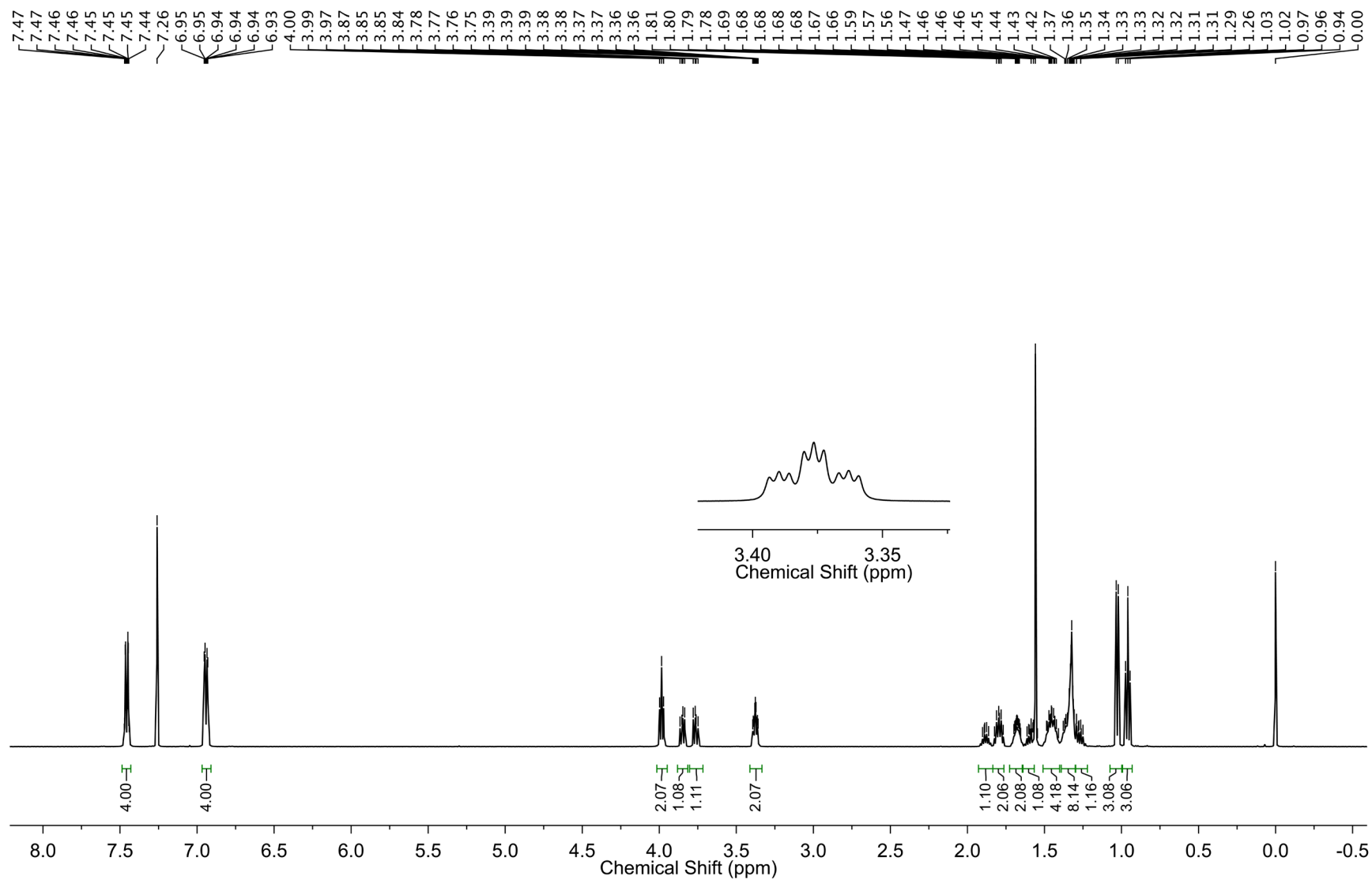
1-Formamido-10-(4'-((S)-2-methylbutoxy)biphenyl-4-oxy)decane (3-62)



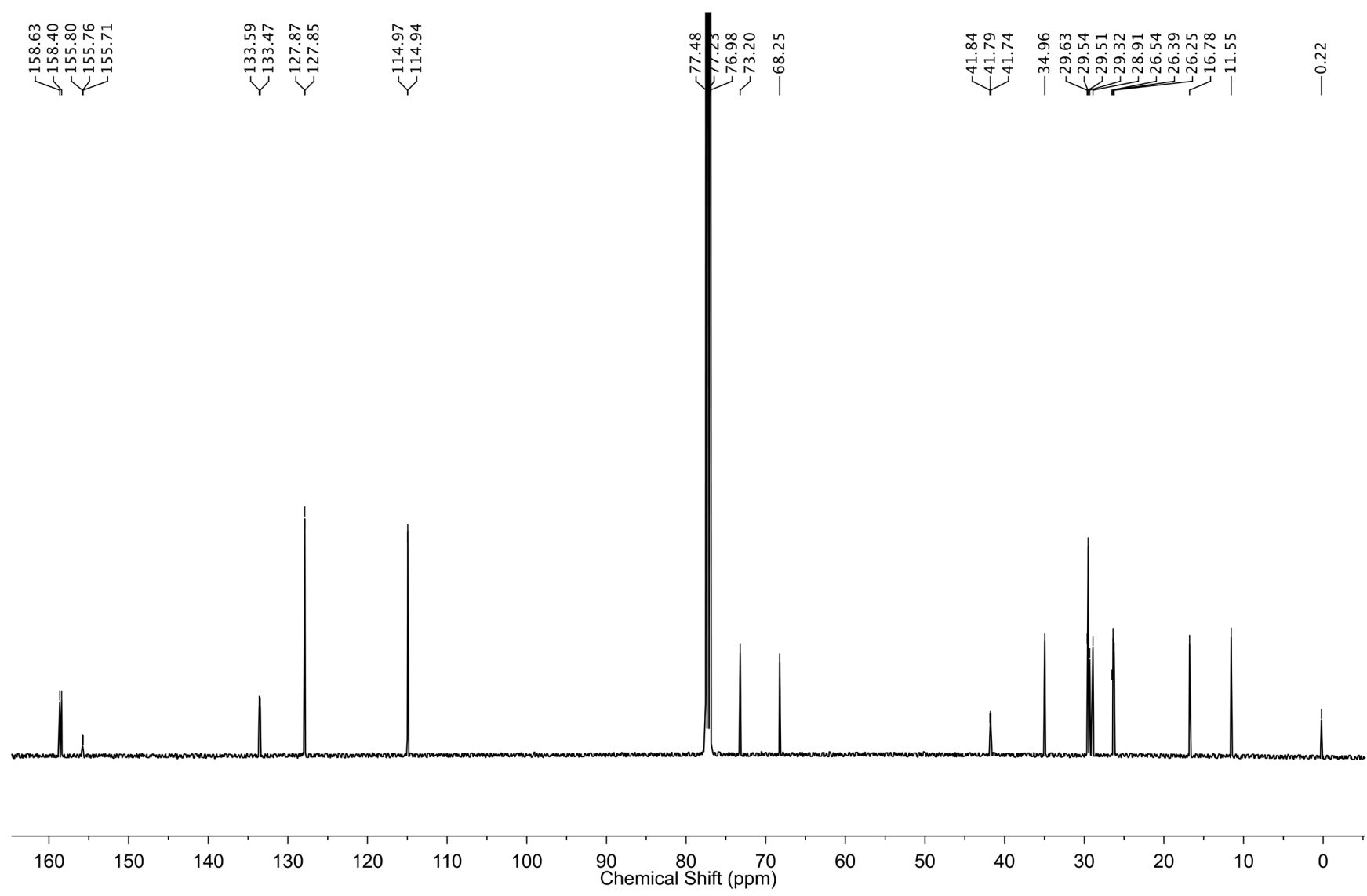
1-Formamido-10-(4'-((S)-2-methylbutoxy)biphenyl-4-oxy)decane (3-62)



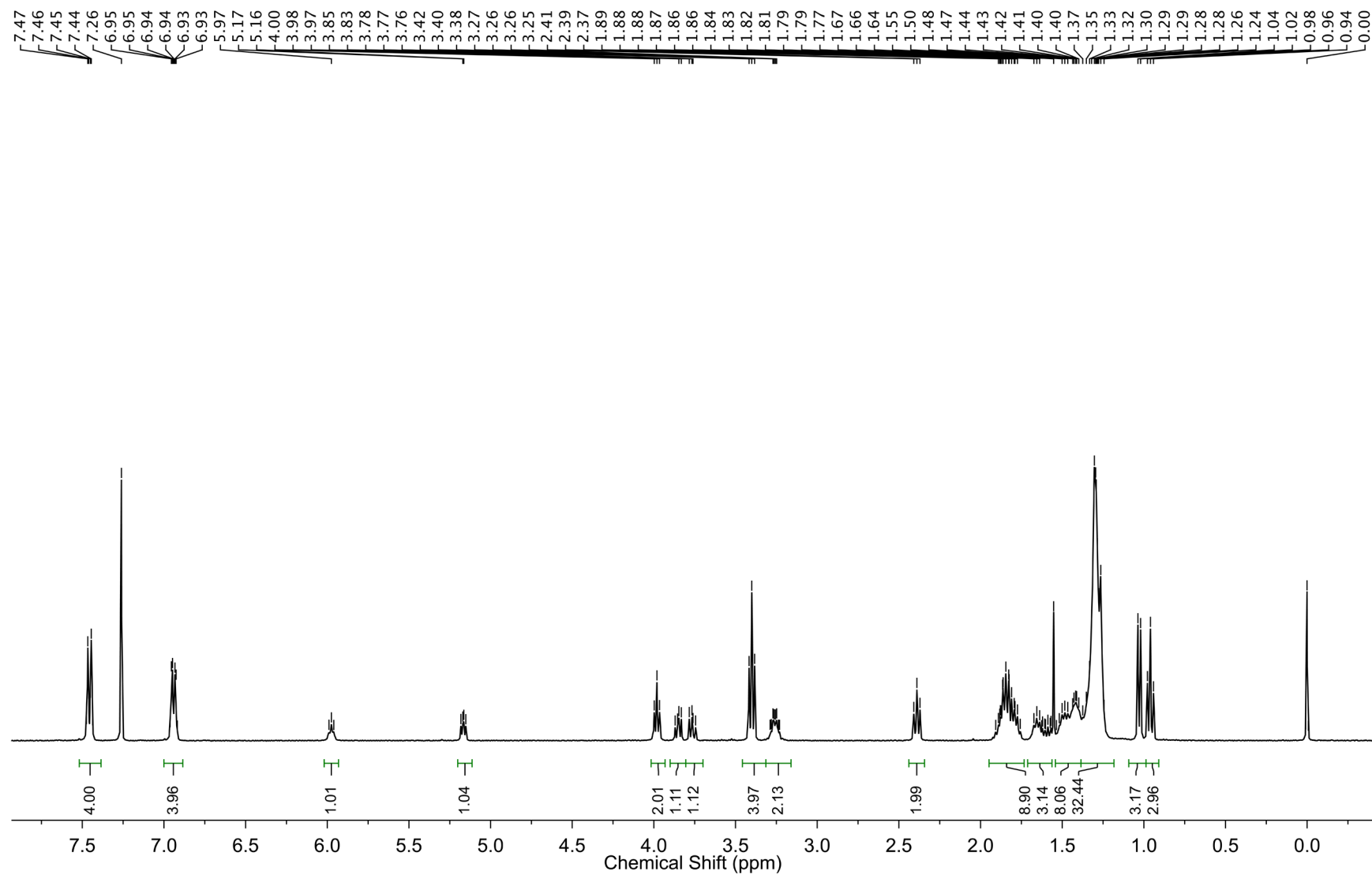
1-Isocyano-10-(4'-((S)-2-methylbutoxy)biphenyl-4-oxy)decane (3-36)



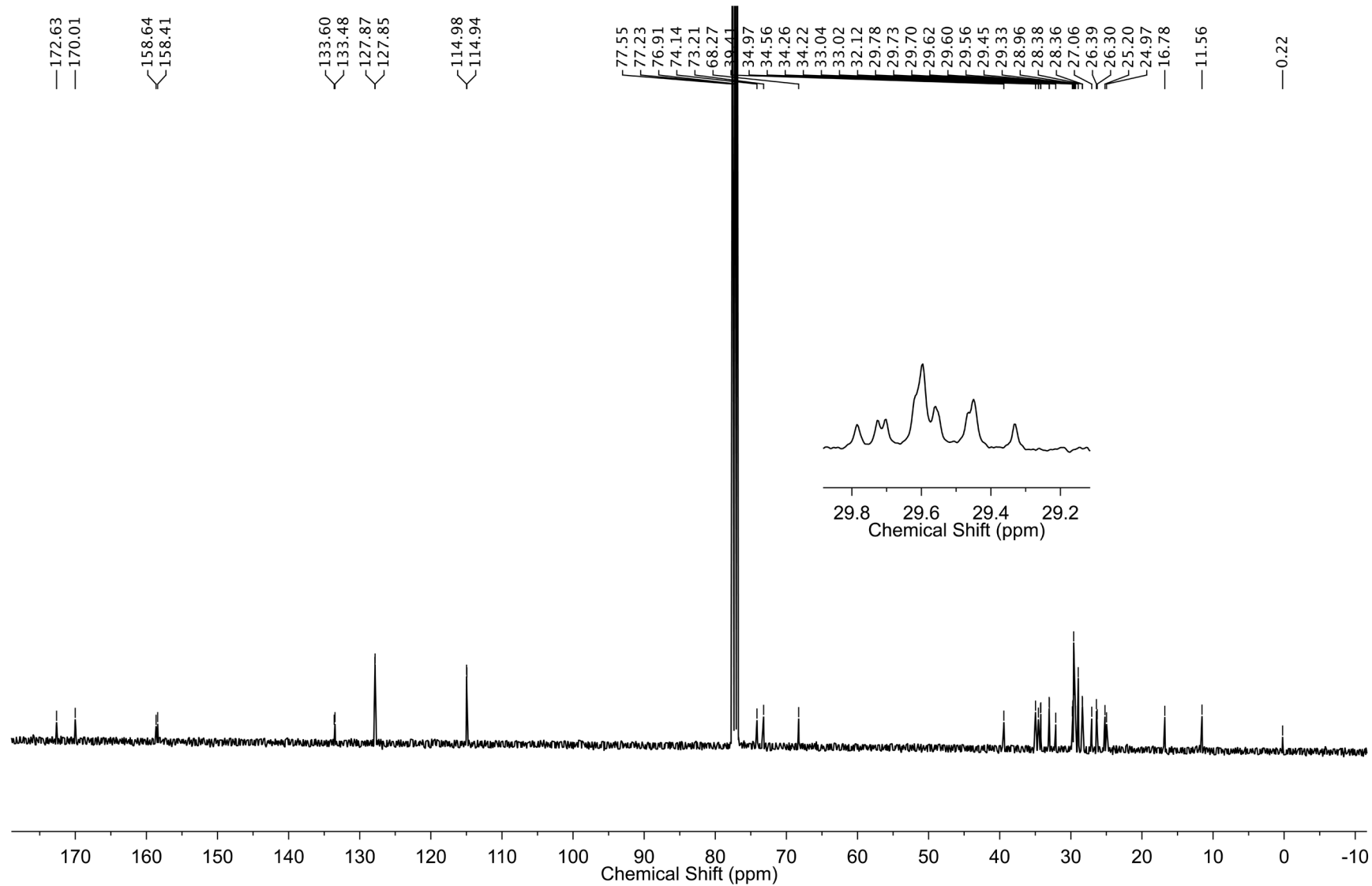
1-Isocyano-10-(4'-((S)-2-methylbutoxy)biphenyl-4-oxy)decane (3-36)



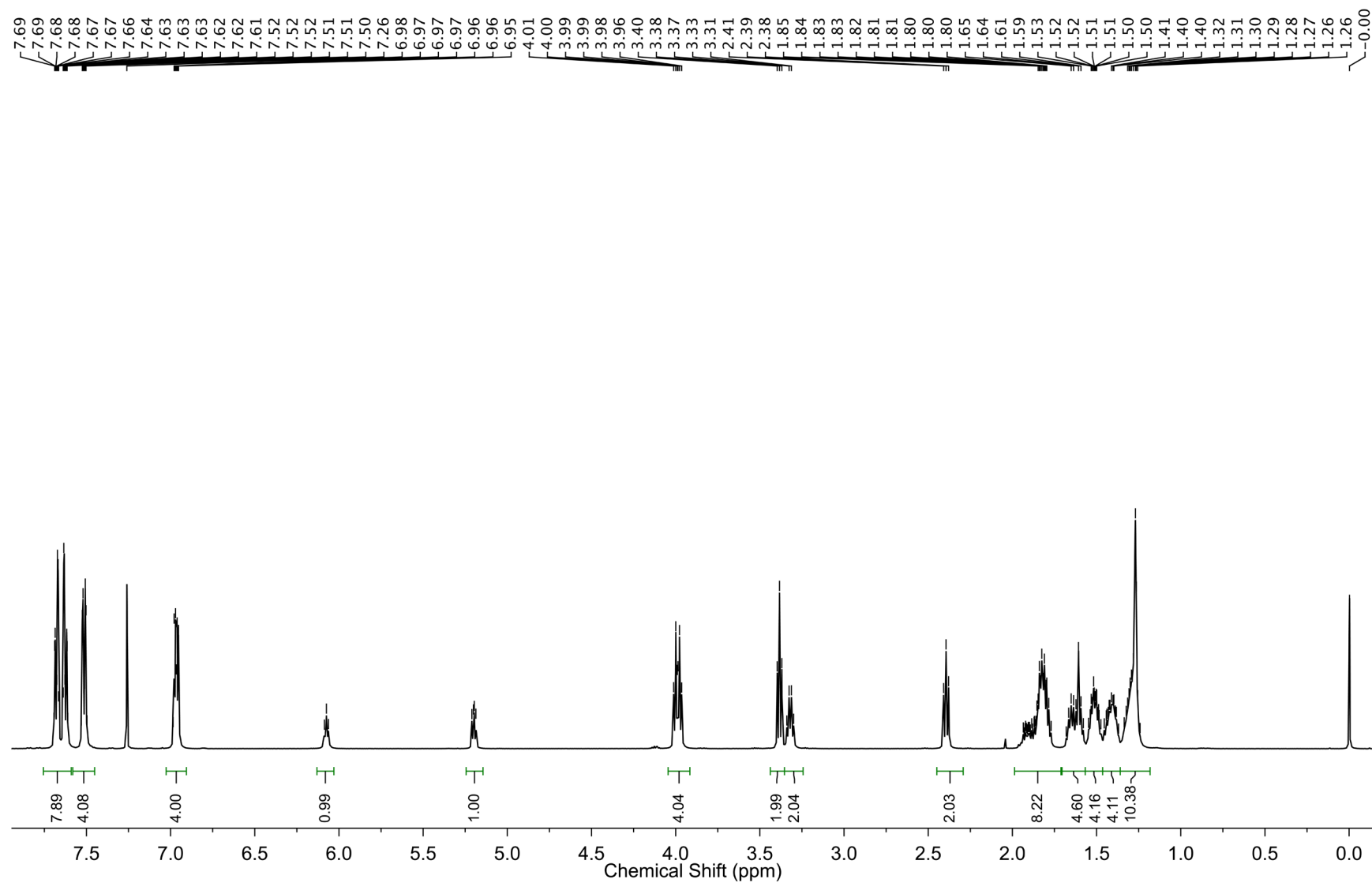
1-(10-(4'-((S)-2-Methylbutoxy)biphenyl-4-oxyl)decylaminocarbonyl)-11-bromoundecyl 11-bromoundecanoate (3-41)



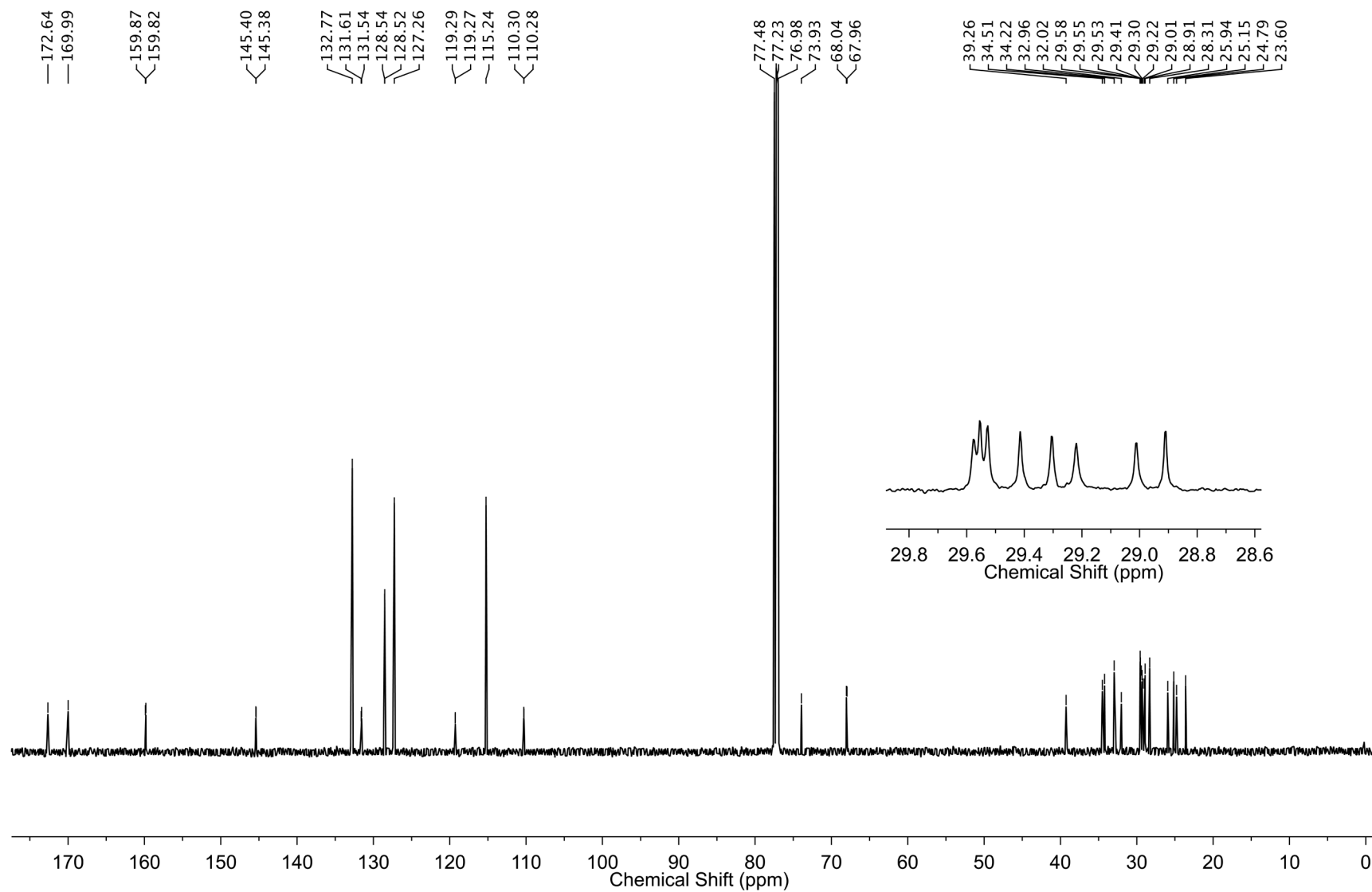
1-(10-(4'-((S)-2-Methylbutoxy)biphenyl-4-oxy)decylaminocarbonyl)-11-bromoundecyl 11-bromoundecanoate (3-41)



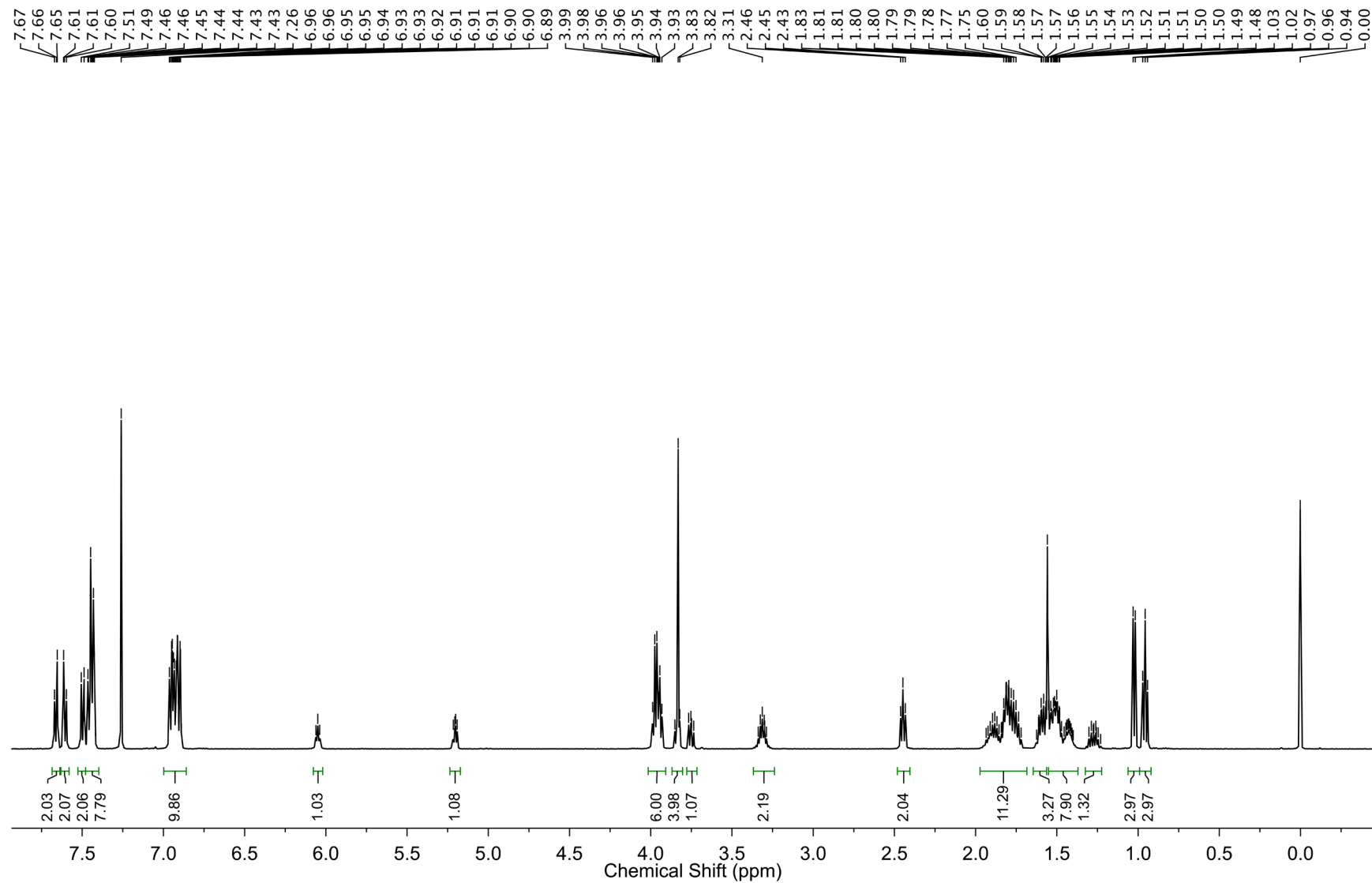
1-(5-(4'-Cyanobiphenyl-4-oxy)pentylaminocarbonyl)-6-(4'-cyanobiphenyl-4-oxy)hexyl 11-bromoundecanoate (3-45)



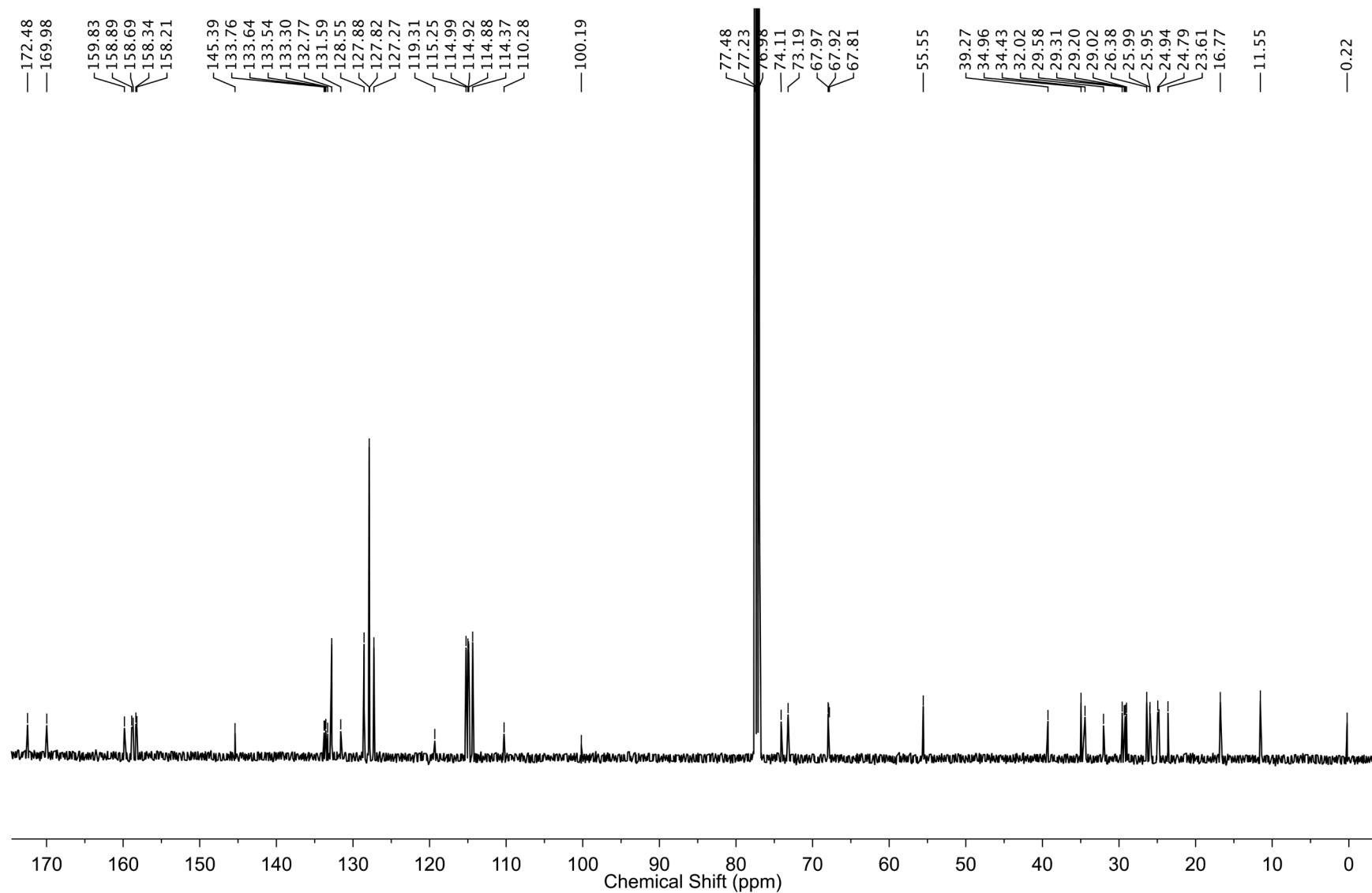
1-(5-(4'-Cyanobiphenyl-4-oxy)pentylaminocarbonyl)-6-(4'-cyanobiphenyl-4-oxy)hexyl 11-bromoundecanoate (3-45)



1-(5-(4'-Cyanobiphenyl-4-oxy)pentylaminocarbonyl)-6-(4'-methoxybiphenyl-4-oxy)hexyl 6-(4'-((S)-2-methylbutoxy)biphenyl-4-oxy)hexanoate (3-1)

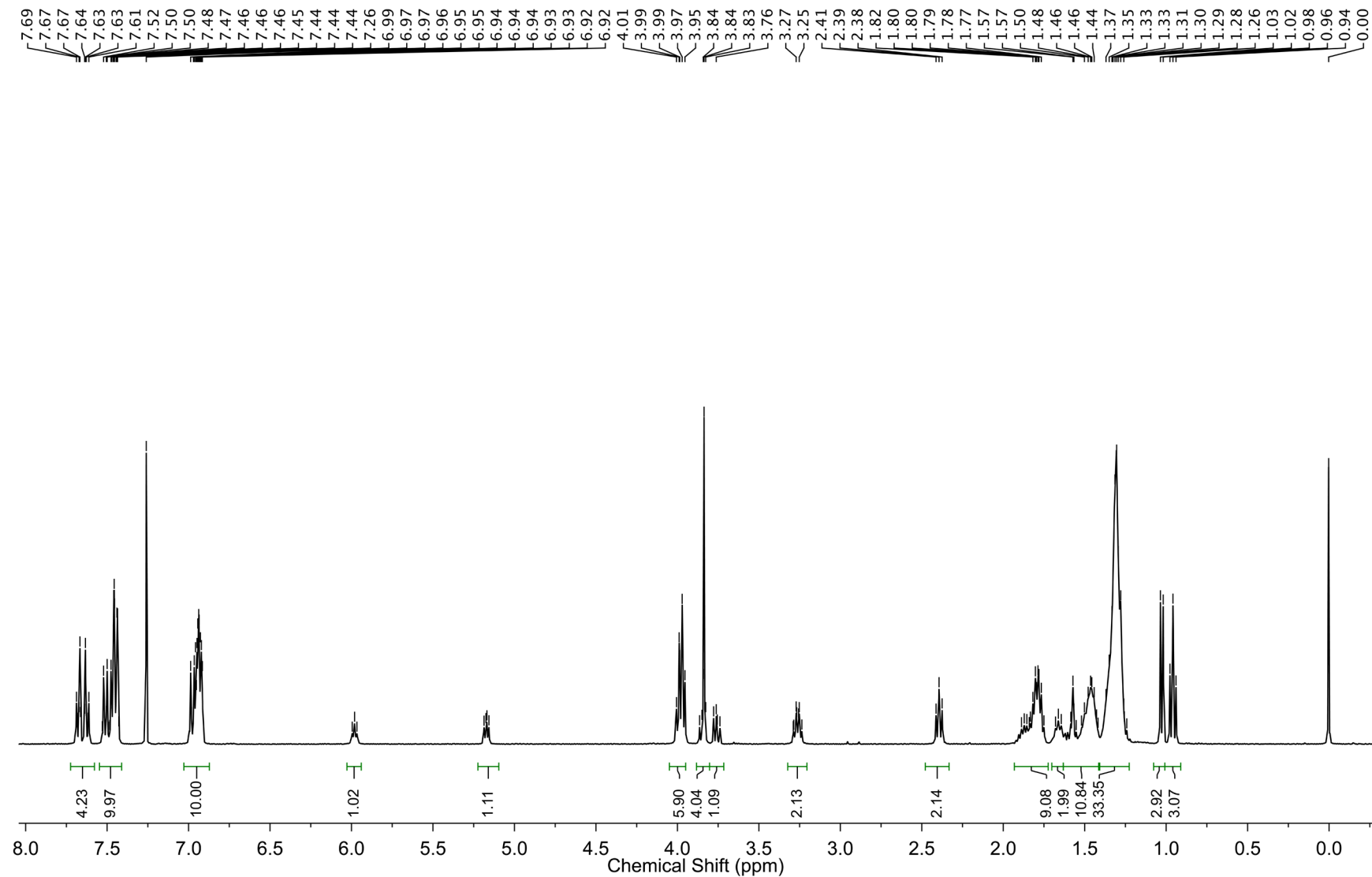


1-(5-(4'-Cyanobiphenyl-4-oxy)pentylaminocarbonyl)-6-(4'-methoxybiphenyl-4-oxy)hexyl 6-(4'-((S)-2-methylbutoxy)biphenyl-4-oxy)hexanoate (3-1)



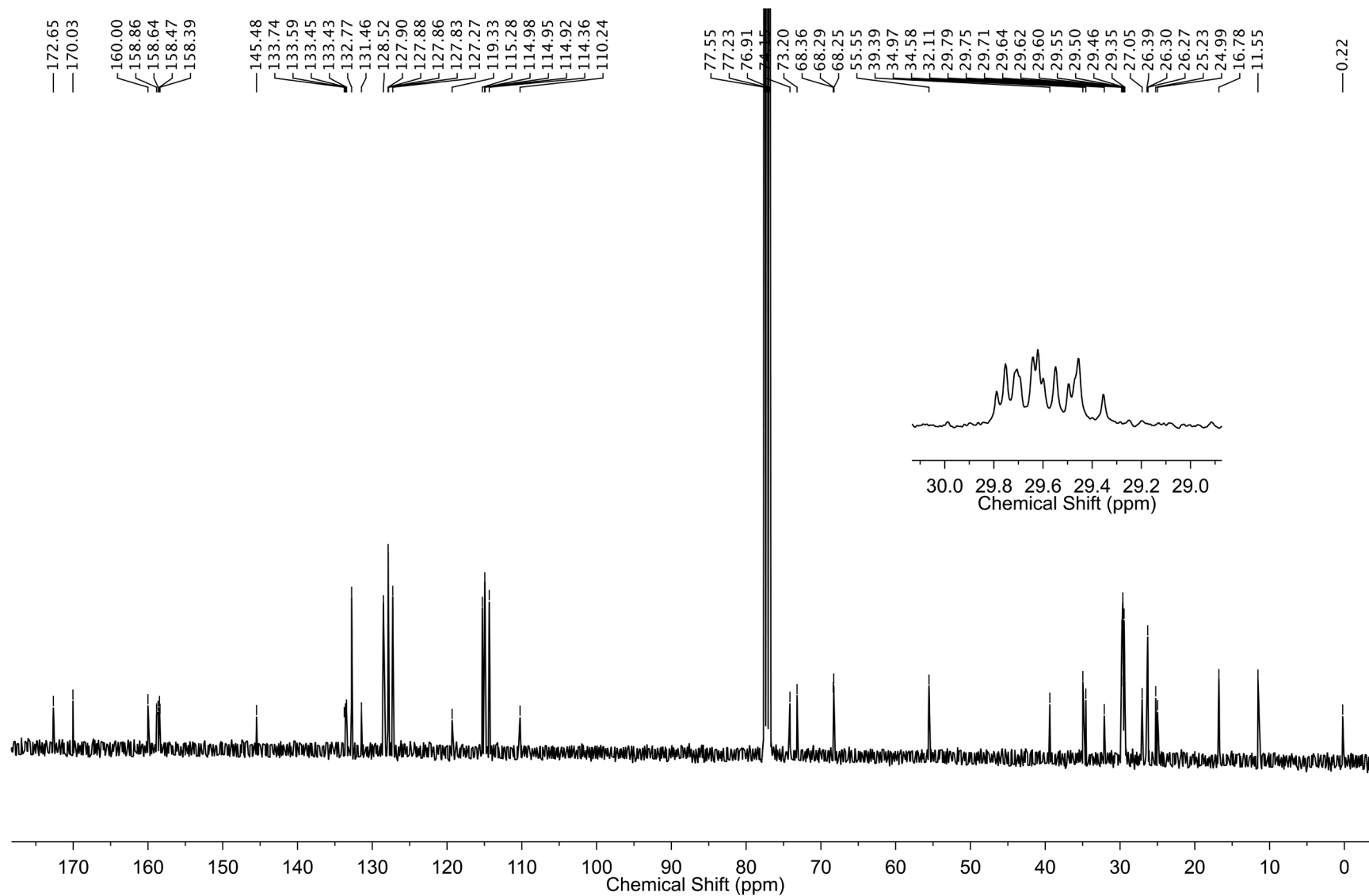
1-(10-(4'-Cyanobiphenyl-4-oxy)decylaminocarbonyl)-11-(4'-methoxybiphenyl-4-oxy)undecyl methylbutoxy)biphenyl-4-oxy)undecanoate (3-2)

11-(4'-((S)-2-



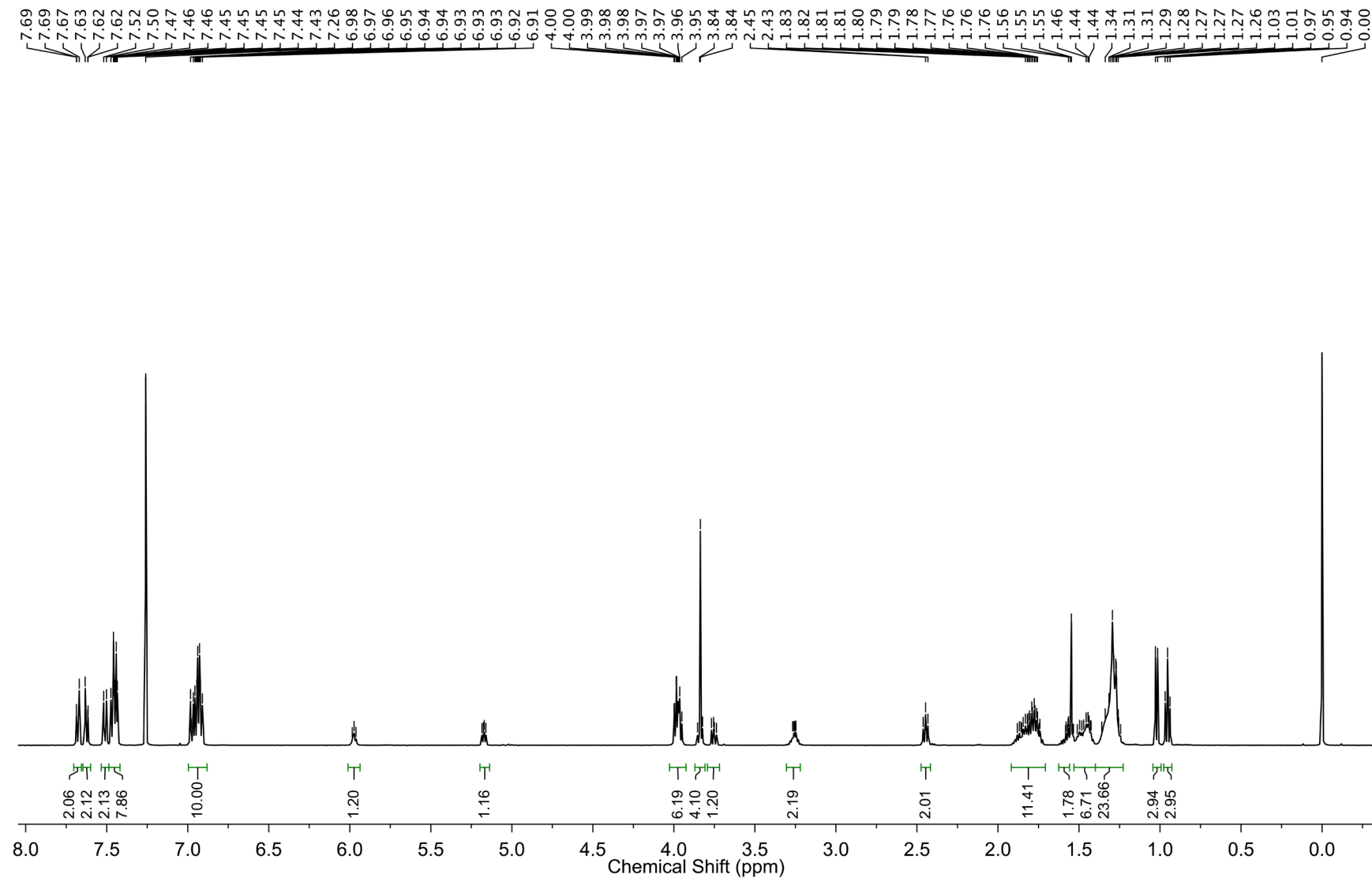
1-(10-(4'-Cyanobiphenyl-4-oxy)decylaminocarbonyl)-11-(4'-methoxybiphenyl-4-oxy)undecyl methylbutoxy)biphenyl-4-oxy)undecanoate (3-2)

11-(4'-((S)-2-



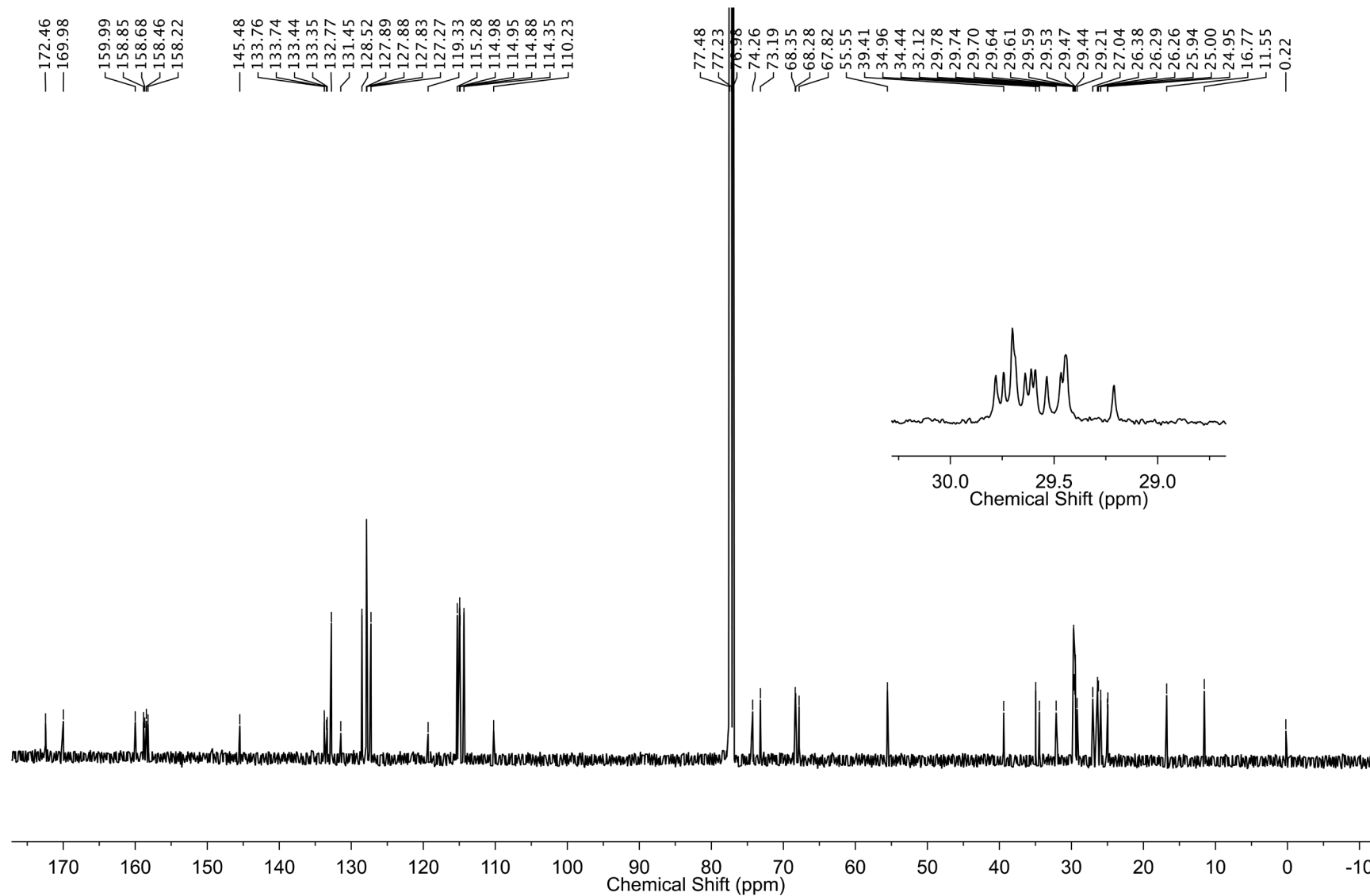
**1-(10-(4'-Cyanobiphenyl-4-oxy)decylaminocarbonyl)-11-(4'-methoxybiphenyl-4-oxy)undecyl
methylbutoxy)biphenyl-4-oxy)hexanoate (3-4)**

6-(4'-((S)-2-



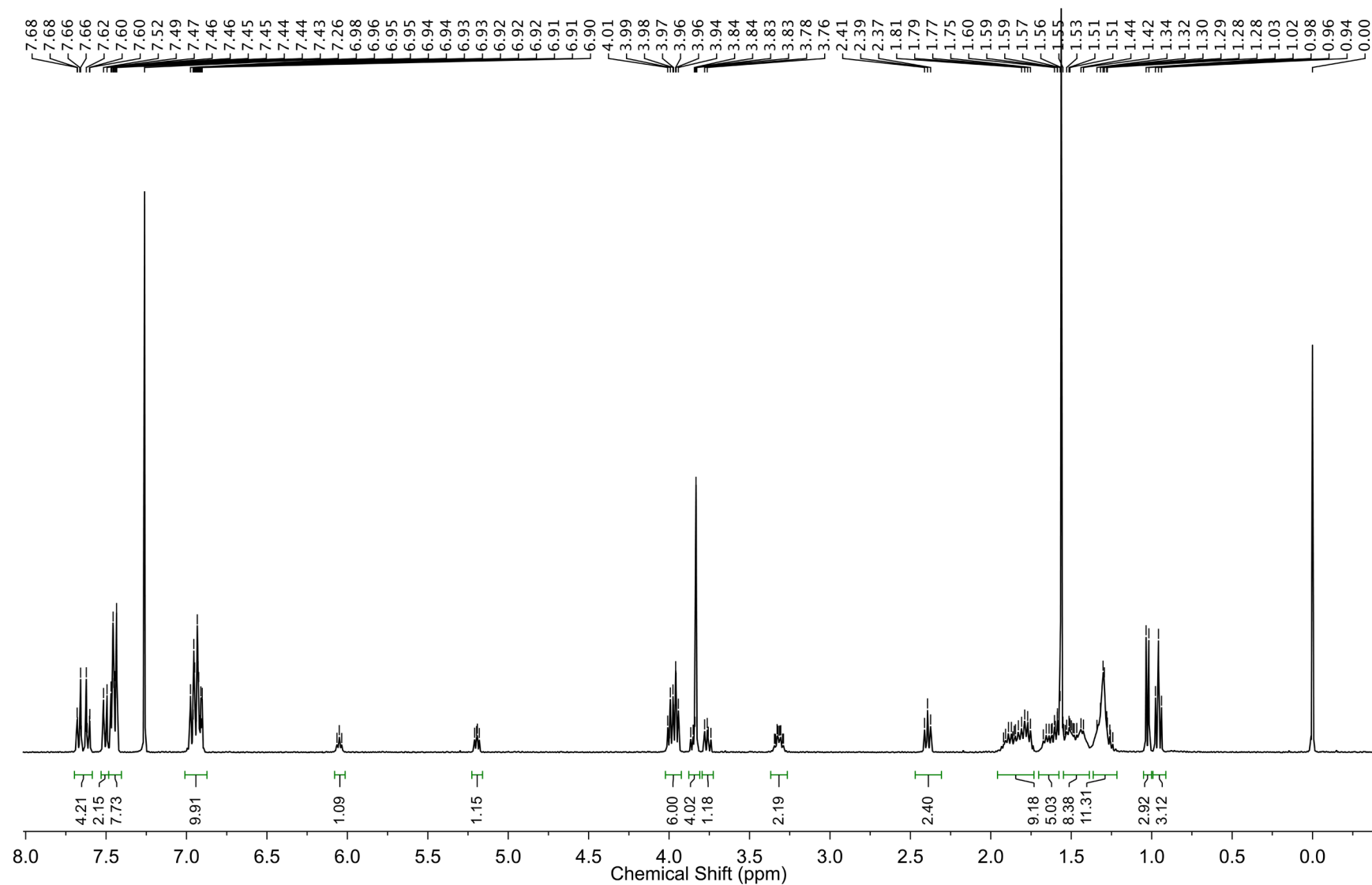
1-(10-(4'-Cyanobiphenyl-4-oxy)decylaminocarbonyl)-11-(4'-methoxybiphenyl-4-oxy)undecyl methylbutoxy)biphenyl-4-oxy)hexanoate (3-4)

6-(4'-((S)-2-



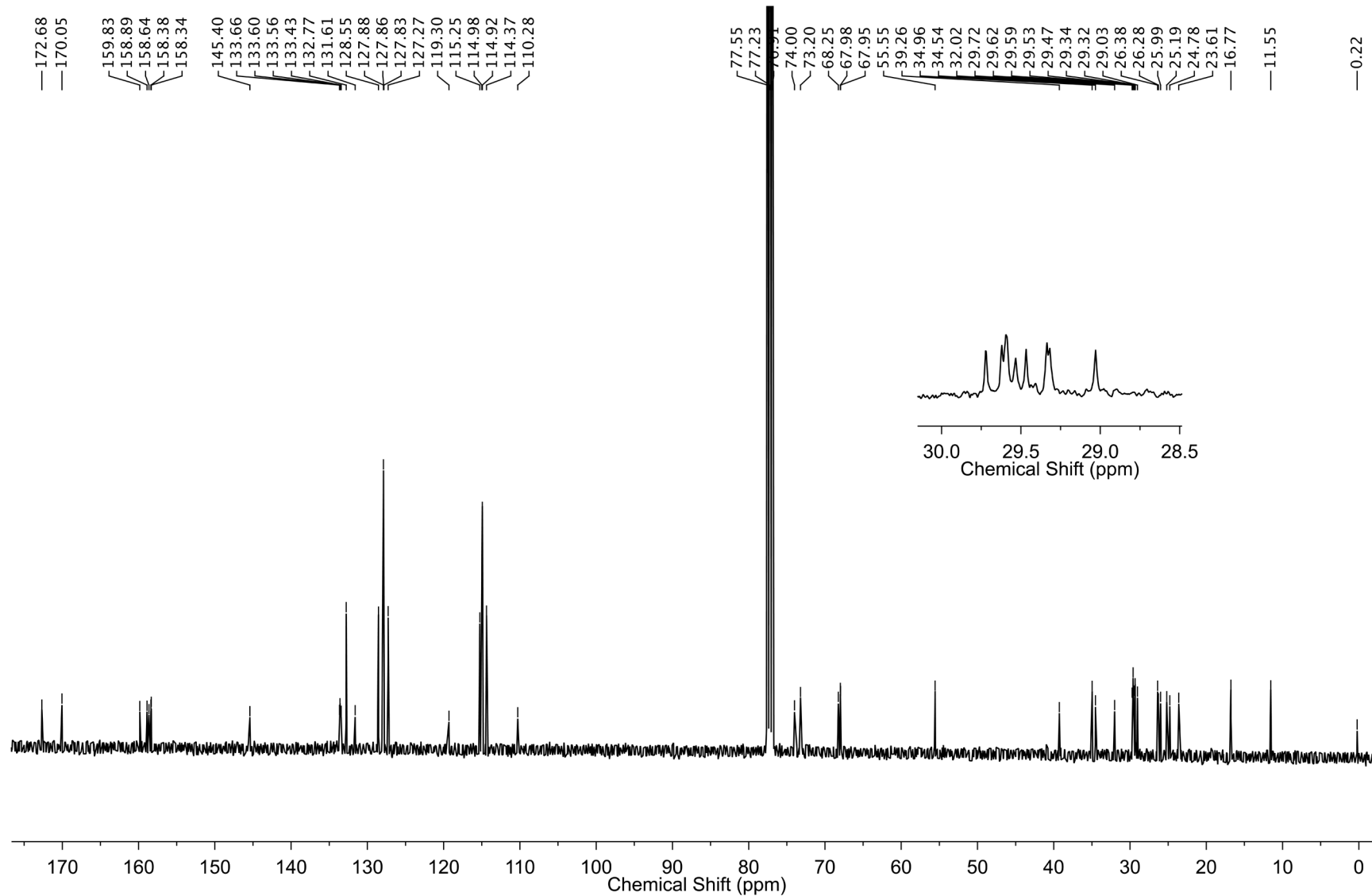
**1-(10-(4'-Cyanobiphenyl-4-oxy)decylaminocarbonyl)-11-(4'-methoxybiphenyl-4-oxy)undecyl
methylbutoxy)biphenyl-4-oxy)hexanoate (3-5)**

6-(4'-((S)-2-

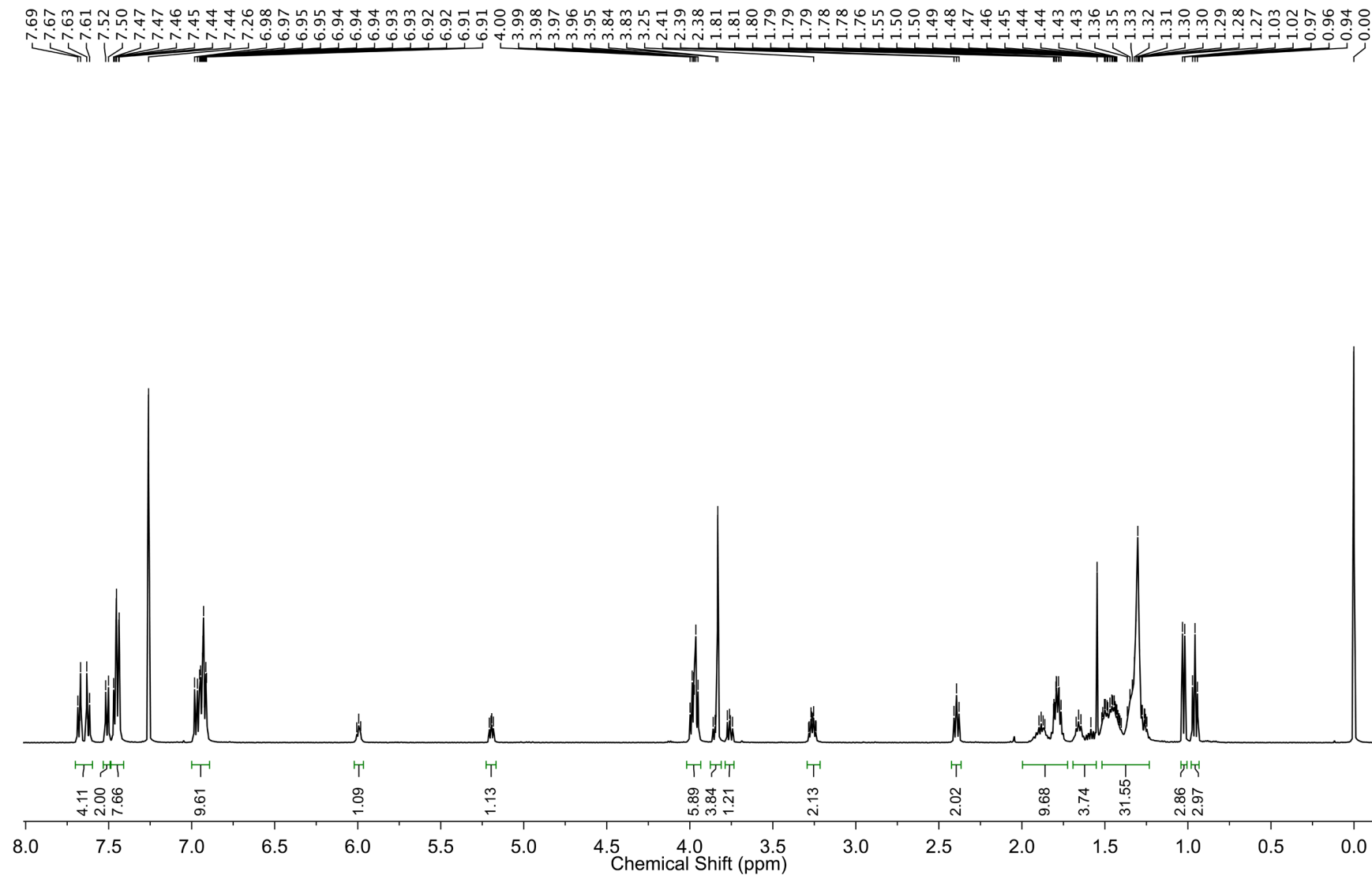


**1-(10-(4'-Cyanobiphenyl-4-oxy)decylaminocarbonyl)-11-(4'-methoxybiphenyl-4-oxy)undecyl
methylbutoxy)biphenyl-4-oxy)hexanoate (3-5)**

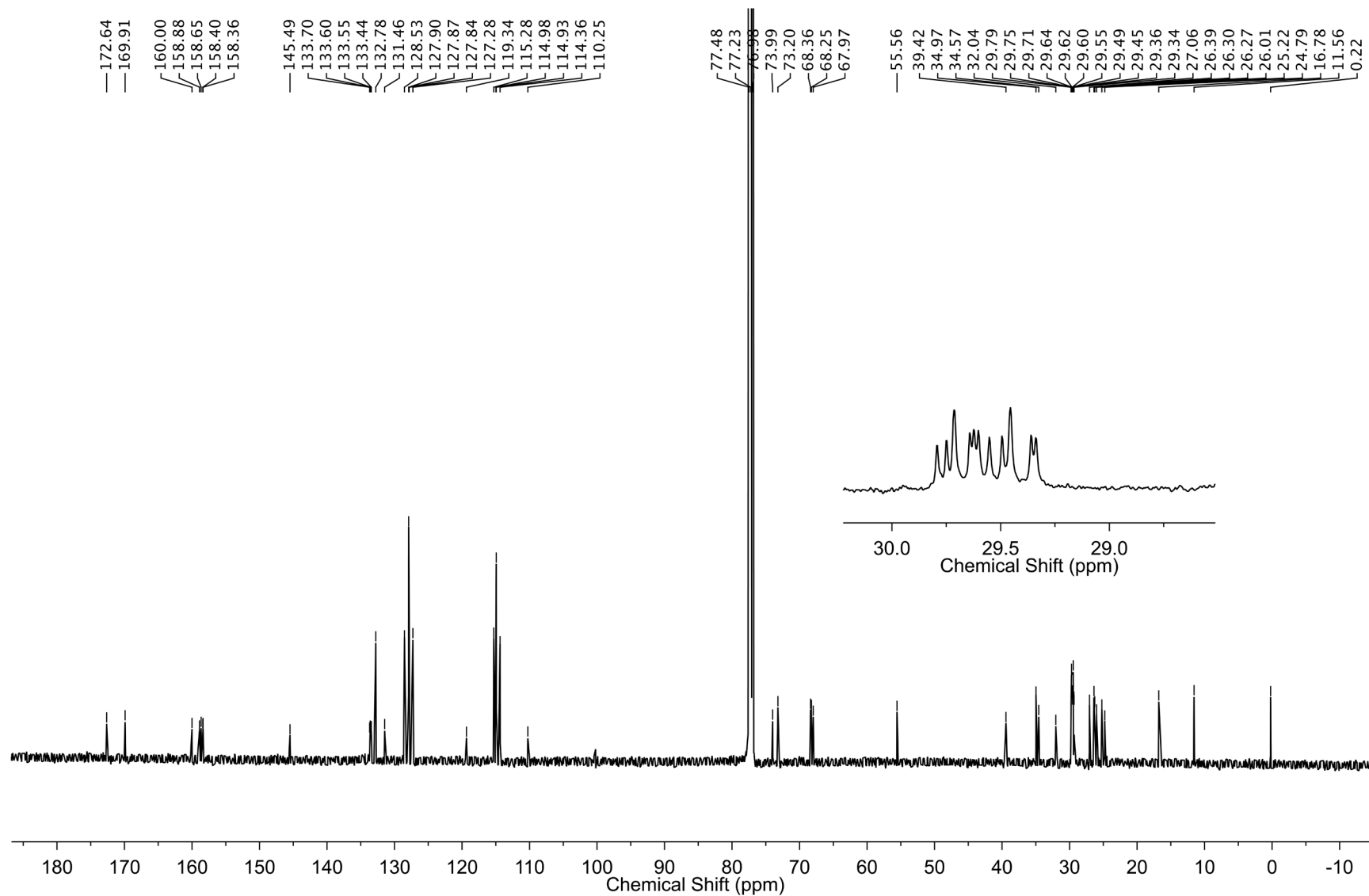
6-(4'-((S)-2-



1-(10-(4'-Cyanobiphenyl-4-oxy)decylaminocarbonyl)-6-(4'-methoxybiphenyl-4-oxy)hexyl 11-(4'-((S)-2-methylbutoxy)biphenyl-4-oxy)undecanoate (3-6)

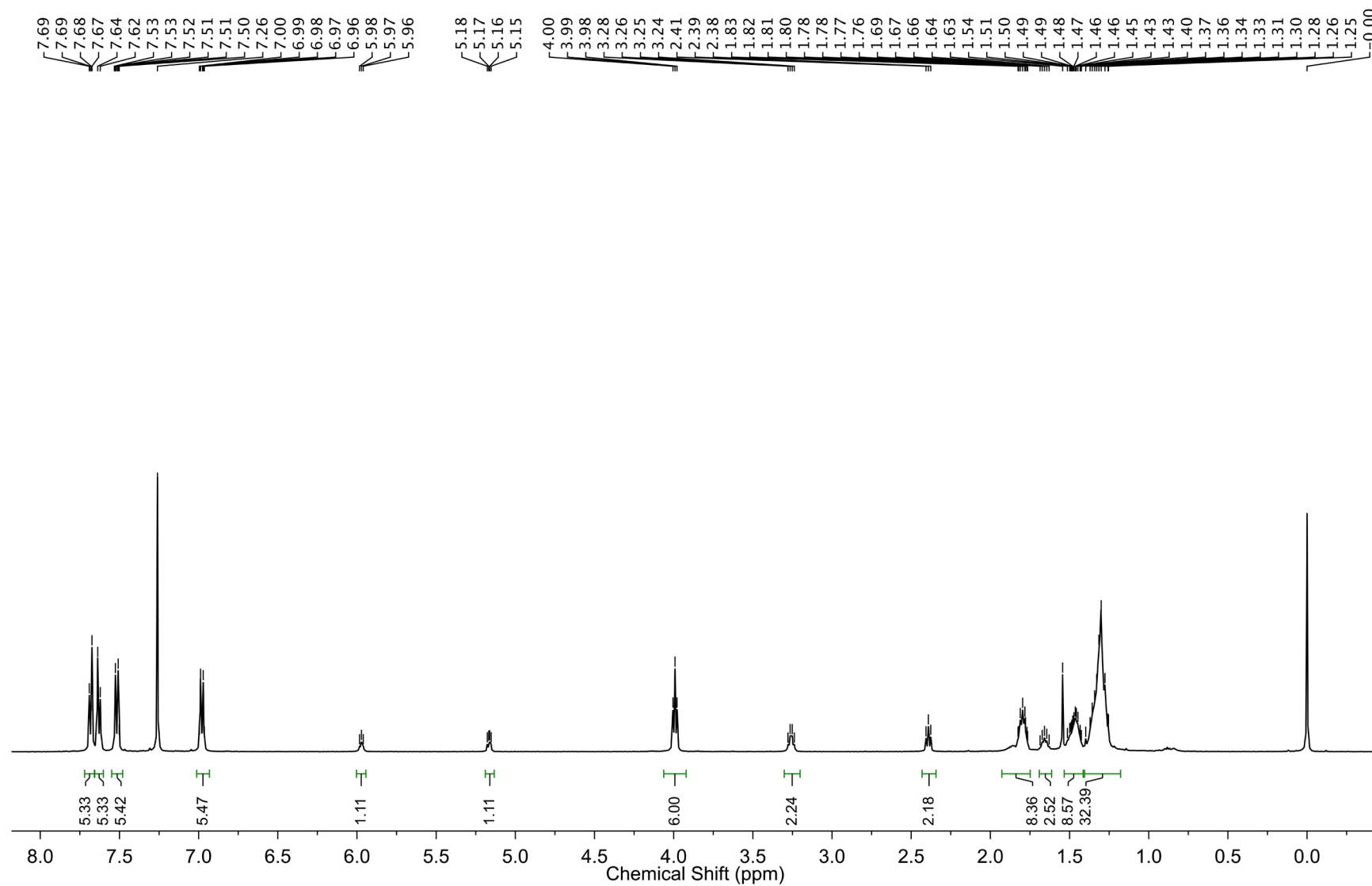


1-(10-(4'-Cyanobiphenyl-4-oxy)decylaminocarbonyl)-6-(4'-methoxybiphenyl-4-oxy)hexyl 11-(4'-((S)-2-methylbutoxy)biphenyl-4-oxy)undecanoate (3-6)



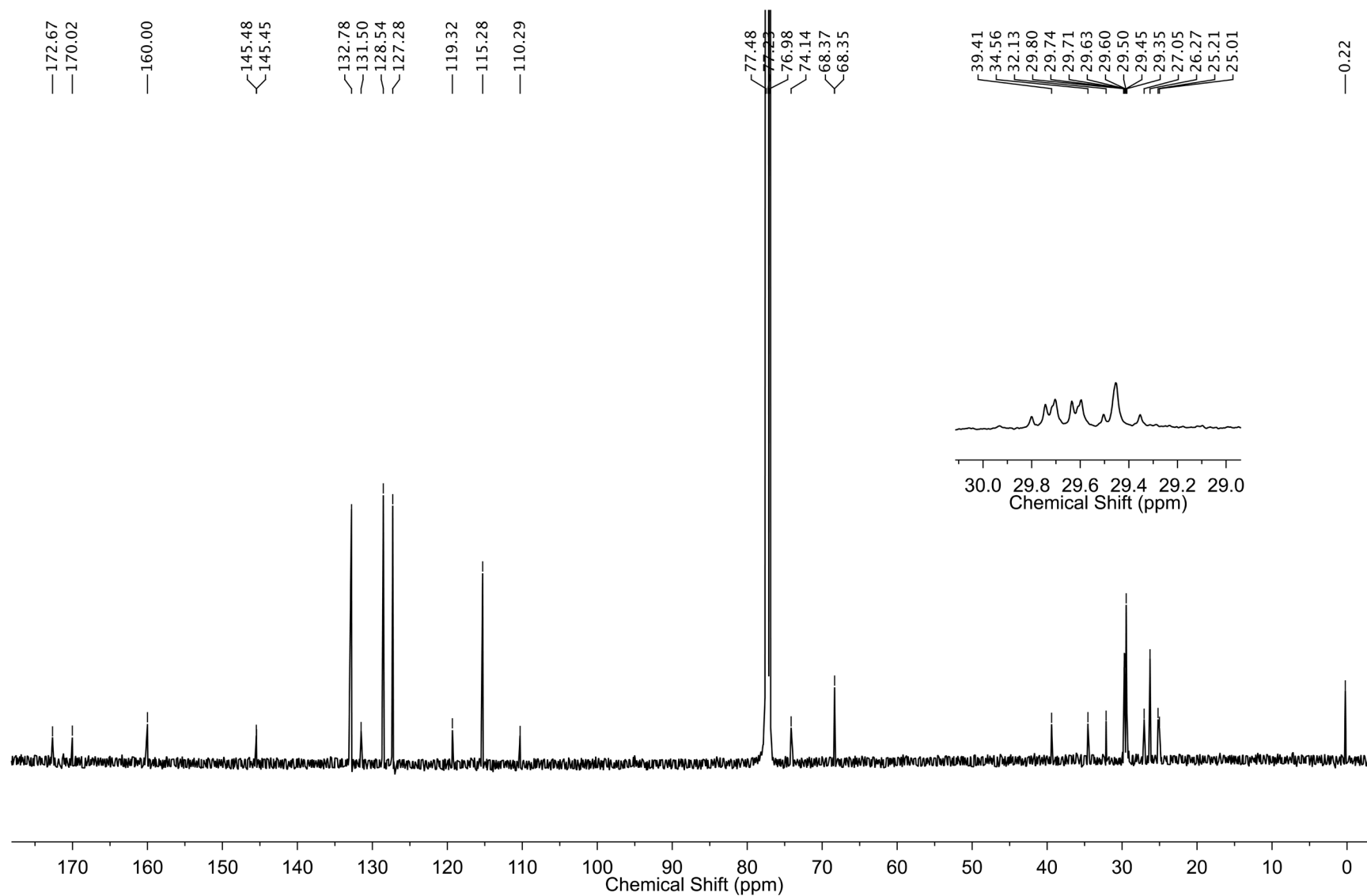
**1-(10-(4'-Cyanobiphenyl-4-oxy)decylaminocarbonyl)-11-(4'-cyanobiphenyl-4-oxy)undecyl
oxy)undecanoate (3-8)**

11-(4'-cyanobiphenyl-4-



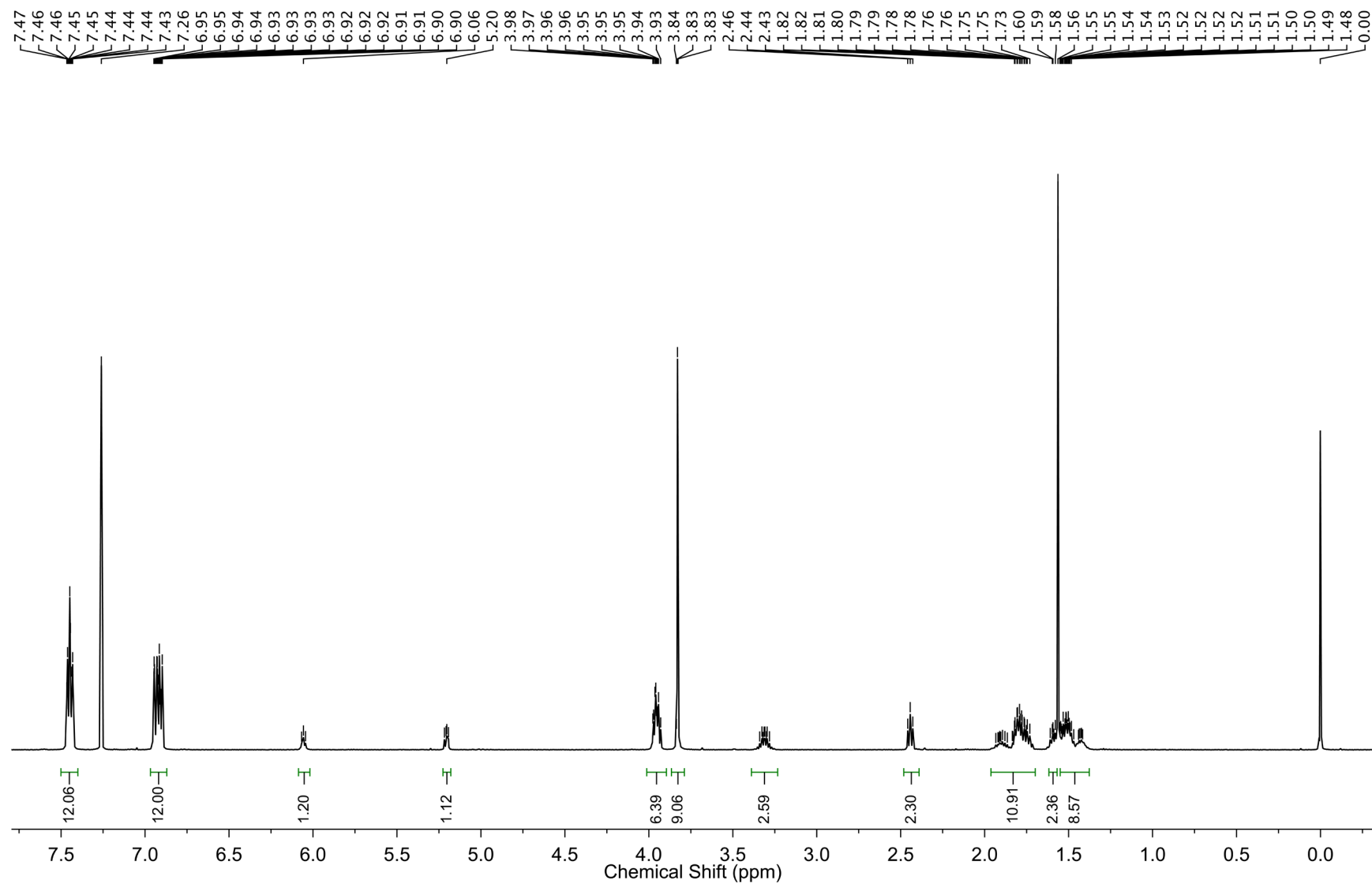
**1-(10-(4'-Cyanobiphenyl-4-oxy)decylaminocarbonyl)-11-(4'-cyanobiphenyl-4-oxy)undecyl
oxy)undecanoate (3-8)**

11-(4'-cyanobiphenyl-4-



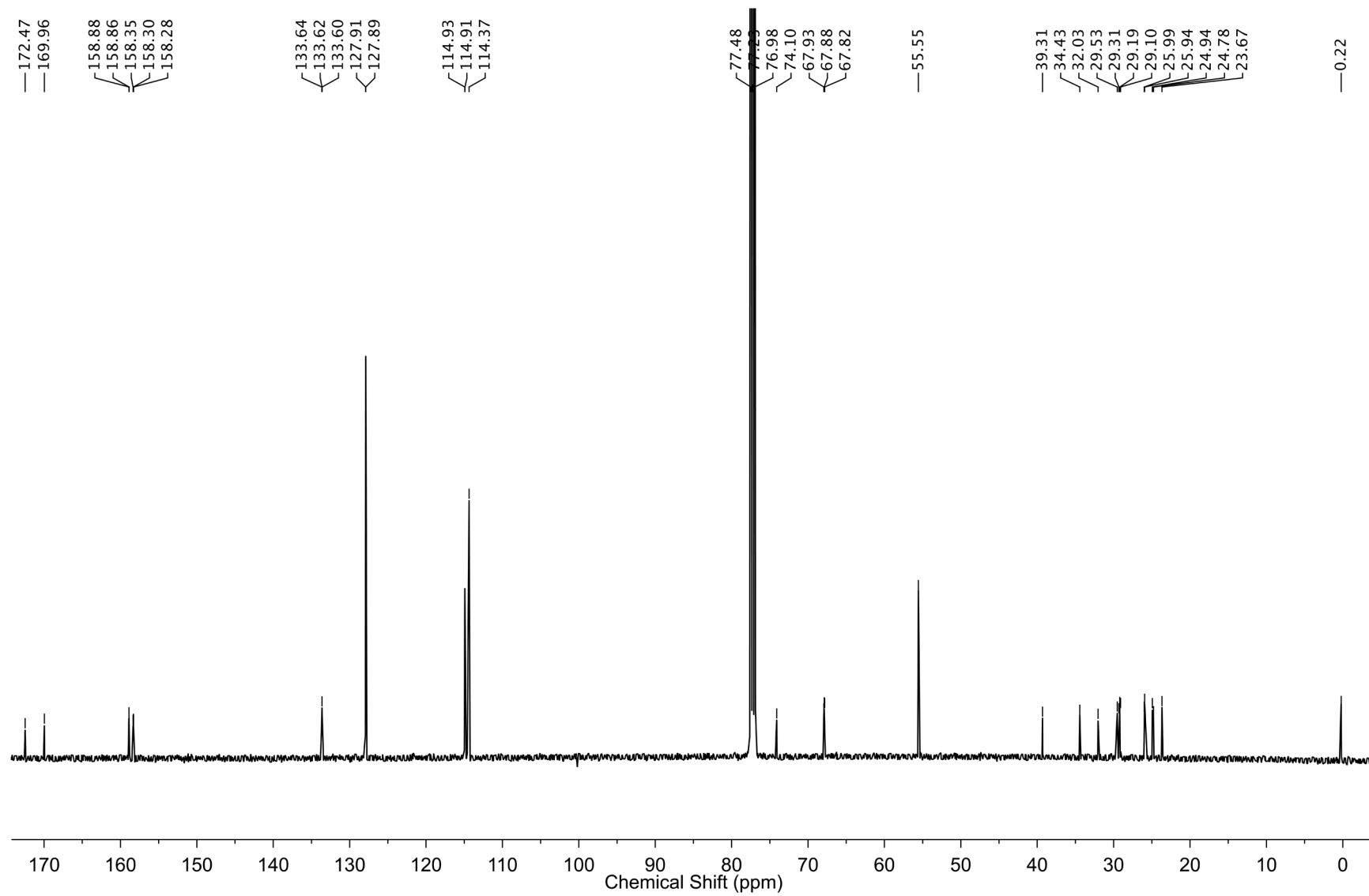
**1-(5-(4'-Methoxybiphenyl-4-oxy)pentylaminocarbonyl)-6-(4'-methoxybiphenyl-4-oxy)hexyl
oxy)hexanoate (3-9)**

**6-(4'-methoxybiphenyl-4-
oxy)hexanoate**

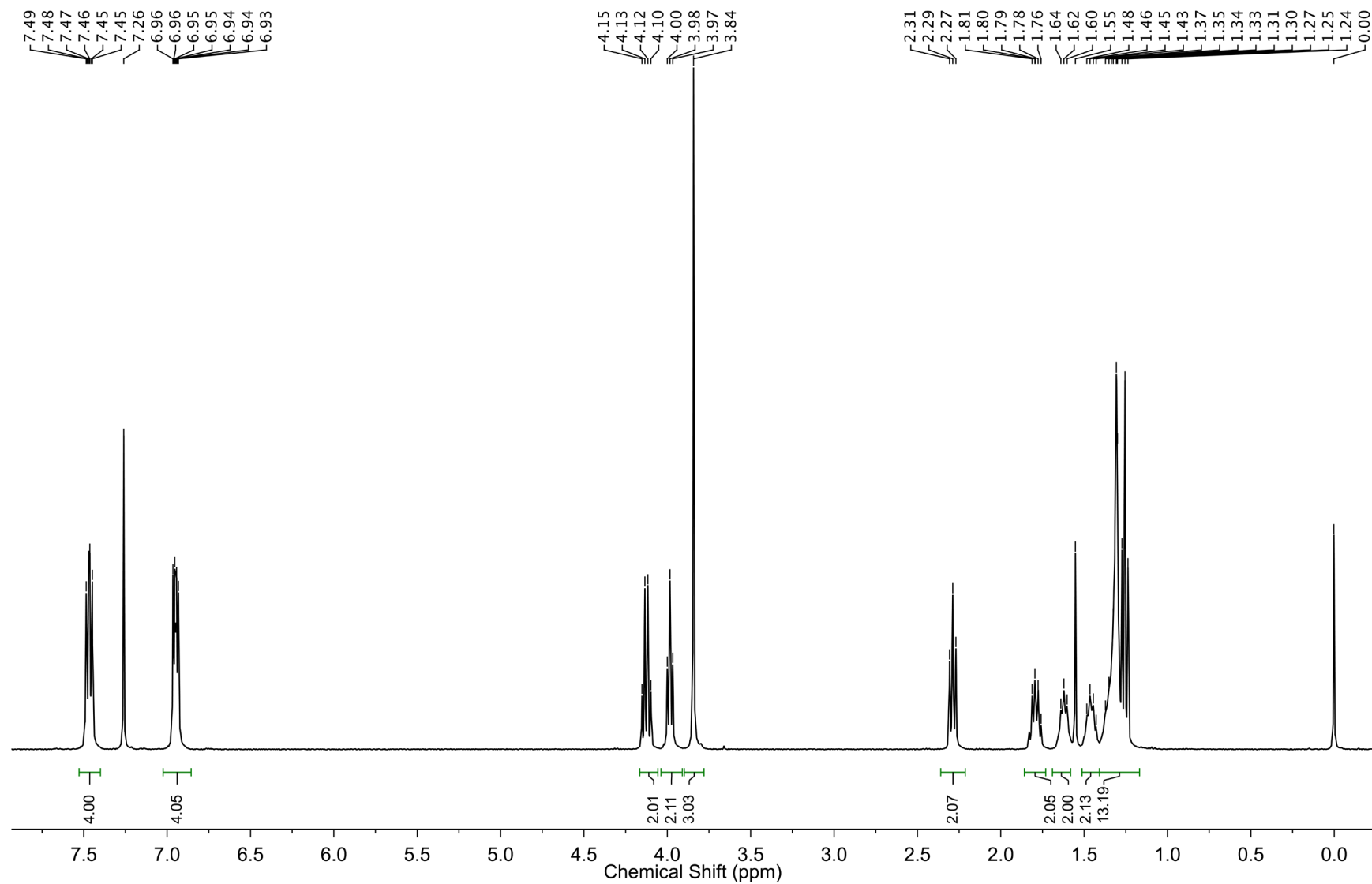


**1-(5-(4'-Methoxybiphenyl-4-oxo)pentylaminocarbonyl)-6-(4'-methoxybiphenyl-4-oxo)hexyl
oxy)hexanoate (3-9)**

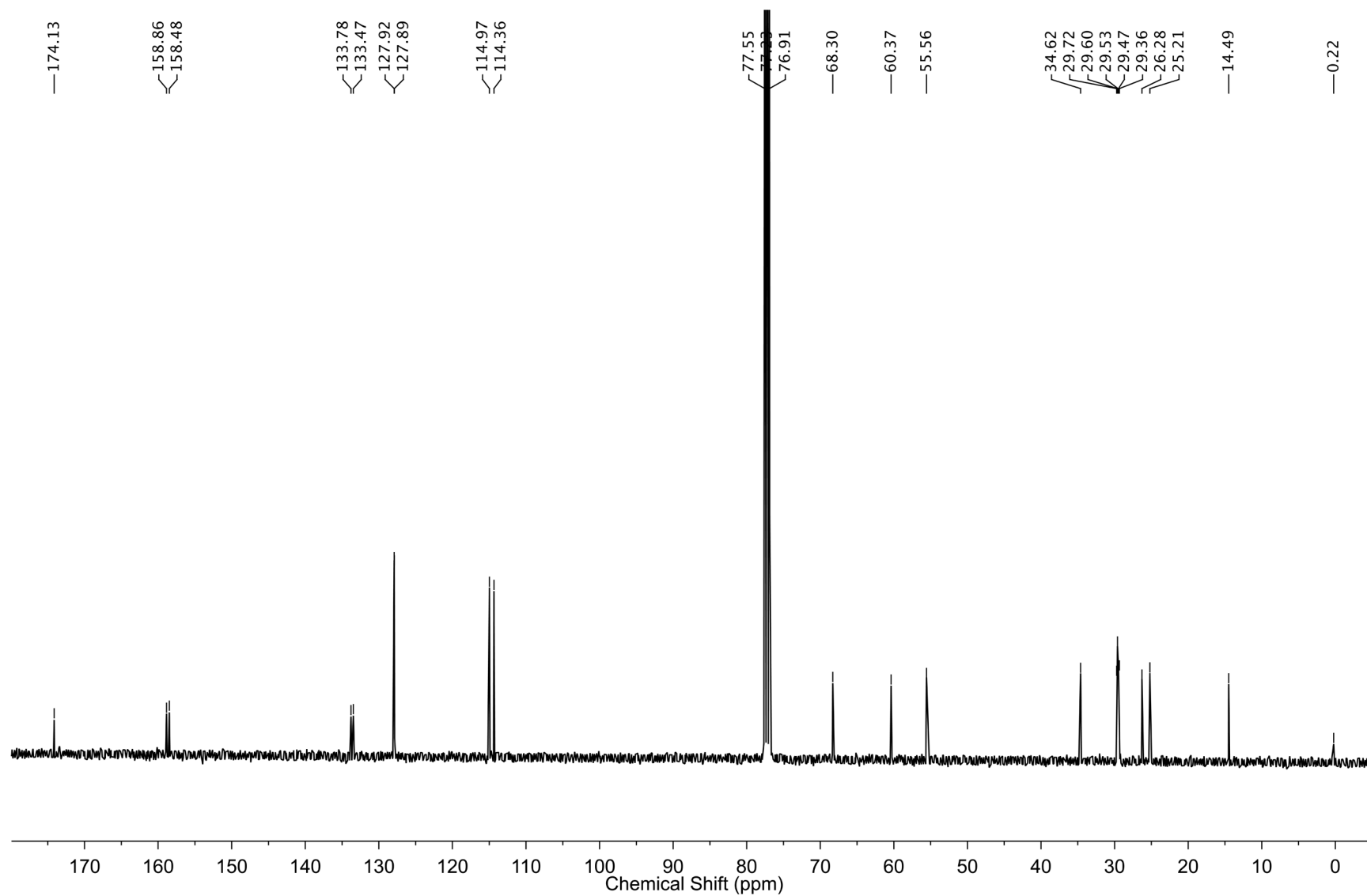
6-(4'-methoxybiphenyl-4-



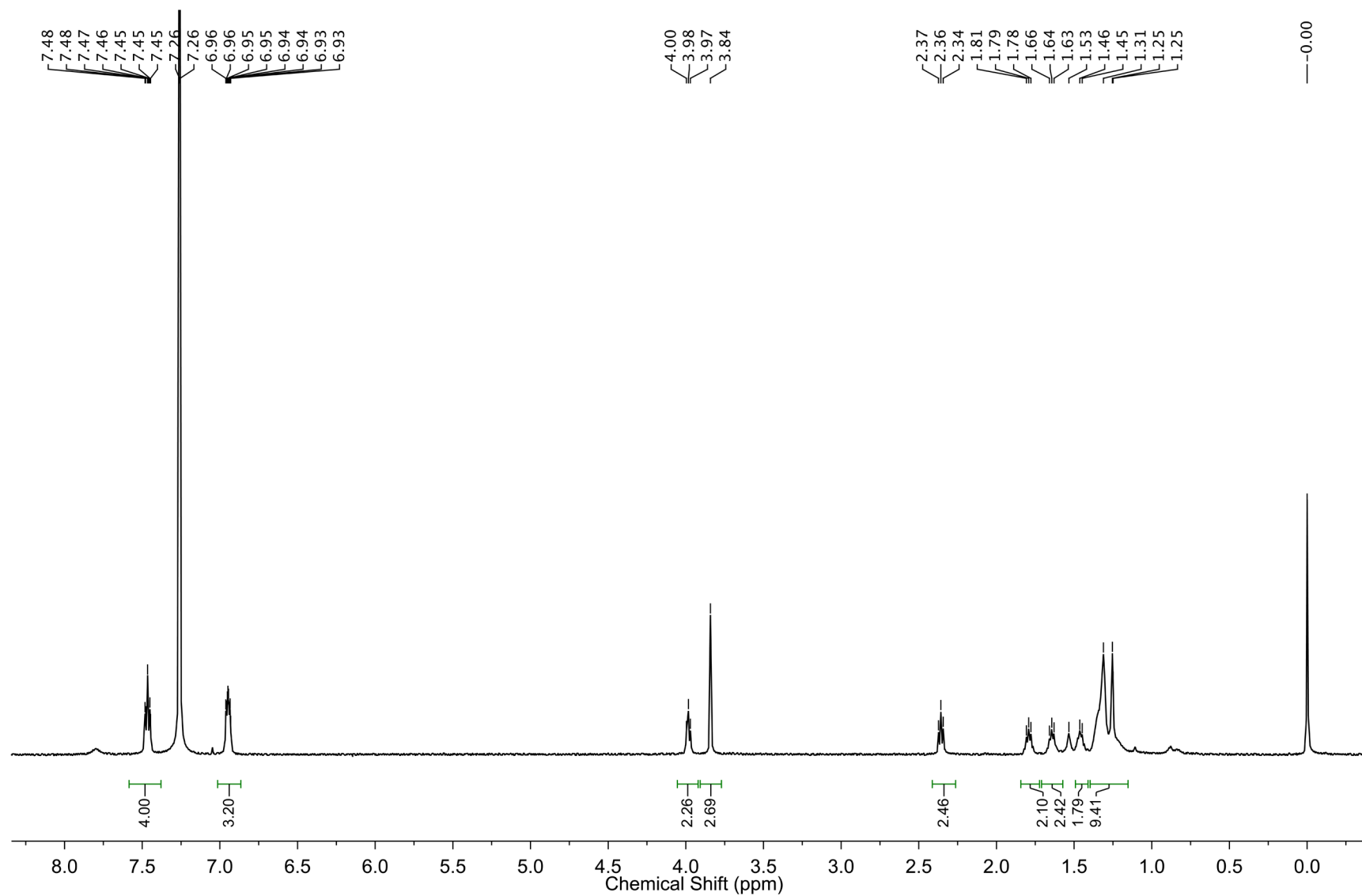
Ethyl 11-(4'-Methoxybiphenyl-4-oxy)undecanoate (3-63)



Ethyl 11-(4'-Methoxybiphenyl-4-oxy)undecanoate (3-63)

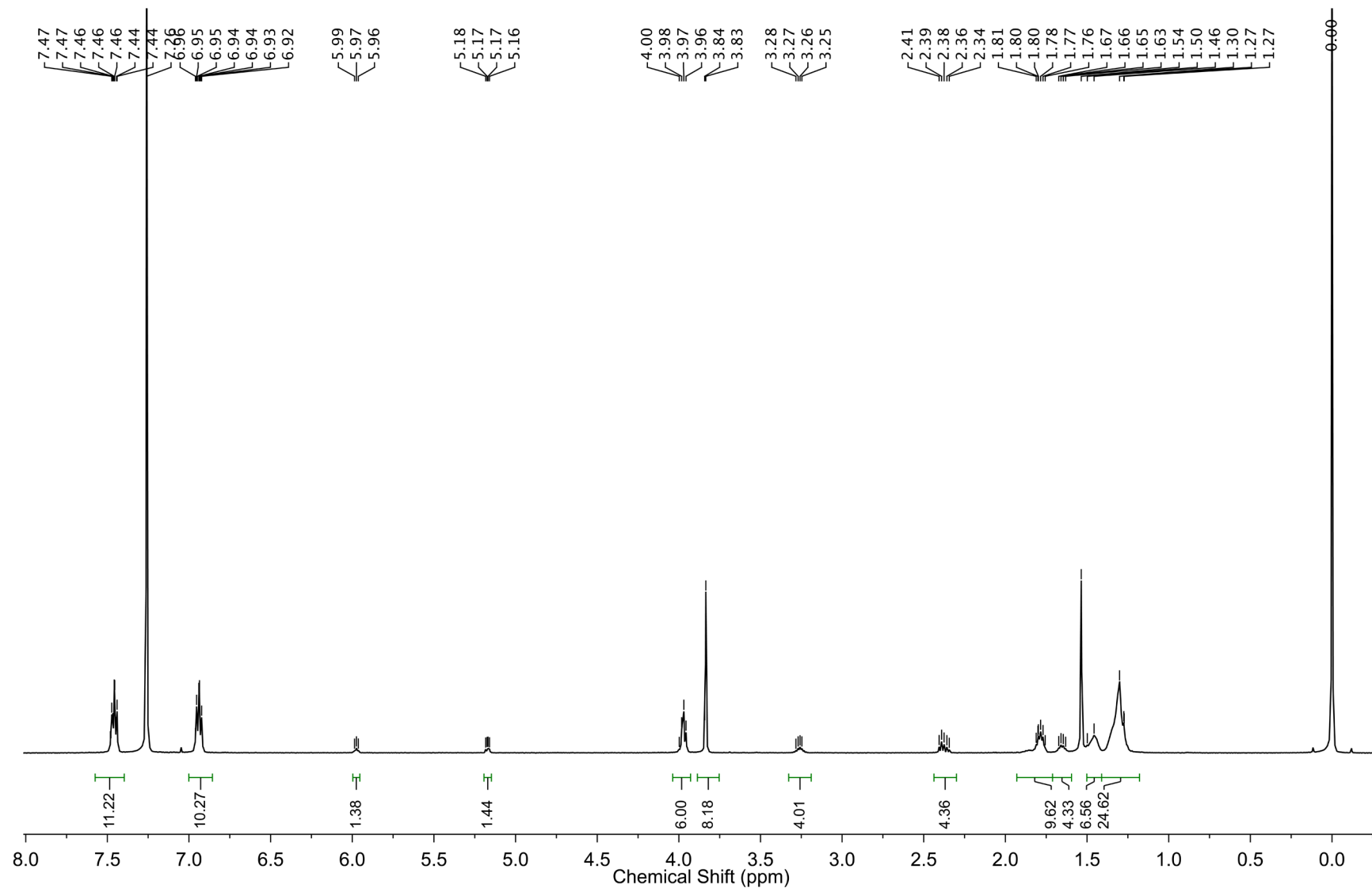


11-(4'-Methoxybiphenyl-4-oxy)undecanoic acid (3-43)



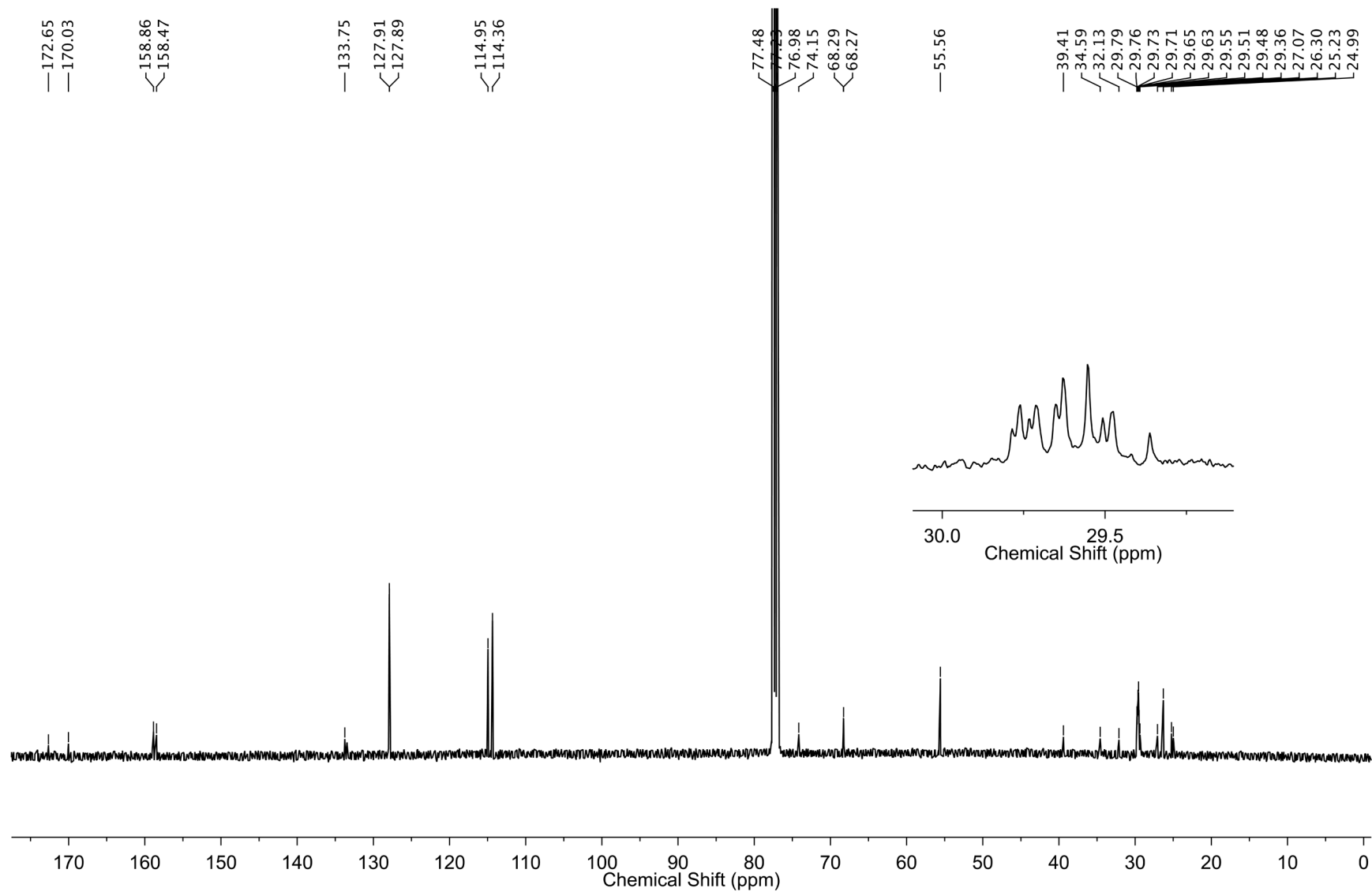
1-(10-(4'-Methoxybiphenyl-4-oxy)decylaminocarbonyl)-11-(4'-methoxybiphenyl-4-oxy)undecyl

11-(4'-methoxybiphenyl-4-oxy)undecanoate (3-10)

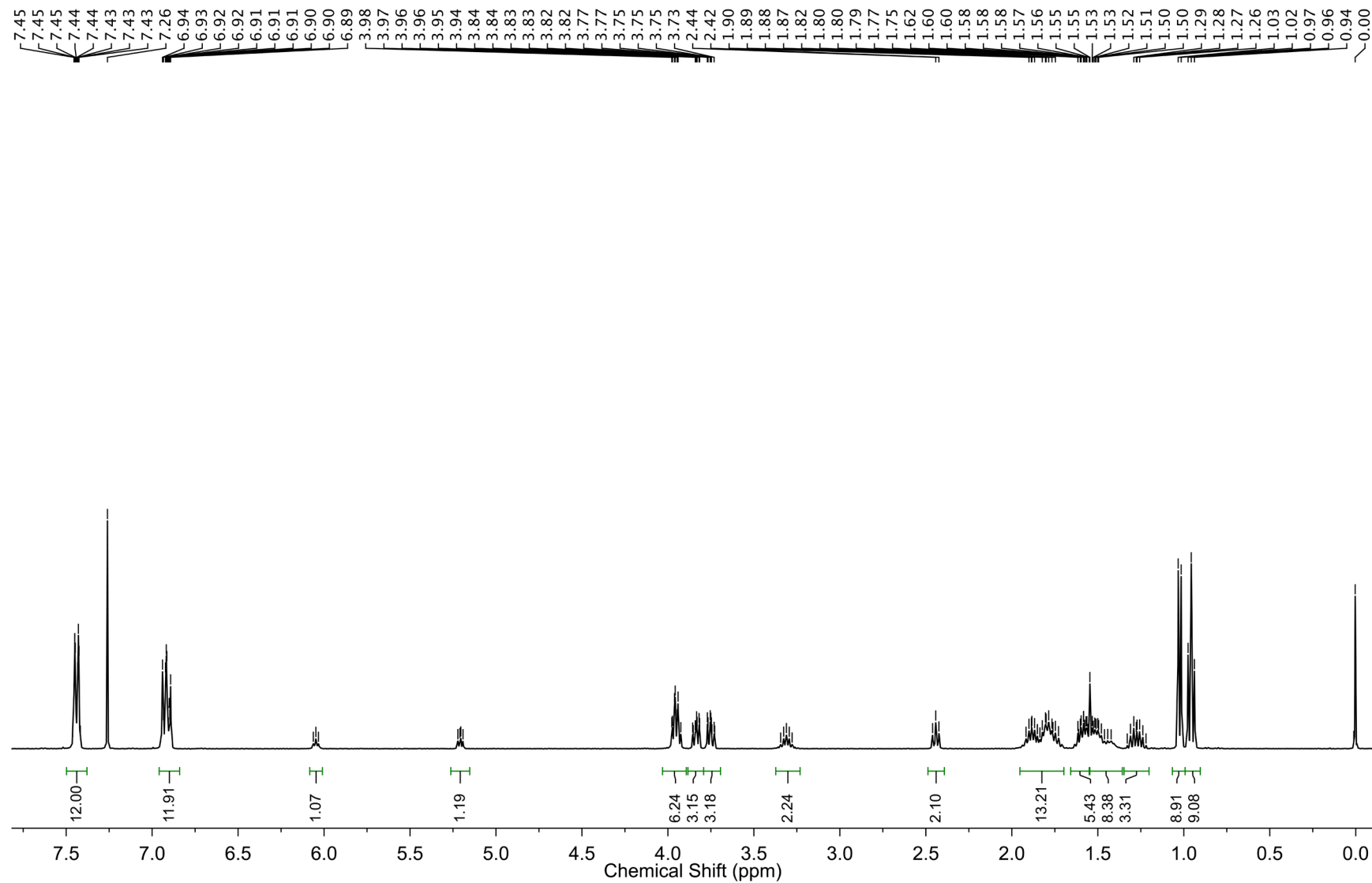


1-(10-(4'-Methoxybiphenyl-4-oxy)decylaminocarbonyl)-11-(4'-methoxybiphenyl-4-oxy)undecyl

11-(4'-methoxybiphenyl-4-oxy)undecanoate (3-10)

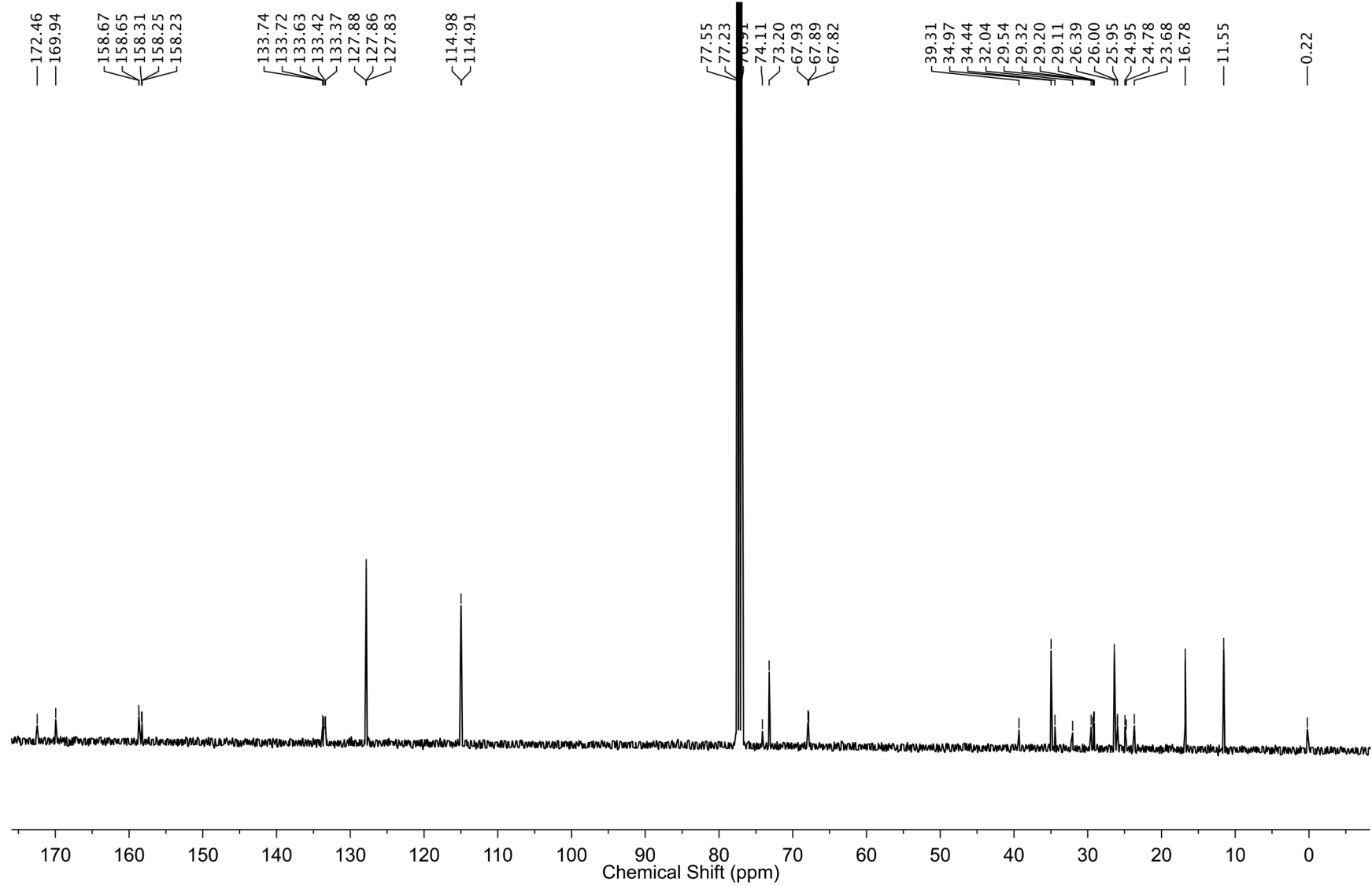


1-(5-(4'-((S)-2-Methylbutoxy)biphenyl-4-oxy)pentylaminocarbonyl)-6-(4'-((S)-2-methylbutoxy)biphenyl-4-oxy)hexyl 6-(4'-cyanobiphenyl-4-oxy)hexanoate (3-11)

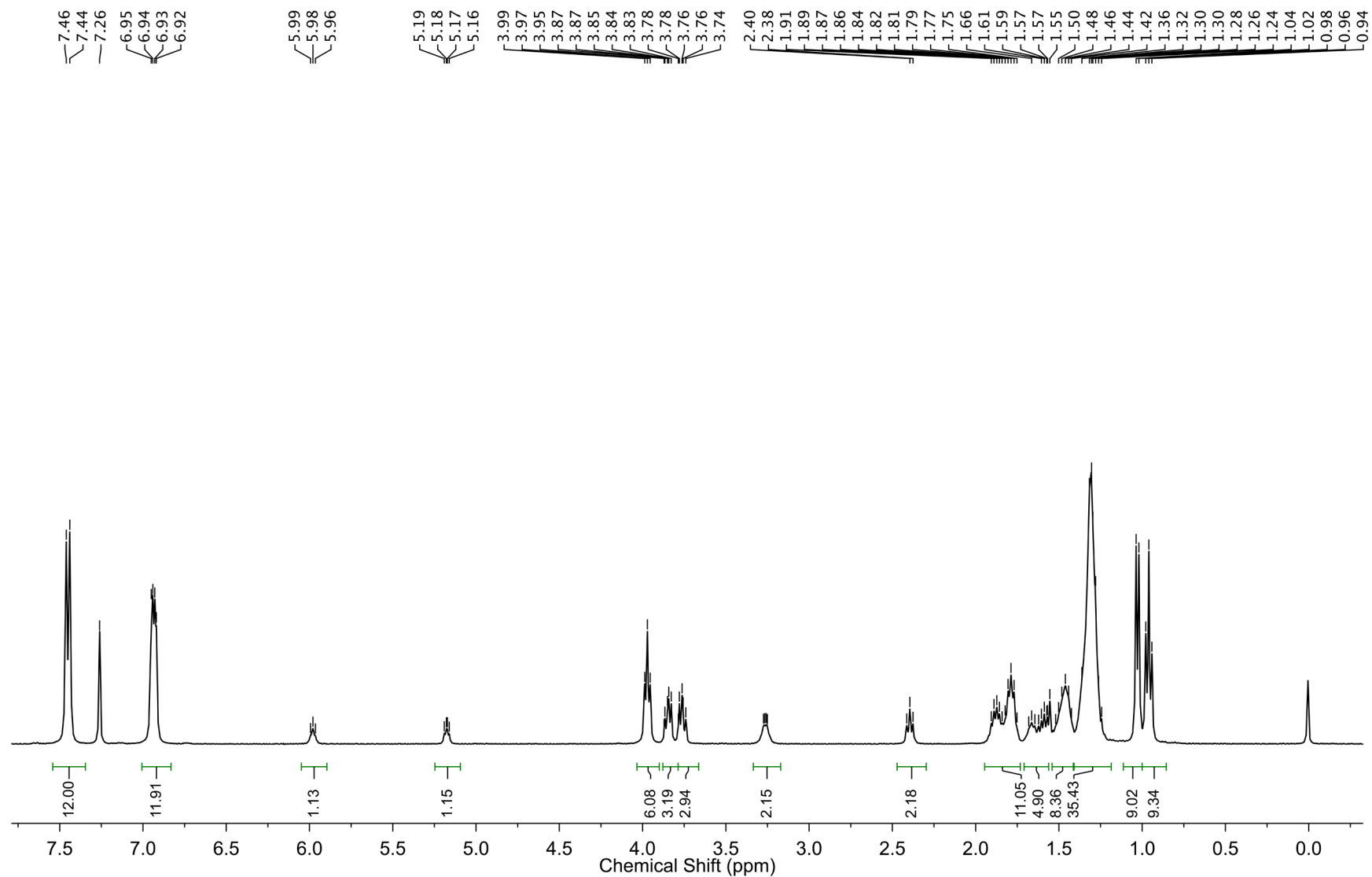


**1-(5-(4'-((S)-2-Methylbutoxy)biphenyl-4-oxy)pentylaminocarbonyl)-6-(4'-((S)-2-methylbutoxy)biphenyl-4-oxy)hexyl
cyanobiphenyl-4-oxy)hexanoate (3-11)**

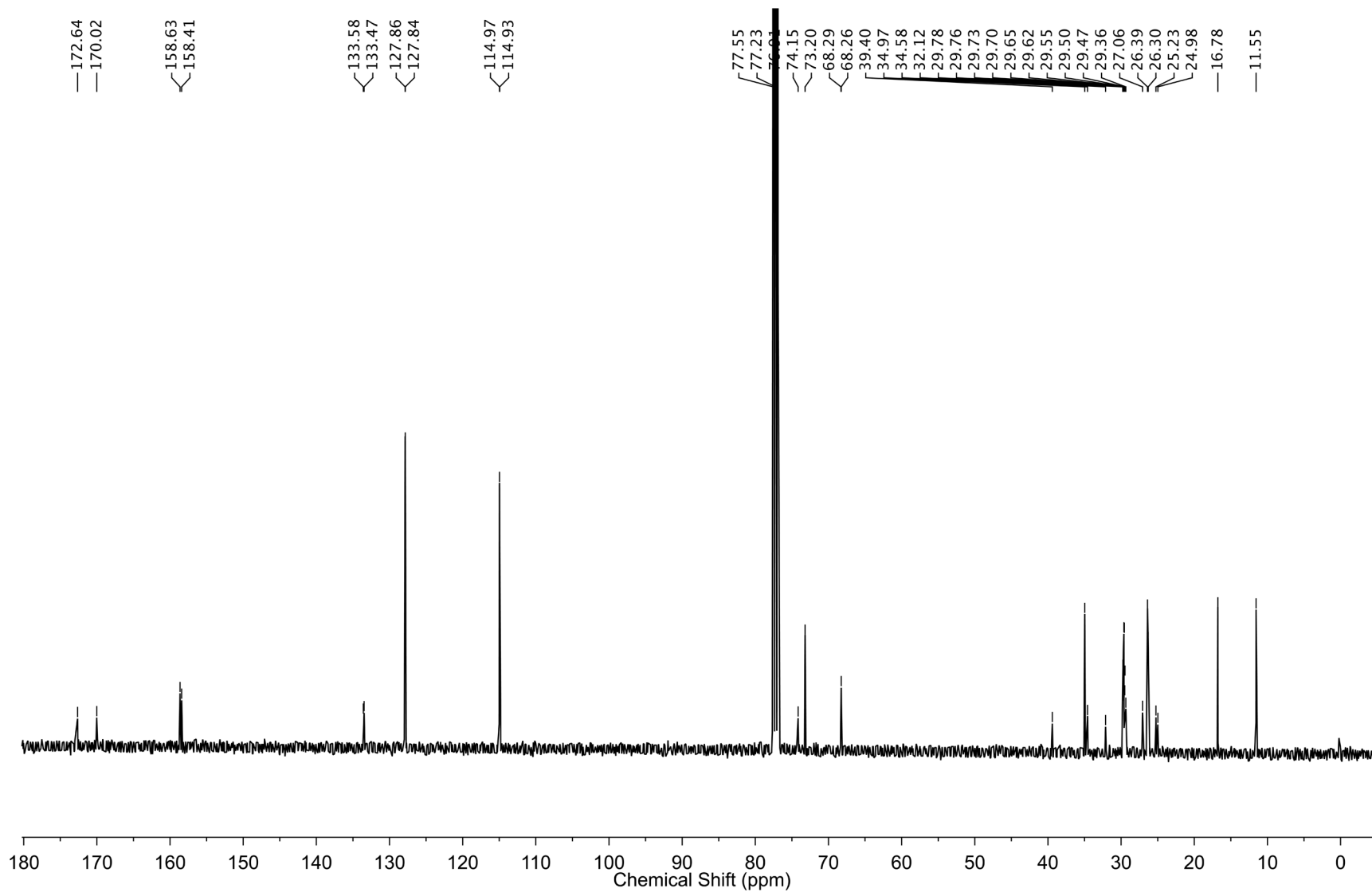
6-(4'-



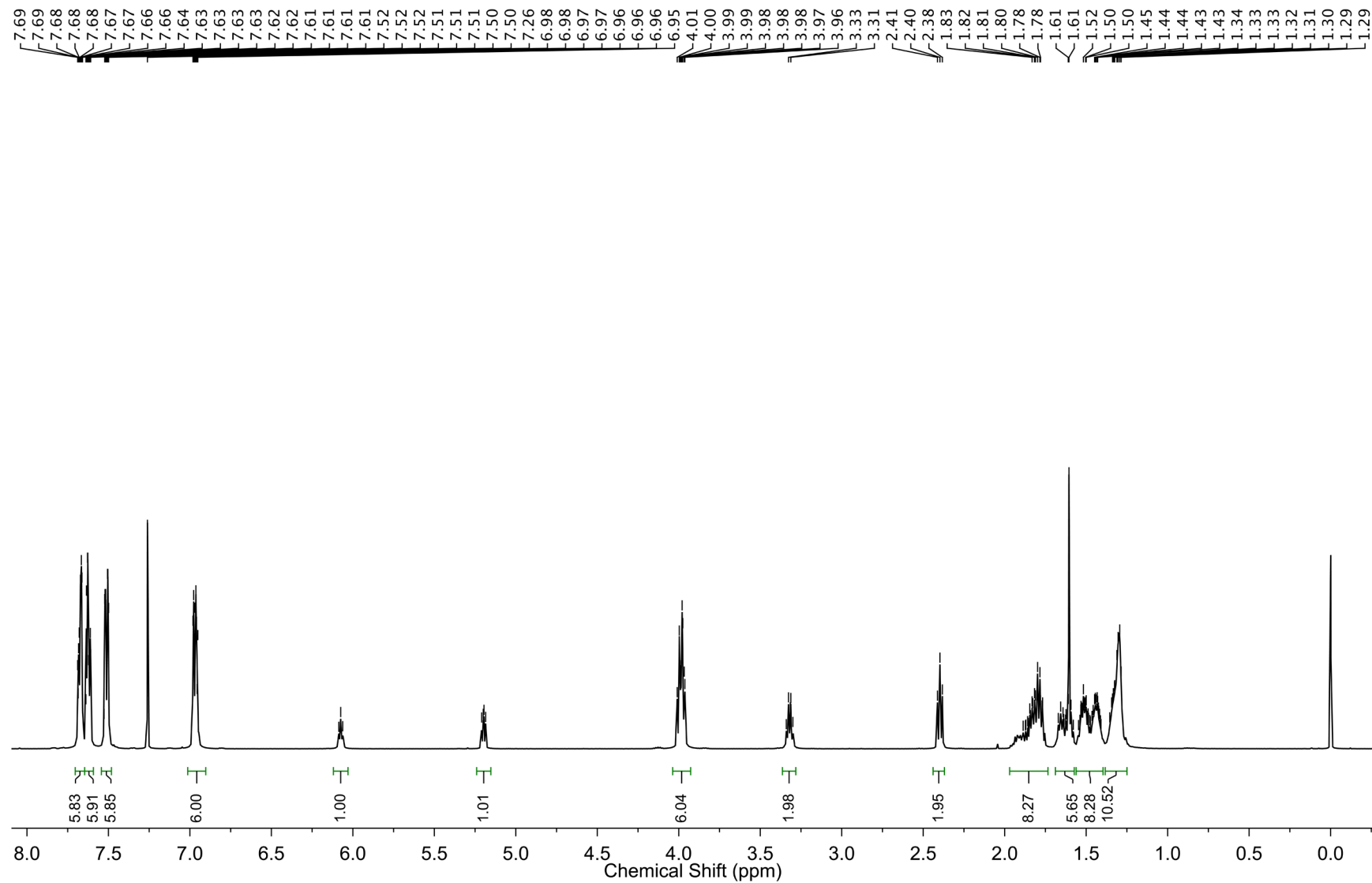
1-(10-(4'-((S)-2-Methylbutoxy)biphenyl-4-oxyl)decylaminocarbonyl)-11-(4'-((S)-2-methylbutoxy)biphenyl-4-oxyl)undecyl 11-(4'-((S)-2-methylbutoxy)phenyl-4-oxyl)undecanoate (3-12)



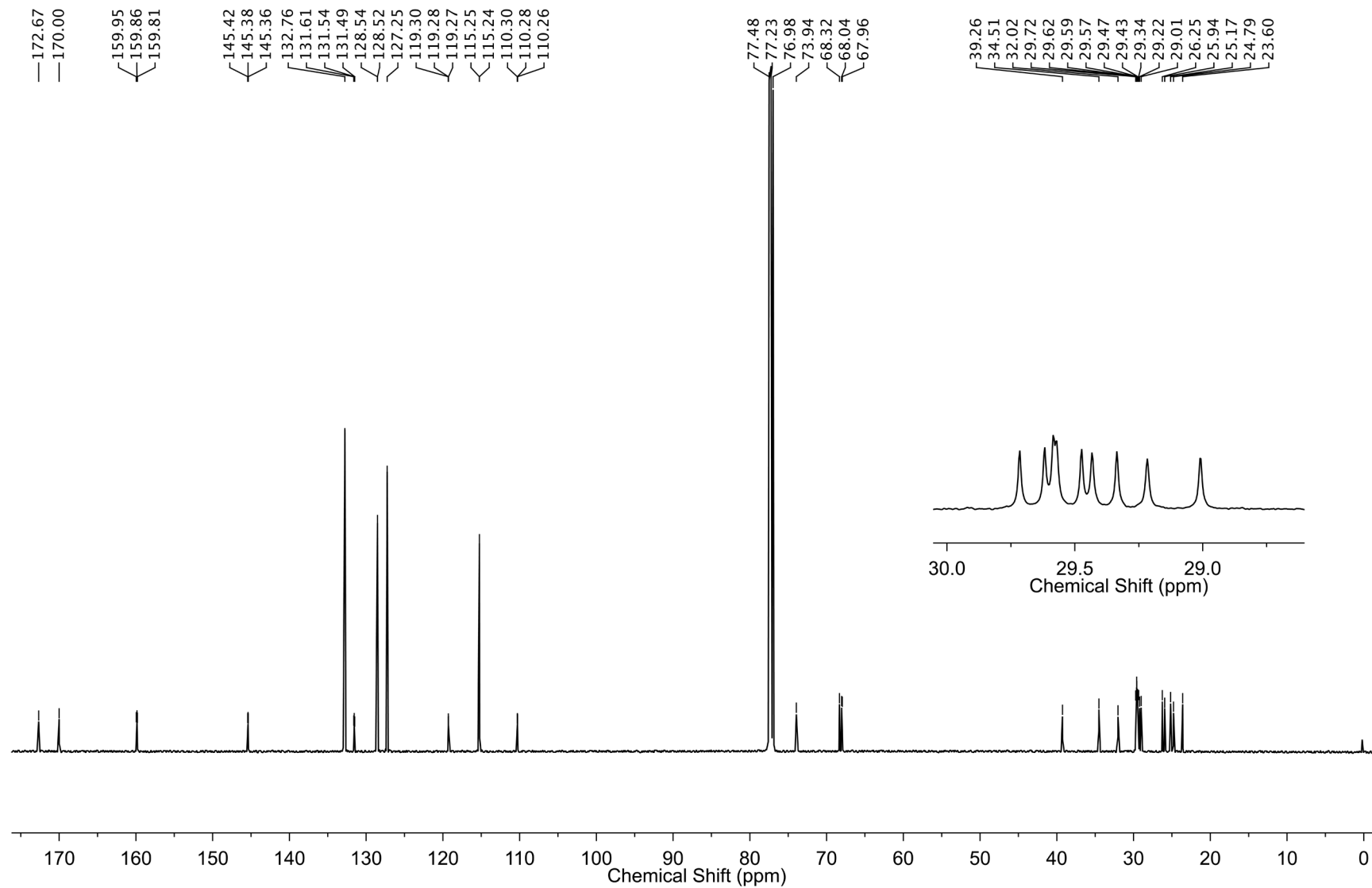
1-(10-(4'-((S)-2-Methylbutoxy)biphenyl-4-oxy)decylaminocarbonyl)-11-(4'-((S)-2-methylbutoxy)biphenyl-4-oxy)undecyl 11-(4'-((S)-2-methylbutoxy)phenyl-4-oxy)undecanoate (3-12)



1-(5-(4'-Cyanobiphenyl-4-oxy)pentylaminocarbonyl)-6-(4'-cyanobiphenyl-4-oxy)hexyl 11-(4'-cyanobiphenyl-4-oxy)decanoate (3-13)

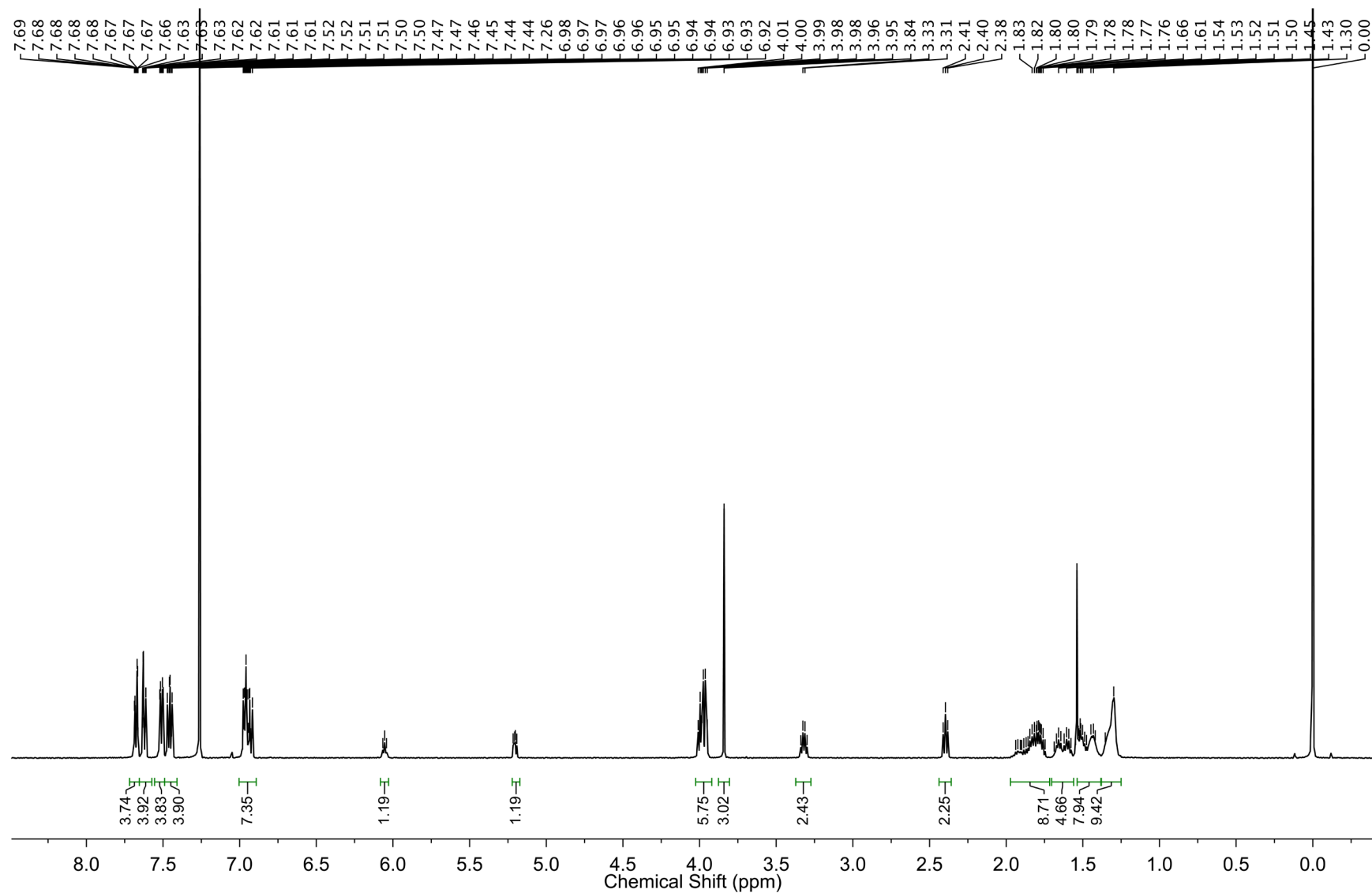


1-(5-(4'-Cyanobiphenyl-4-oxy)pentylaminocarbonyl)-6-(4'-cyanobiphenyl-4-oxy)hexyl 11-(4'-cyanobiphenyl-4-oxy)decanoate (3-13)



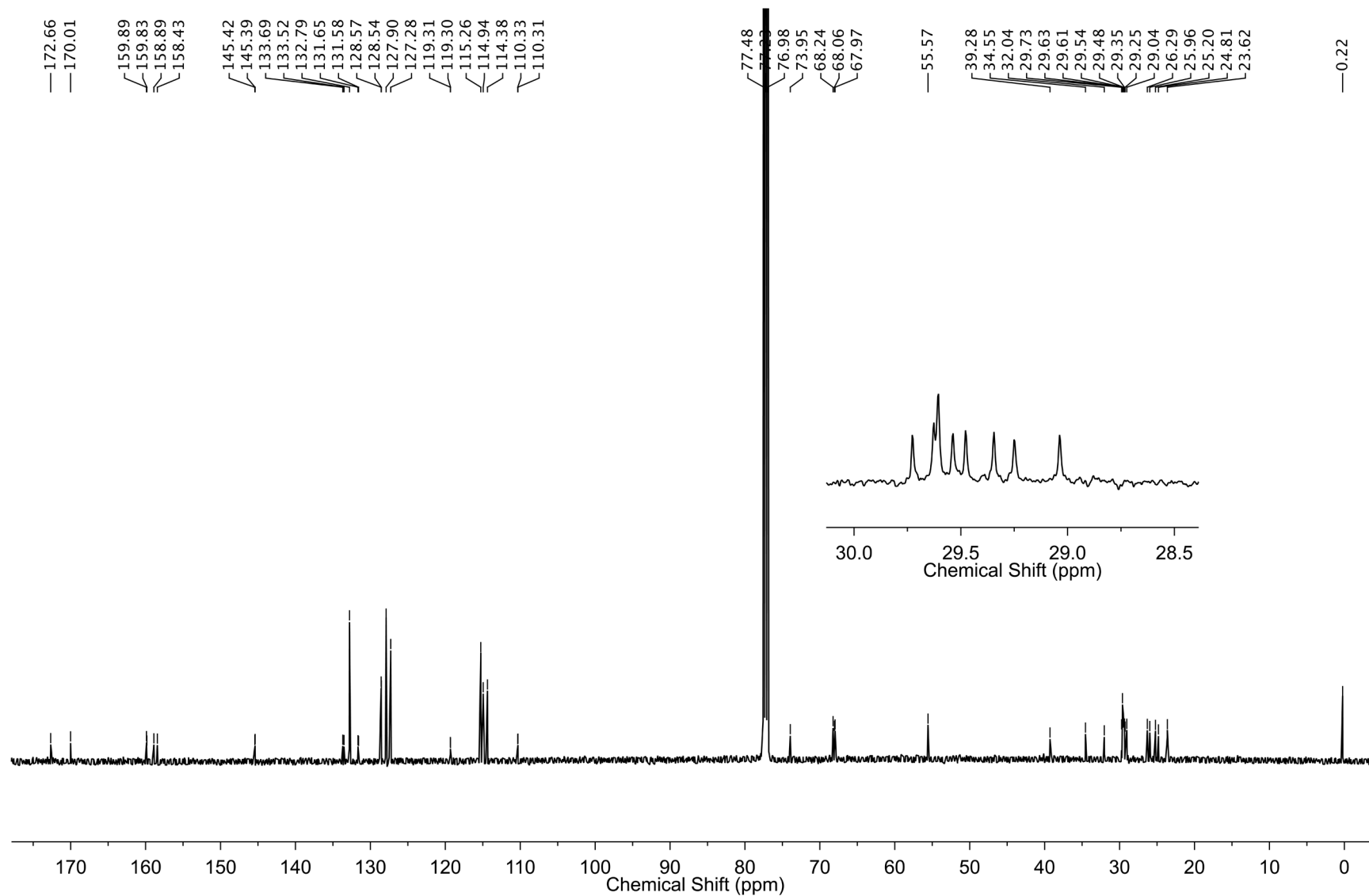
1-(5-(4'-Cyanobiphenyl-4-oxy)pentylaminocarbonyl)-6-(4'-cyanobiphenyl-4-oxy)hexyl
oxy)undecanoate (3-14)

11-(4'-methoxybiphenyl-4-

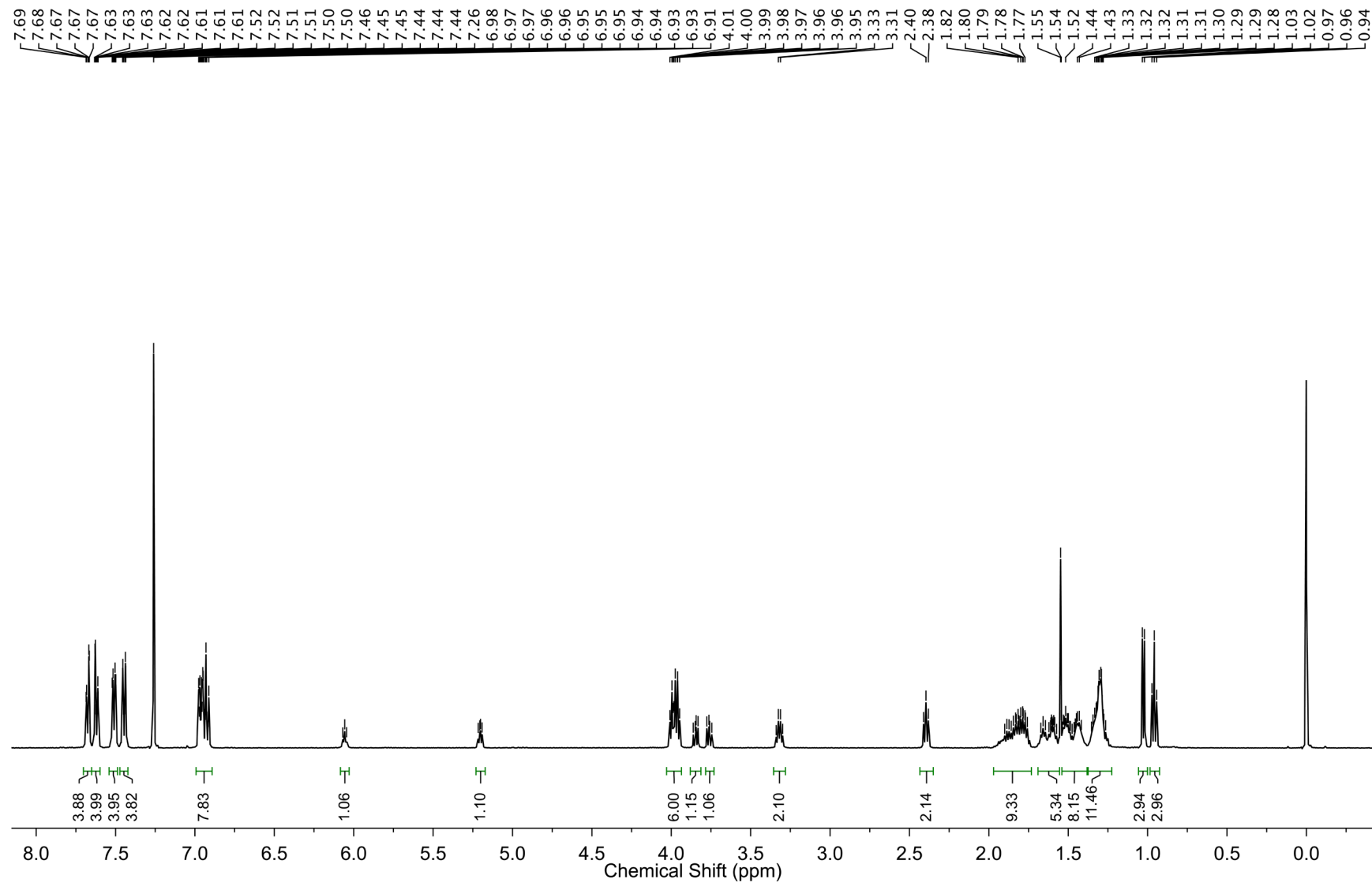


1-(5-(4'-Cyanobiphenyl-4-oxy)pentylaminocarbonyl)-6-(4'-cyanobiphenyl-4-oxy)hexyl
oxy)undecanoate (3-14)

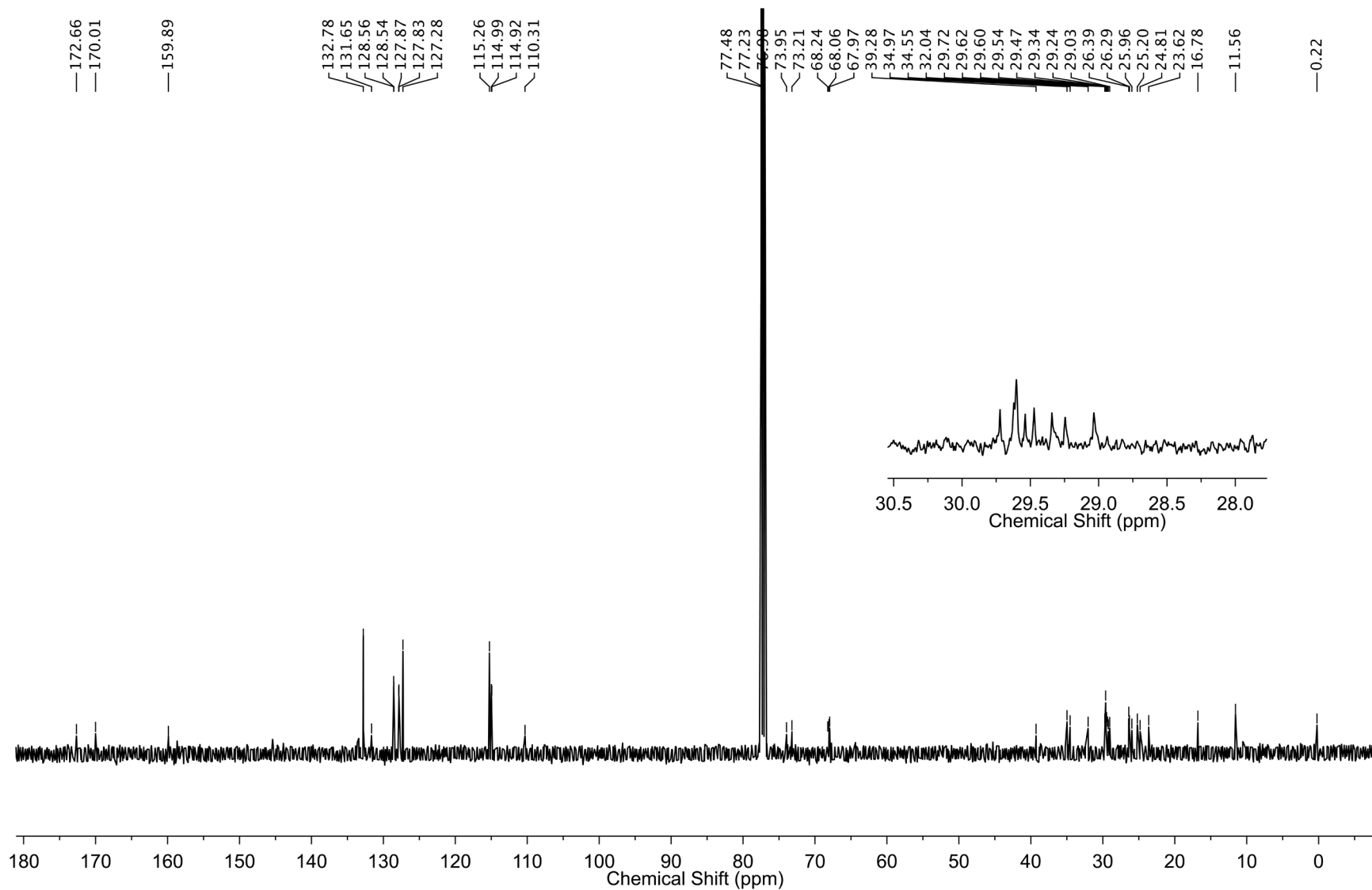
11-(4'-methoxybiphenyl-4-



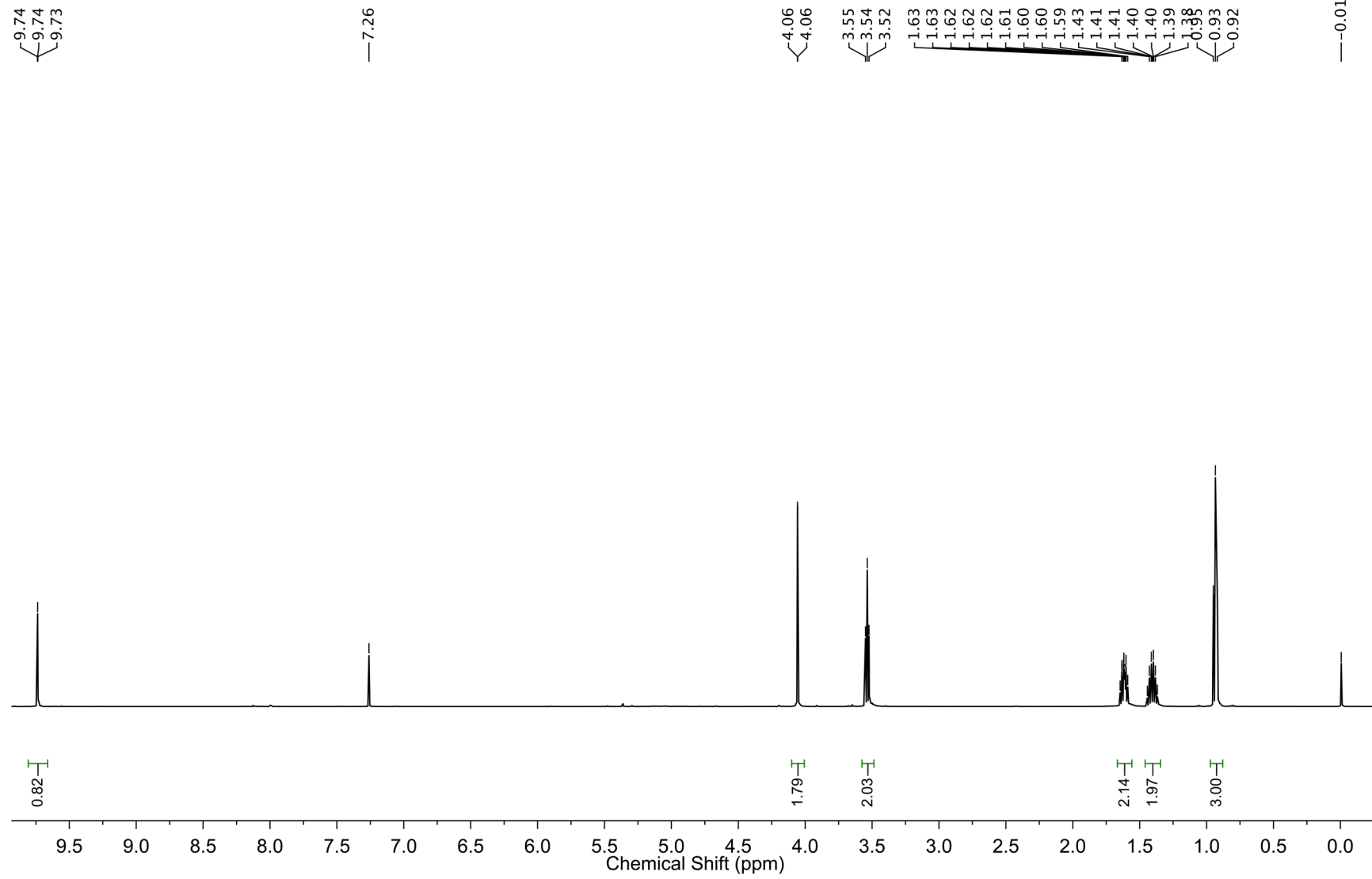
1-(5-(4'-Cyanobiphenyl-4-oxy)pentylaminocarbonyl)-6-(4'-cyanobiphenyl-4-oxy)hexyl 11-(4'-((S)-2-methylbutoxy)biphenyl-4-oxy)undecanoate (3-15)



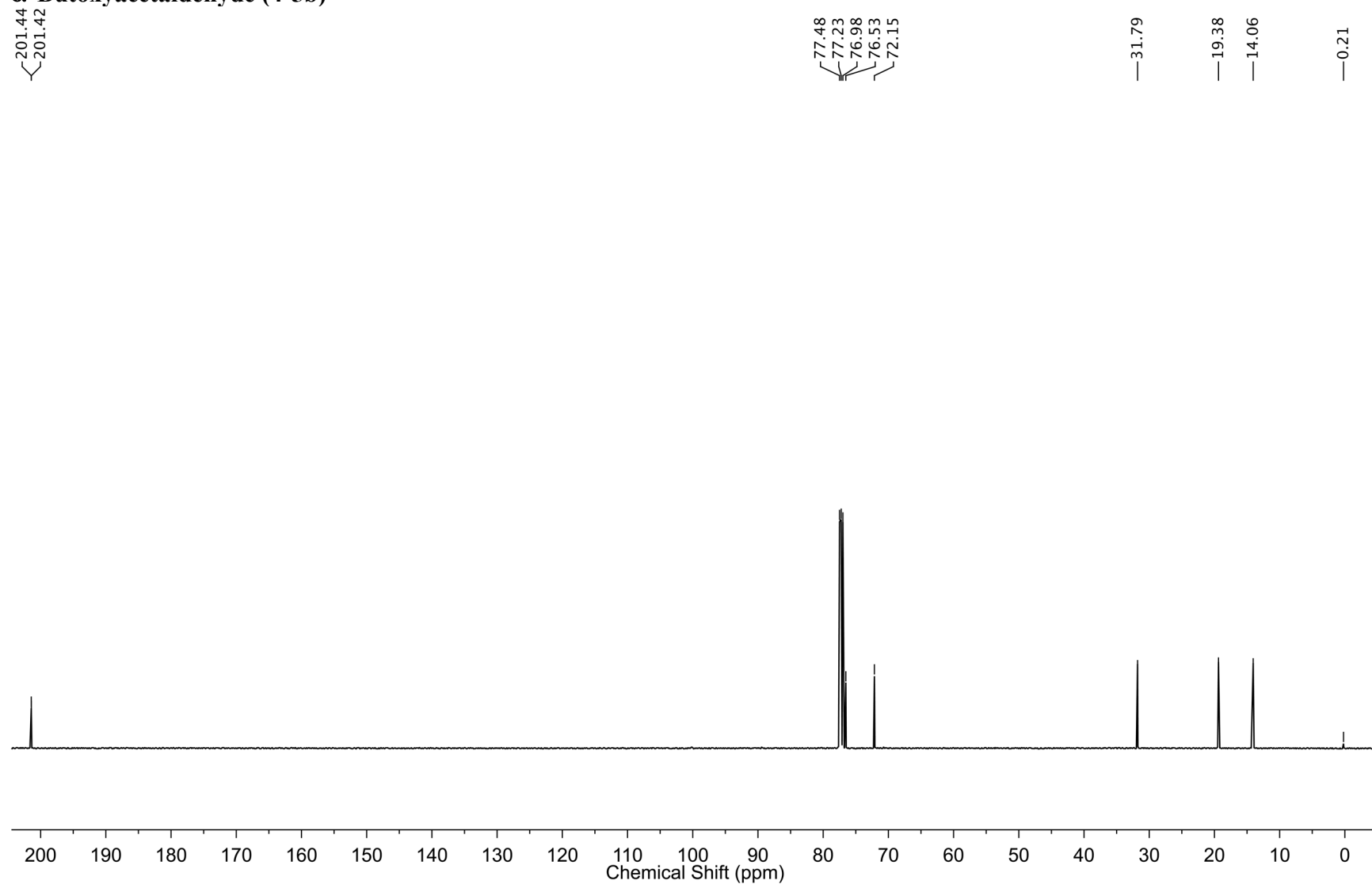
1-(5-(4'-Cyanobiphenyl-4-oxy)pentylaminocarbonyl)-6-(4'-cyanobiphenyl-4-oxy)hexyl 11-(4'-((S)-2-methylbutoxy)biphenyl-4-oxy)undecanoate (3-15)



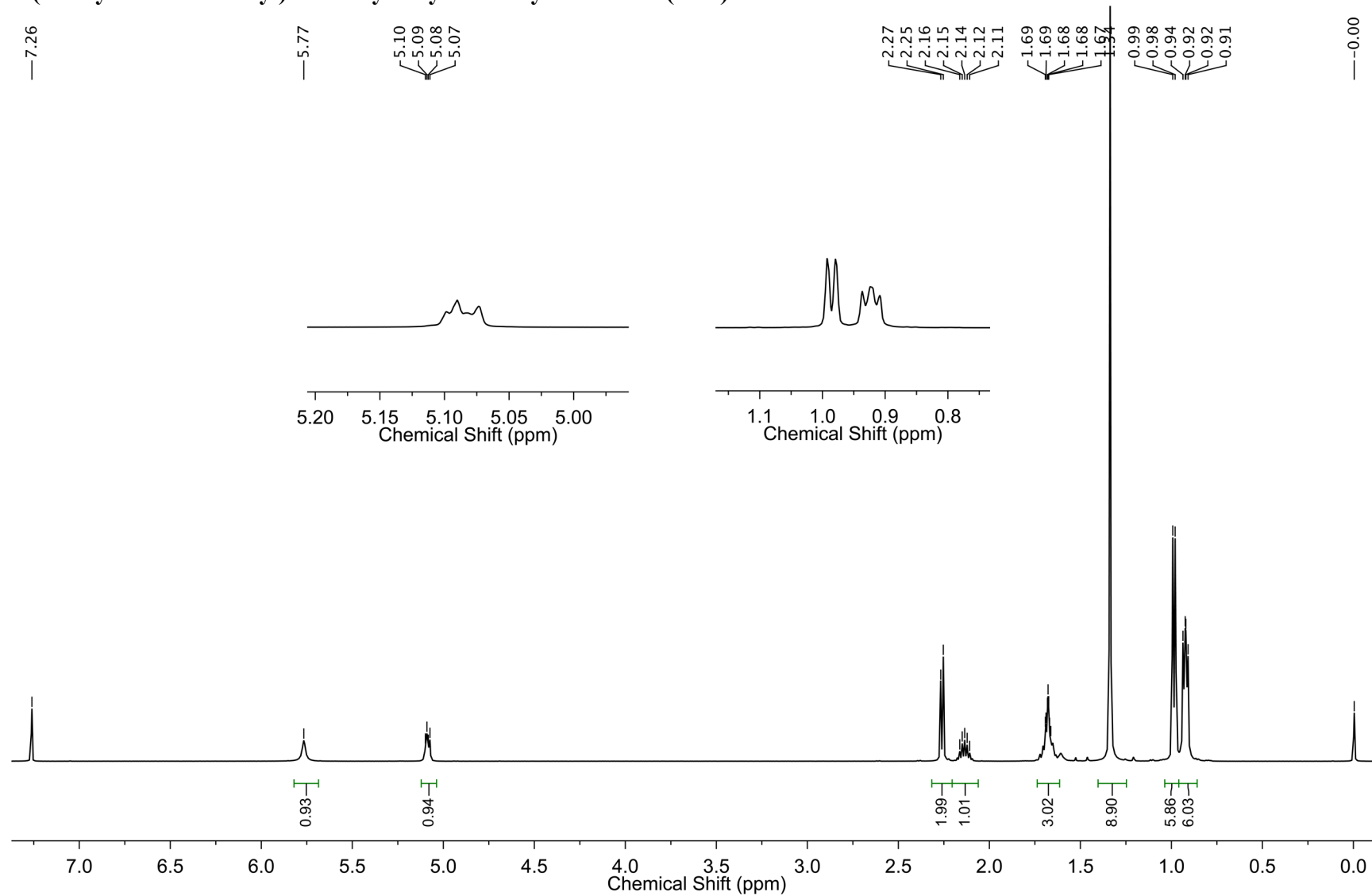
α -Butoxyacetaldehyde (4-5b)



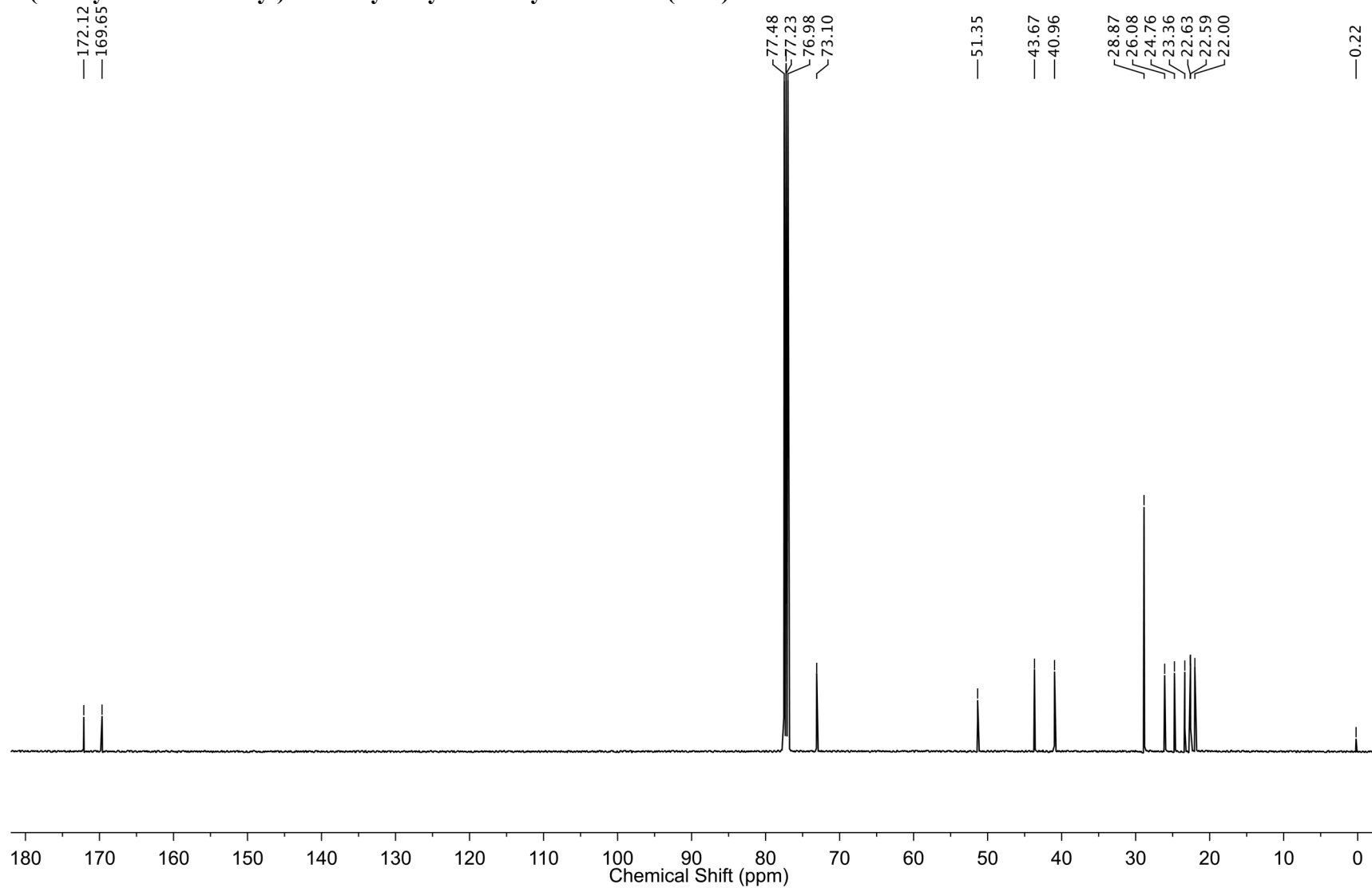
α -Butoxyacetaldehyde (4-5b)



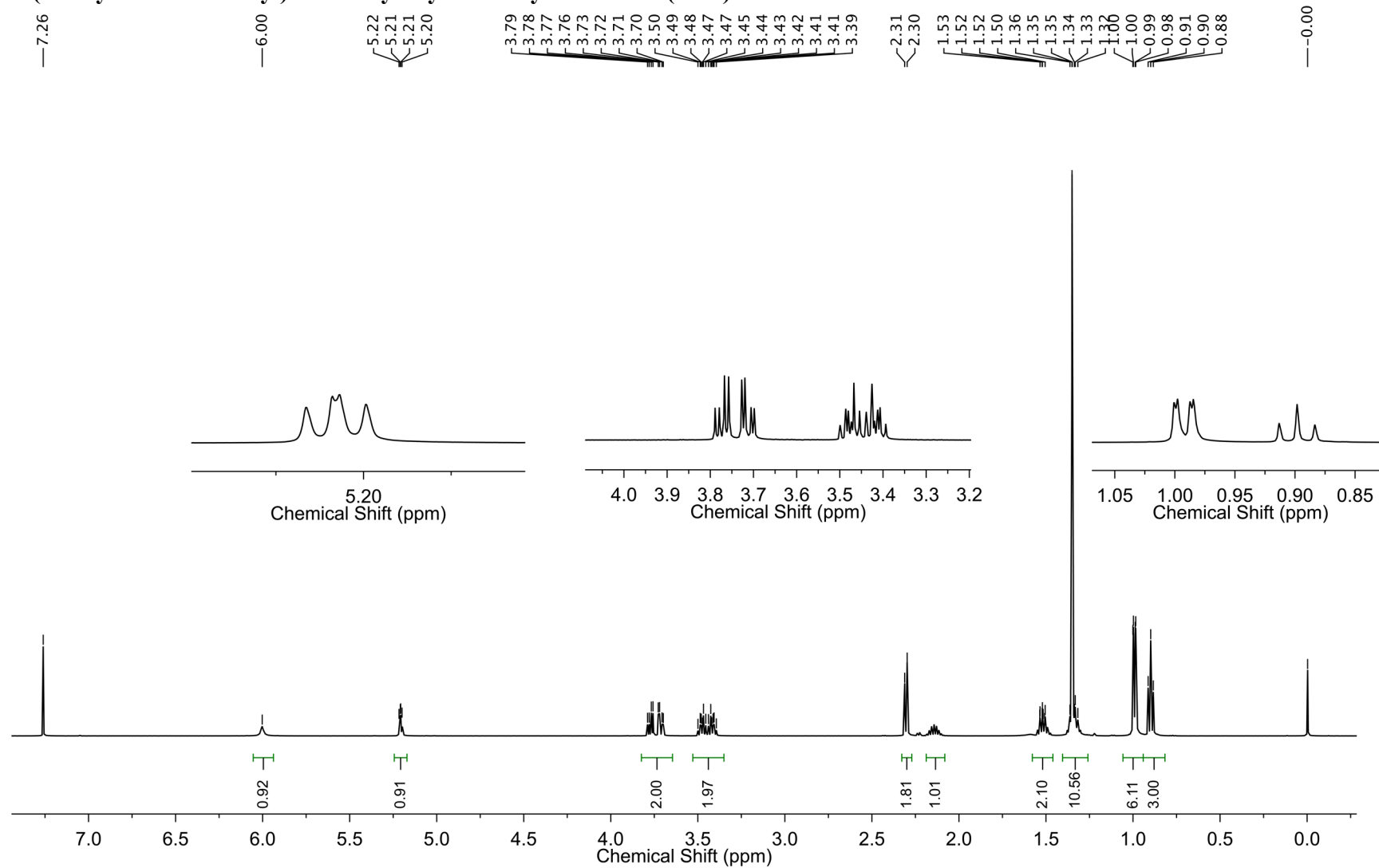
1-(*t*-Butylaminocarbonyl)-3-methylbutyl 3-methylbutanoate (4-6a)



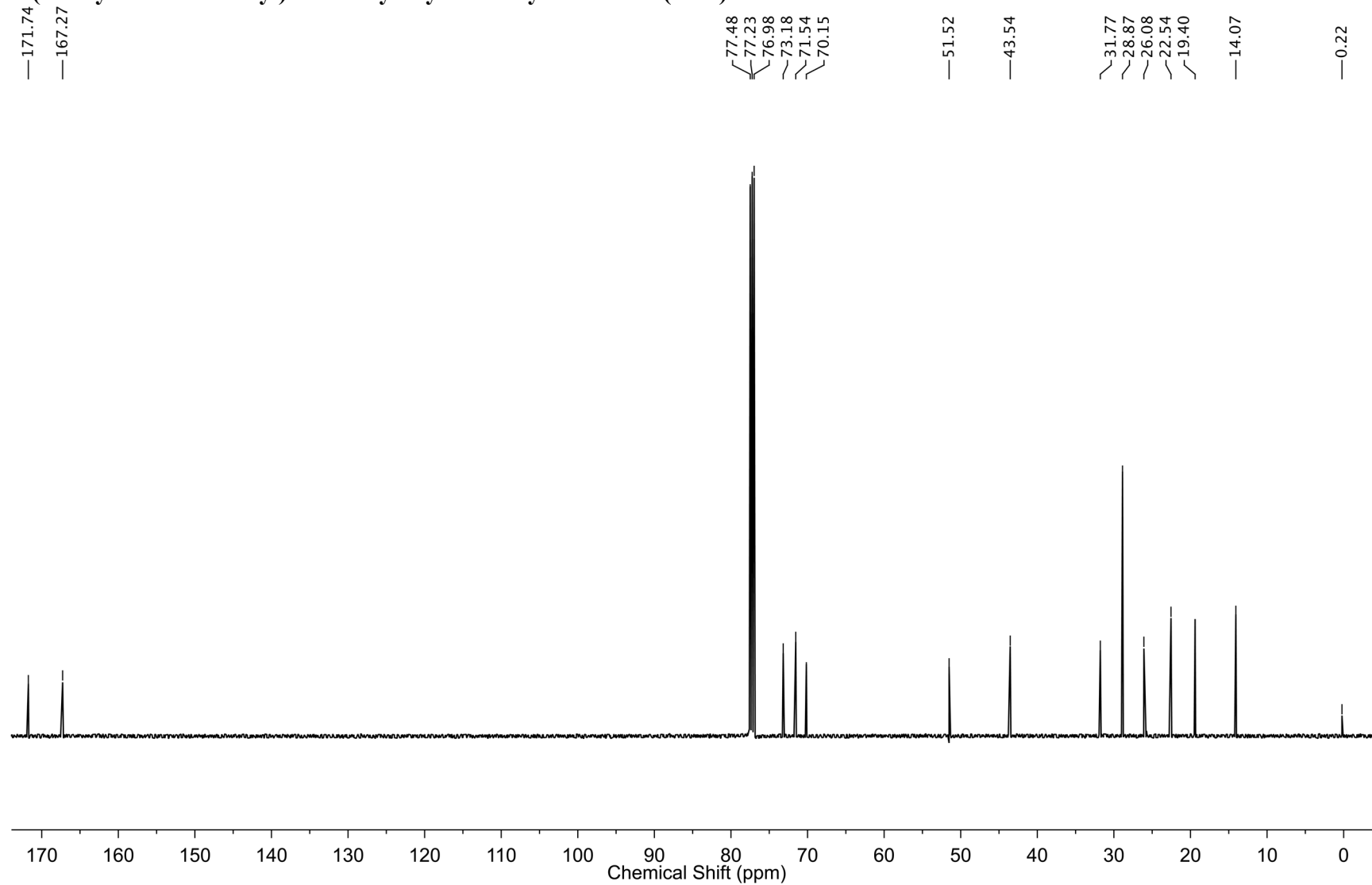
1-(*t*-Butylaminocarbonyl)-3-methylbutyl 3-methylbutanoate (4-6a)



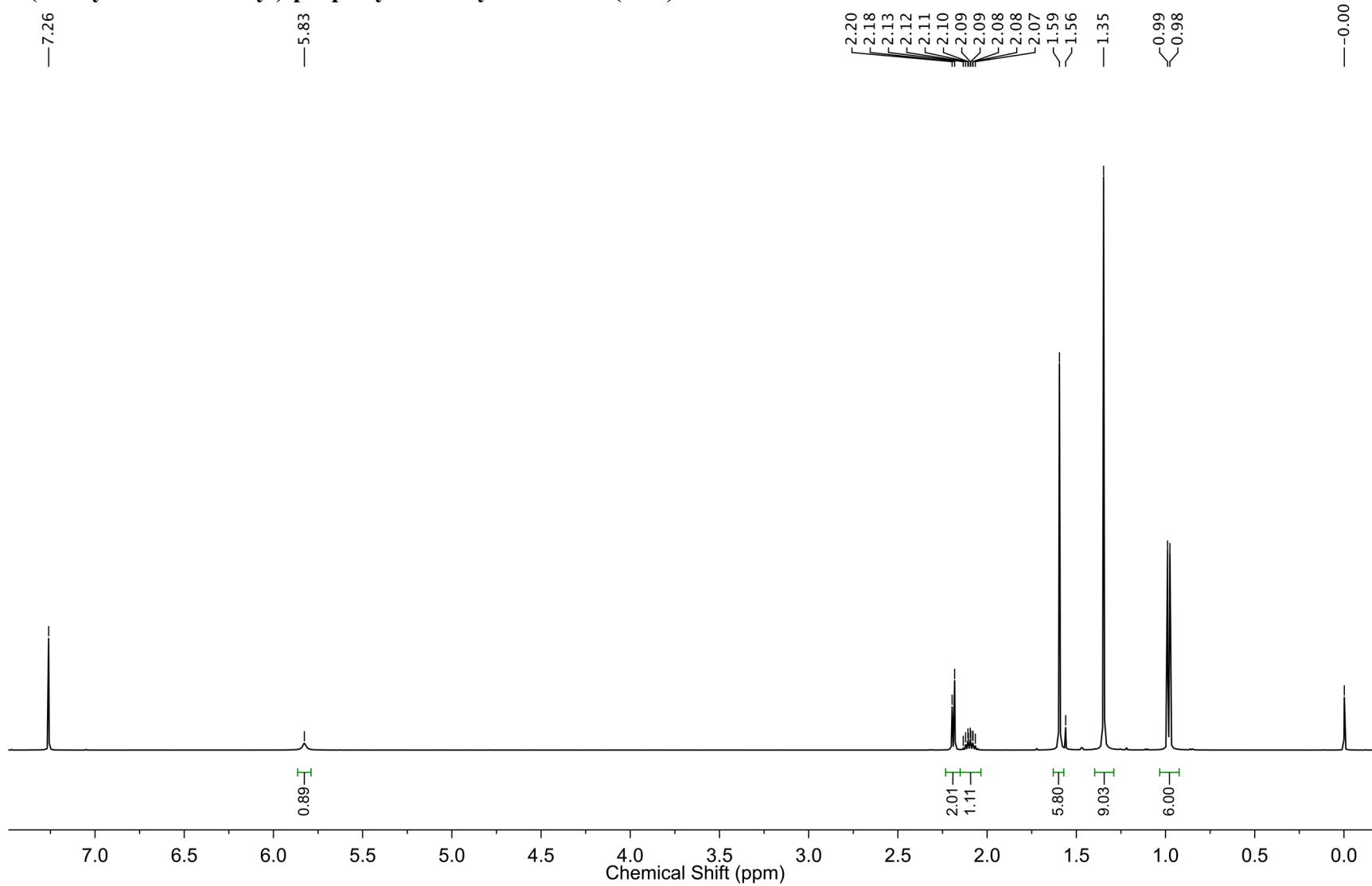
1-(*t*-Butylaminocarbonyl)-2-butoxyethyl 3-methylbutanoate (4-6b)



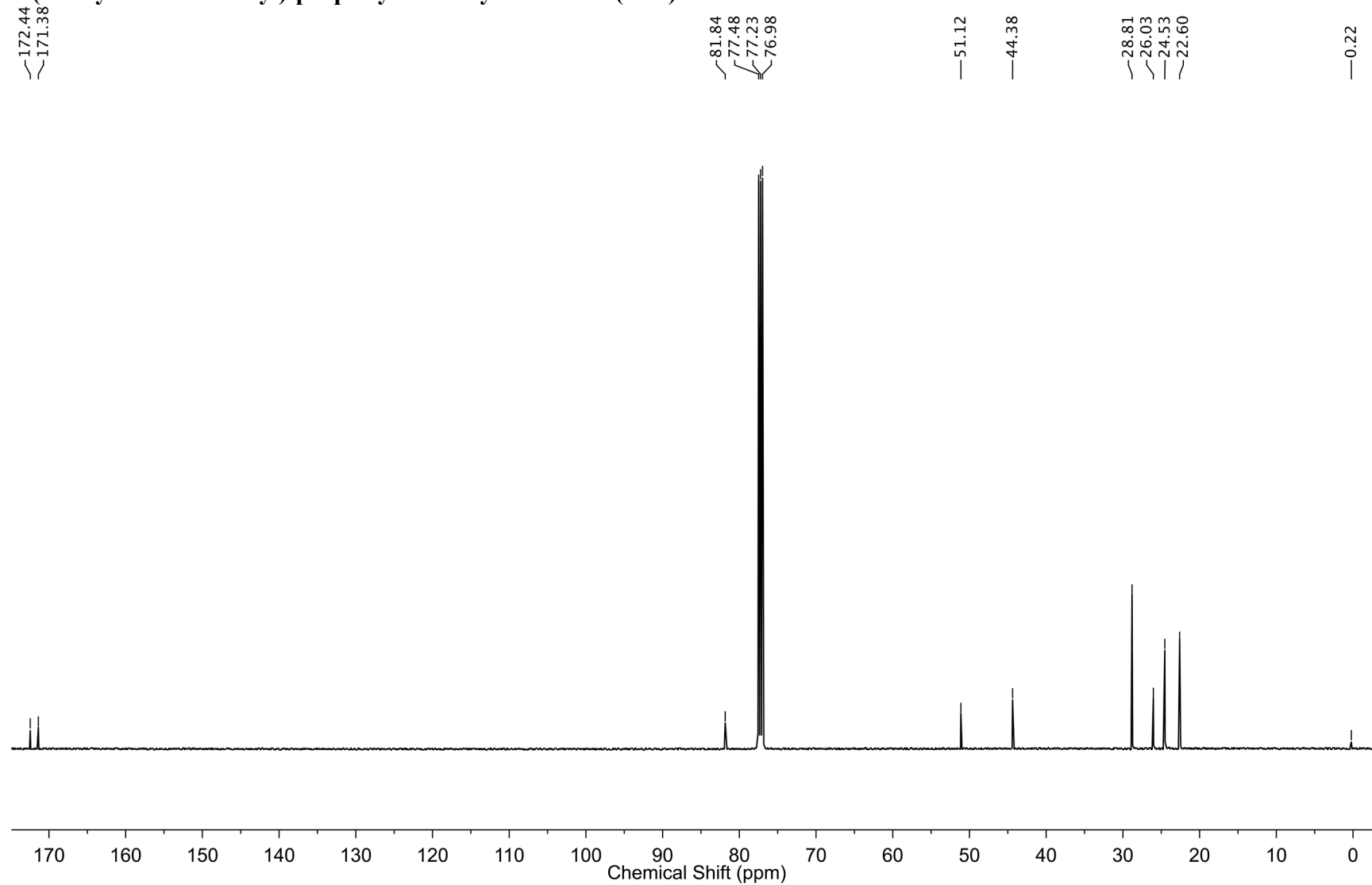
1-(*t*-Butylaminocarbonyl)-2-butoxyethyl 3-methylbutanoate (4-6b)



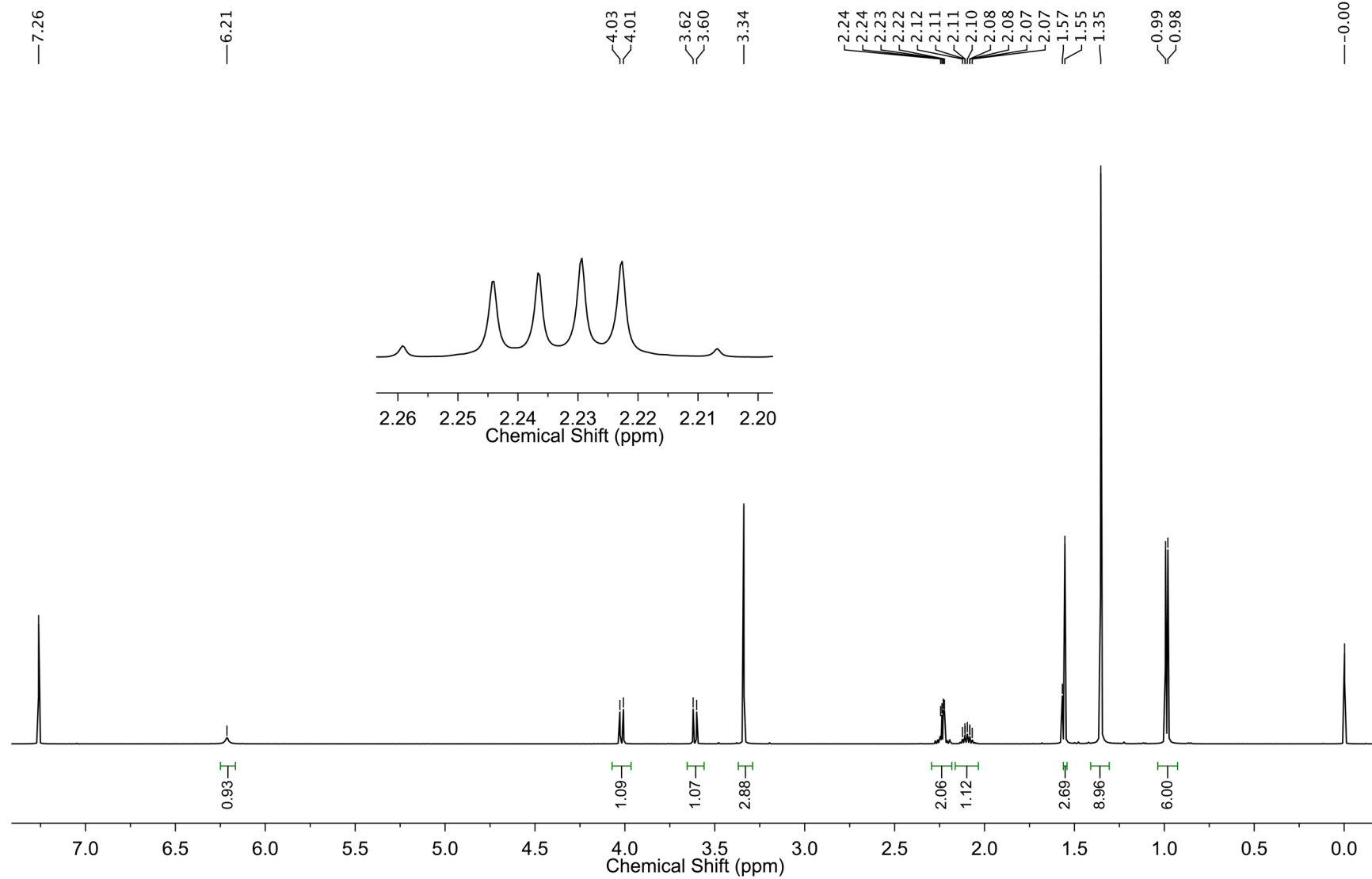
2-(*t*-Butylaminocarbonyl)-prop-2-yl 3-methylbutanoate (4-6c)



2-(*t*-Butylaminocarbonyl)-prop-2-yl 3-methylbutanoate (4-6c)



1-Methoxy-2-(*t*-butylaminocarbonyl)-prop-2-yl 3-methylbutanoate (4-6d)



1-Methoxy-2-(*t*-butylaminocarbonyl)-prop-2-yl 3-methylbutanoate (4-6d)

