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APPENDIX

ศูนย์วิทยทรัพยากร
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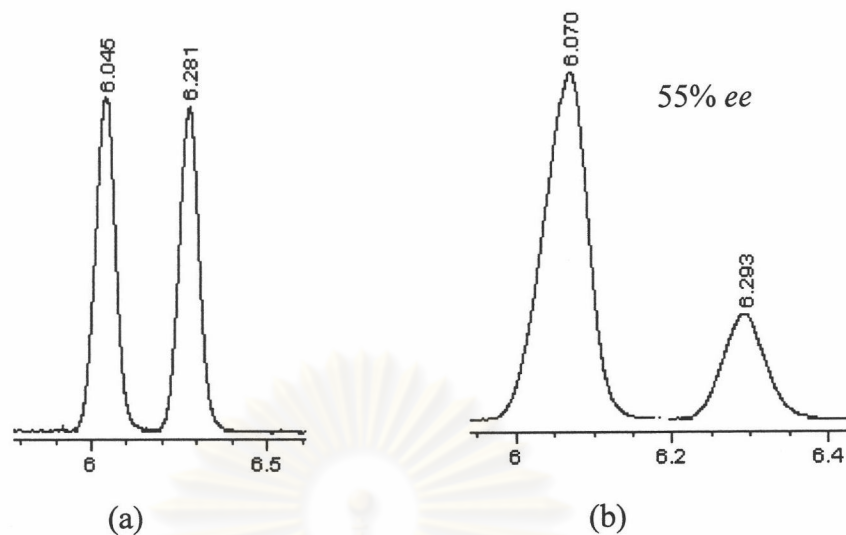


Figure 1 The chromatogram of chiral GC analysis of diethyl 1-hydroxy-(4-methylphenyl)methylphosphonate (**501**); (a) racemic **501** and (b) asymmetric product of **501** on a 15.254 m long, 0.25 i.d., capillary coated with 0.25 μm film of 10% BSiMe in PS255. Temperature 160°C.

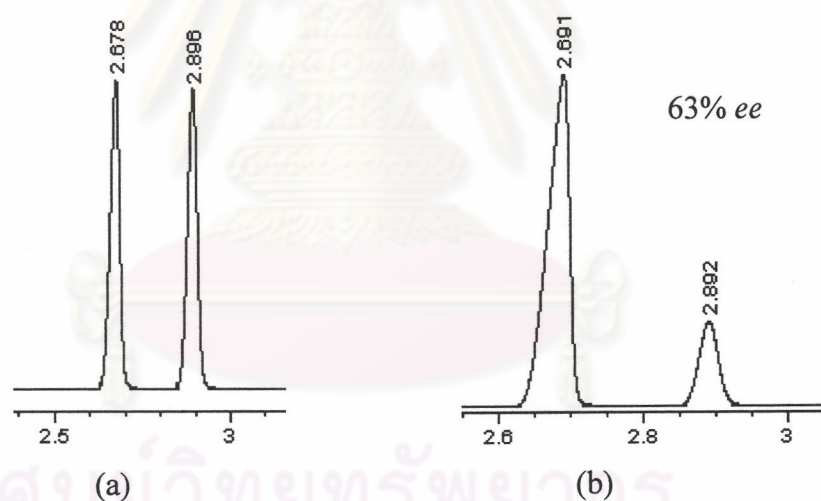


Figure 2 The chromatogram of chiral GC analysis of diethyl 1-hydroxy-3-methylbutylphosphonate (**50aa**); (a) racemic **50aa** and (b) asymmetric product of **50aa** on a 15.092 m long, 0.25 i.d., capillary coated with 0.25 μm film of 10% BSiMe in PS255. Temperature program: 140-220 at 3.5 °C/min.

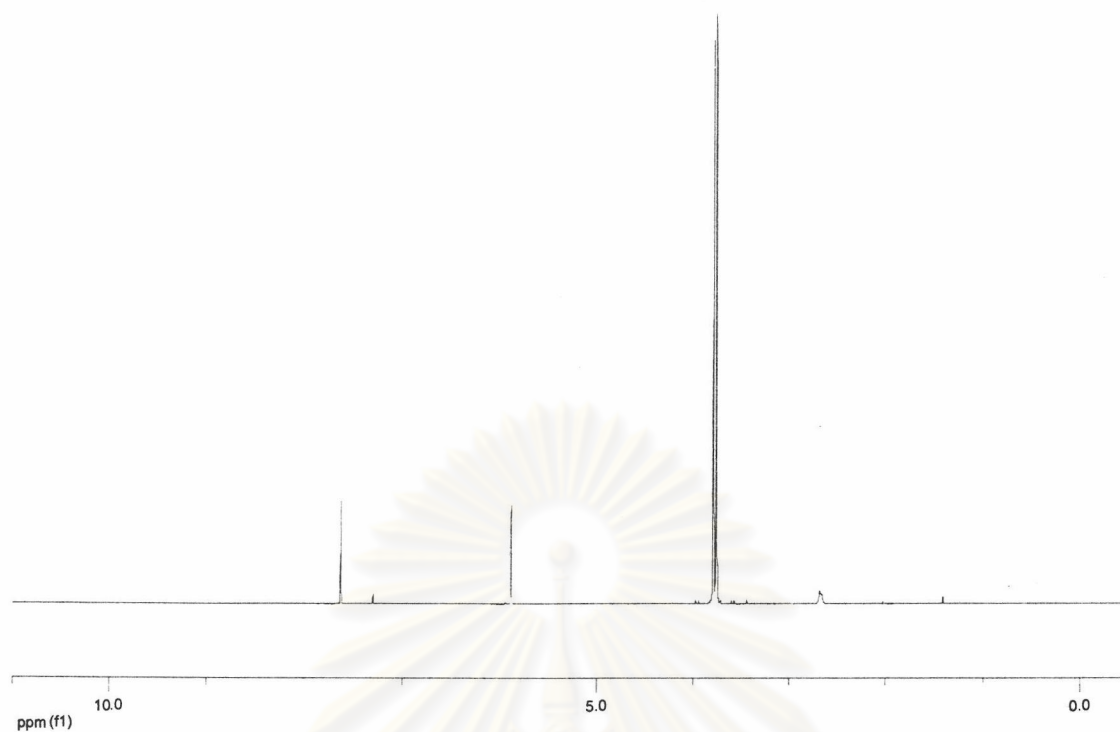


Figure 3 ^1H NMR spectrum (CDCl_3 , 400 MHz) of dimethyl phosphite (49a).

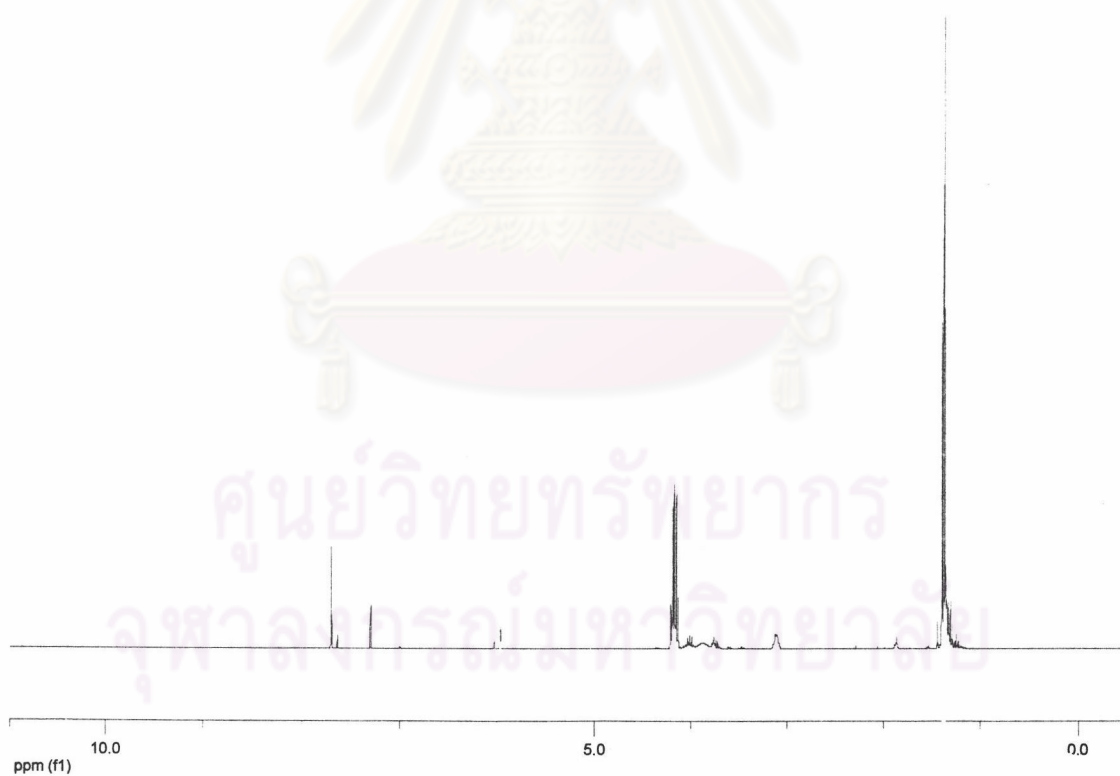


Figure 4 ^1H NMR spectrum (CDCl_3 , 400 MHz) of diethyl phosphite (49b).

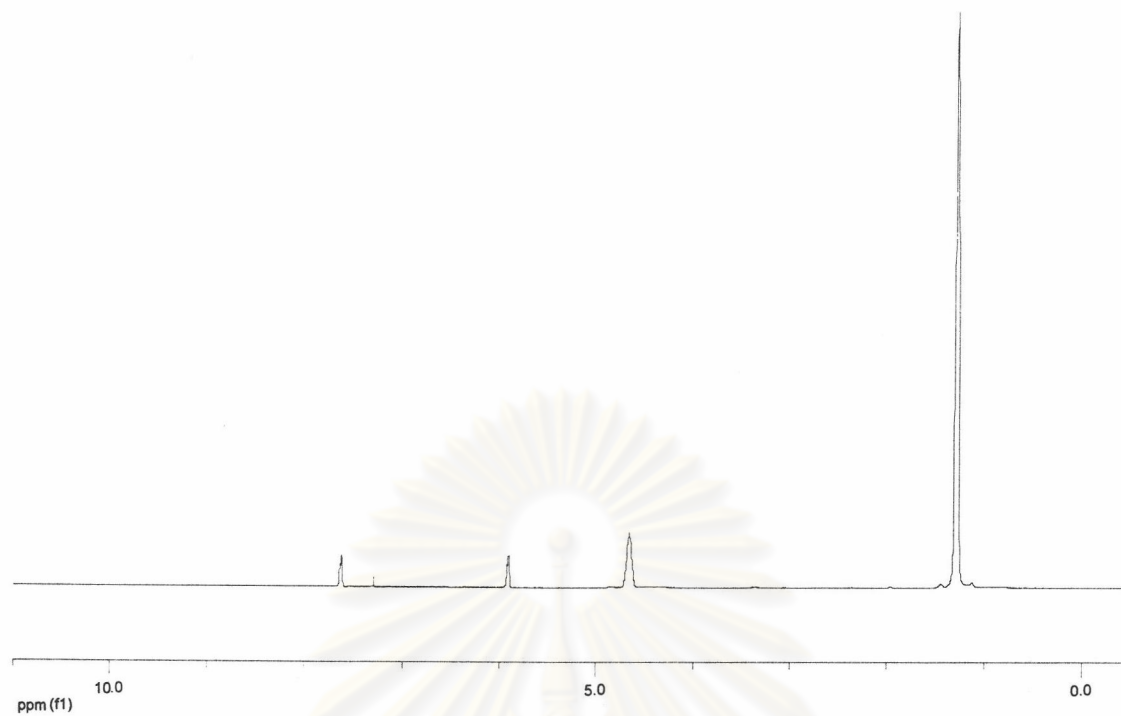


Figure 5 ^1H NMR spectrum (CDCl_3 , 400 MHz) of diisopropyl phosphite (49c).

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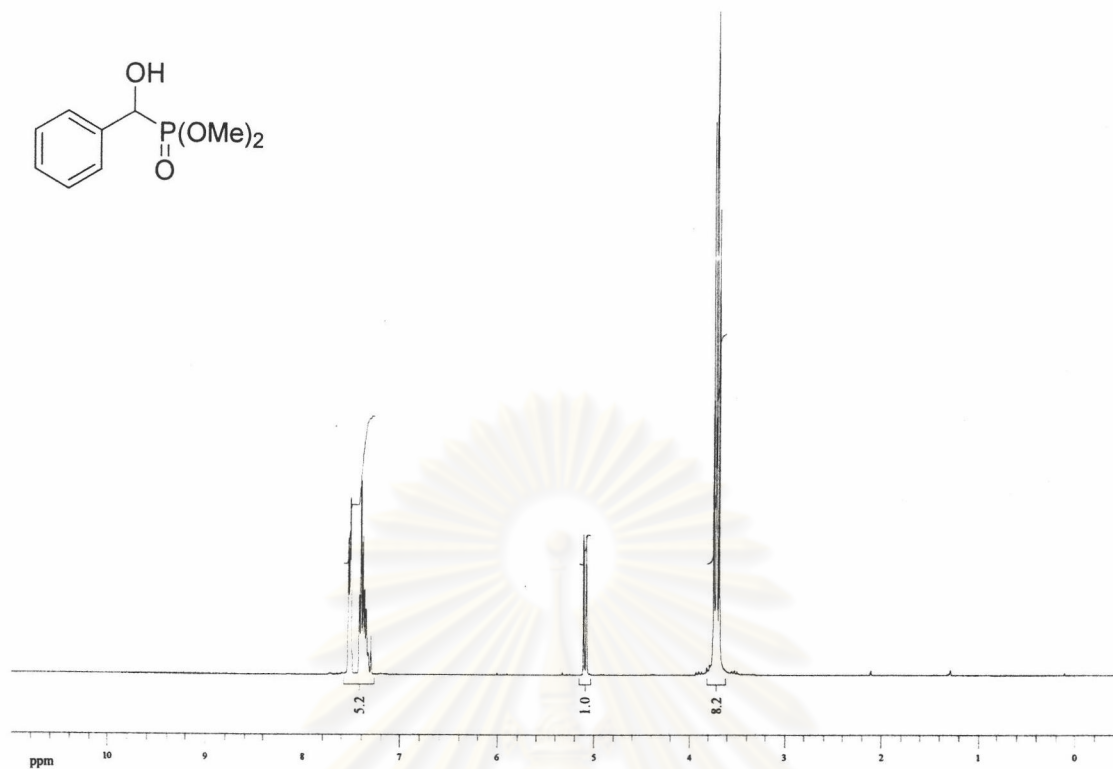


Figure 6 ¹H NMR spectrum (CDCl₃, 400 MHz) of dimethyl 1-hydroxyphenyl methylphosphonate (**50a**).

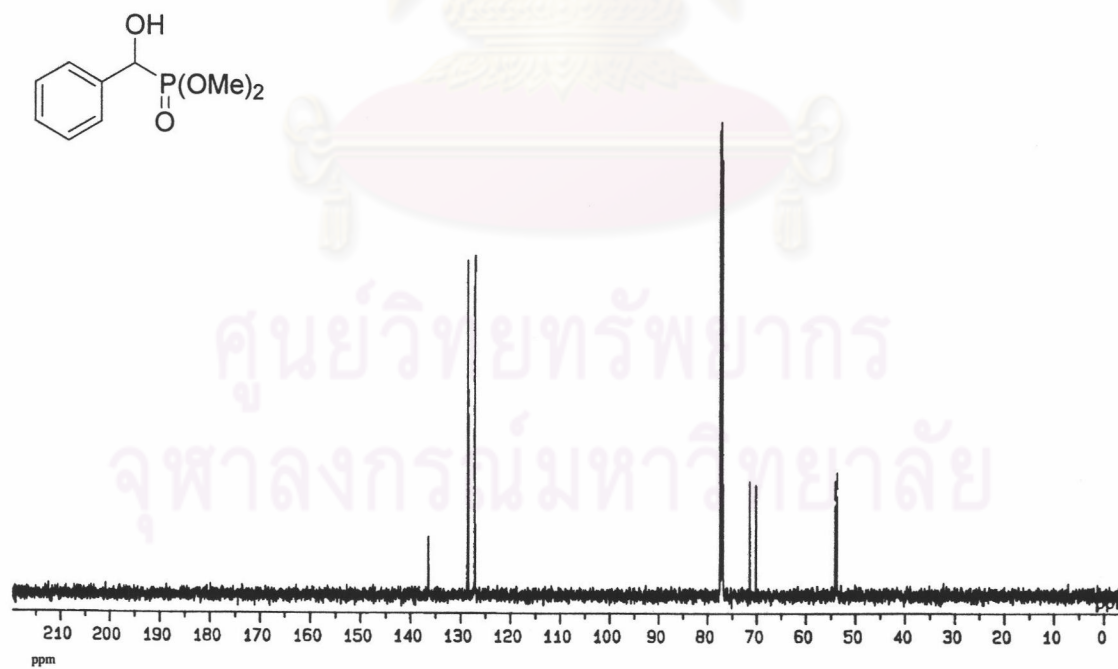


Figure 7 ¹³C NMR spectrum (CDCl₃, 100 MHz) of dimethyl 1-hydroxyphenyl methylphosphonate (**50a**).

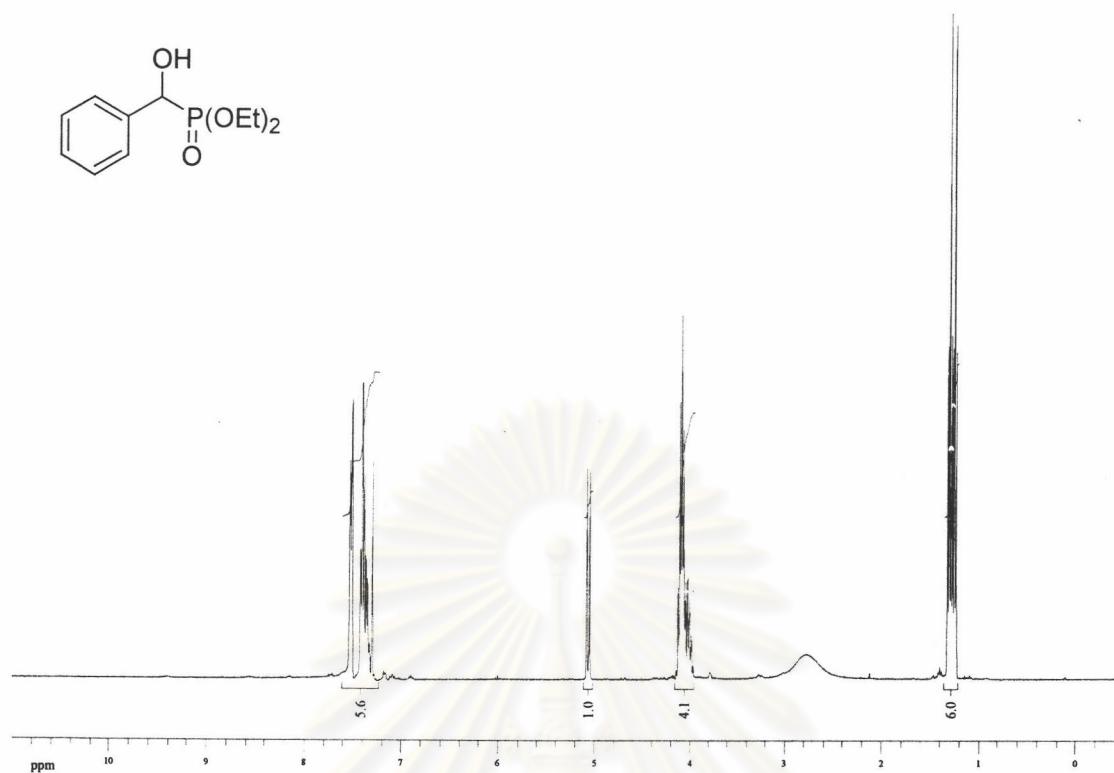


Figure 8 ¹H NMR spectrum (CDCl₃, 400 MHz) of diethyl 1-hydroxyphenyl methylphosphonate (**50b**).

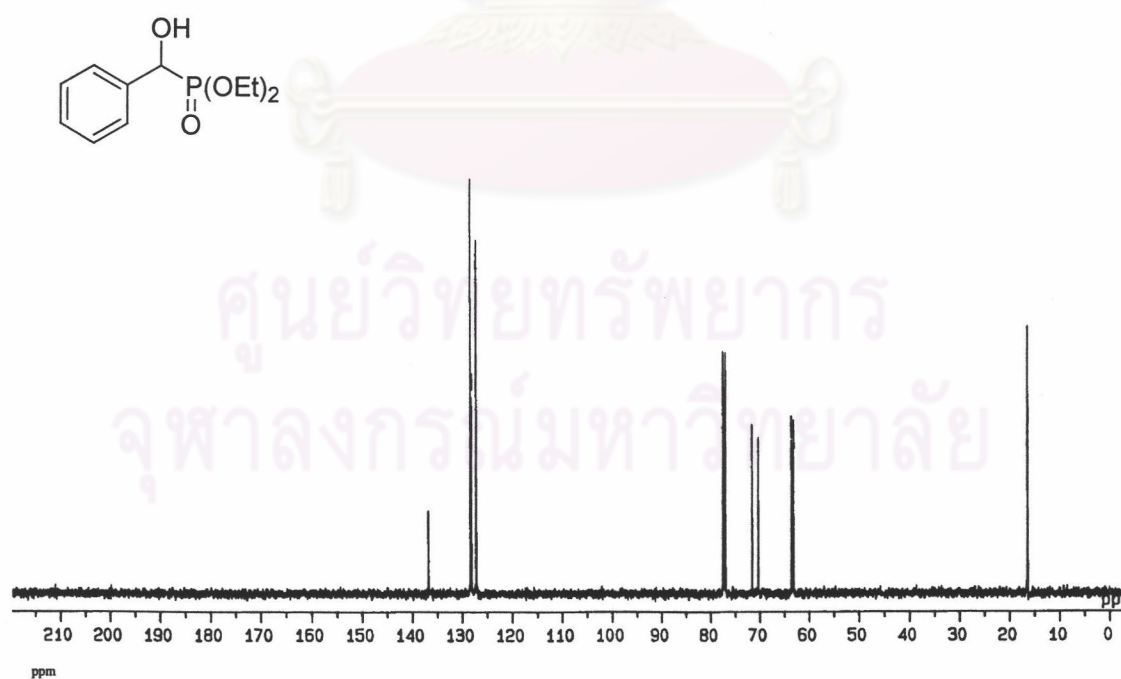


Figure 9 ¹³C NMR spectrum (CDCl₃, 100 MHz) of diethyl 1-hydroxyphenyl methylphosphonate (**50b**).

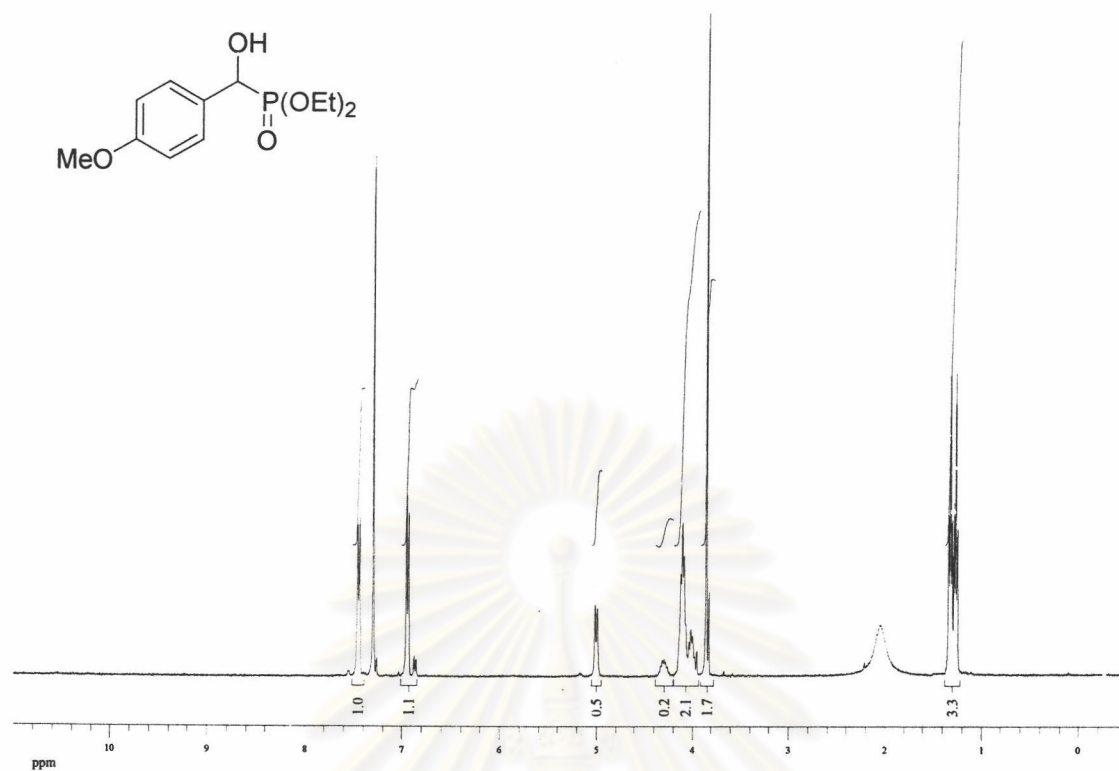


Figure 10 ¹H NMR spectrum (CDCl₃, 400 MHz) of diethyl 1-hydroxy-(4-methoxyphenyl)methylphosphonate (**50c**).

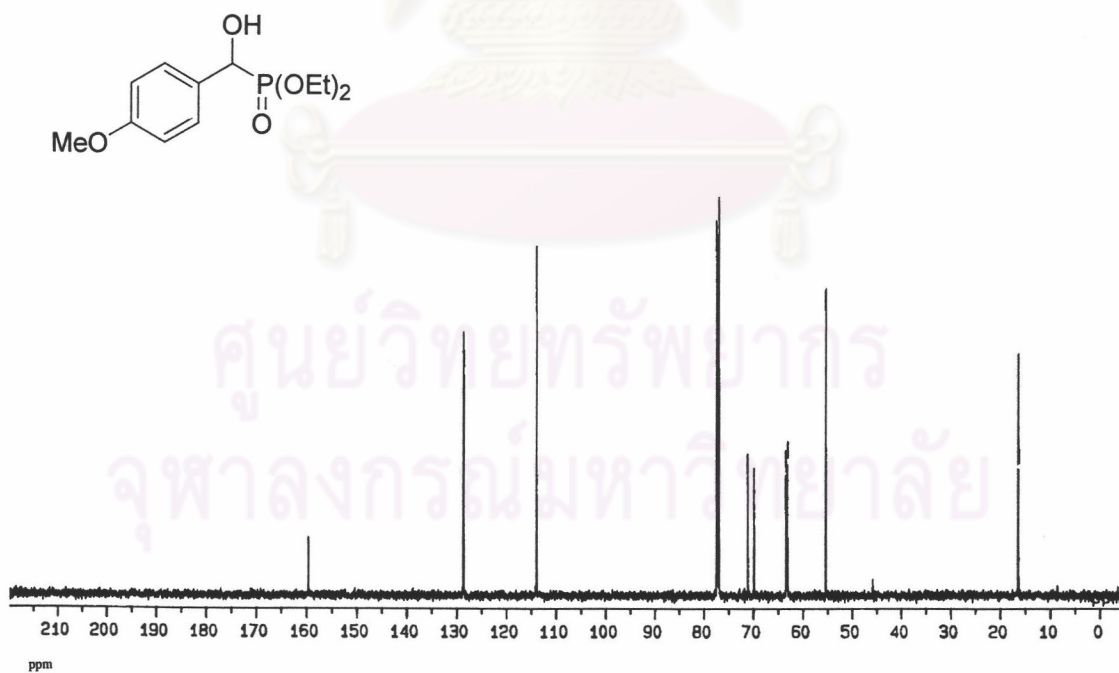


Figure 11 ¹³C NMR spectrum (CDCl₃, 100 MHz) of diethyl 1-hydroxy-(4-methoxyphenyl)methylphosphonate (**50c**).

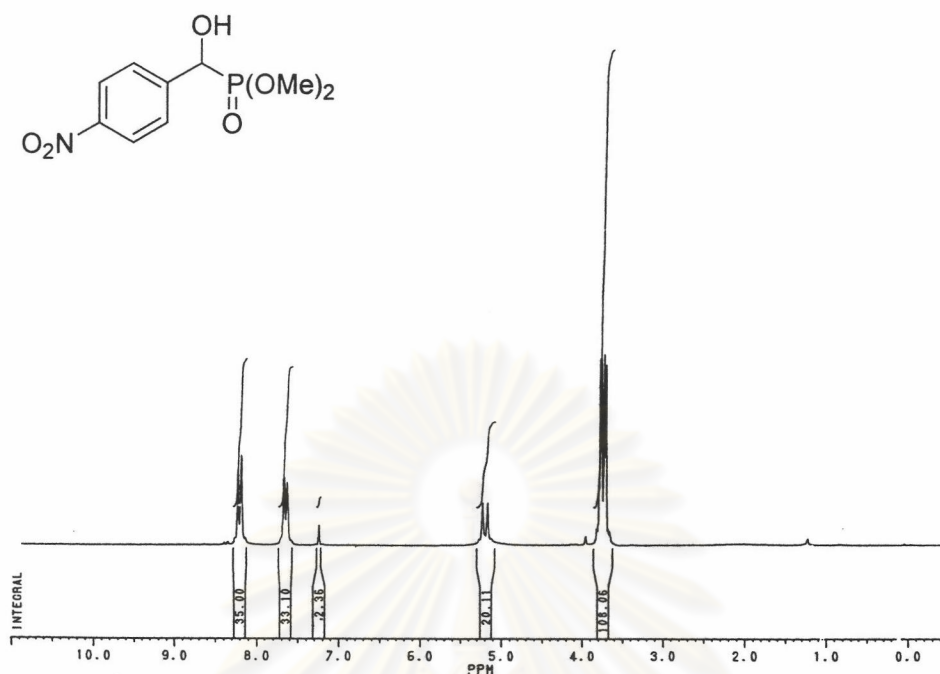


Figure 12 ¹H NMR spectrum (CDCl₃, 200 MHz) of dimethyl 1-hydroxy-(4-nitrophenyl)methylphosphonate (**50d**).

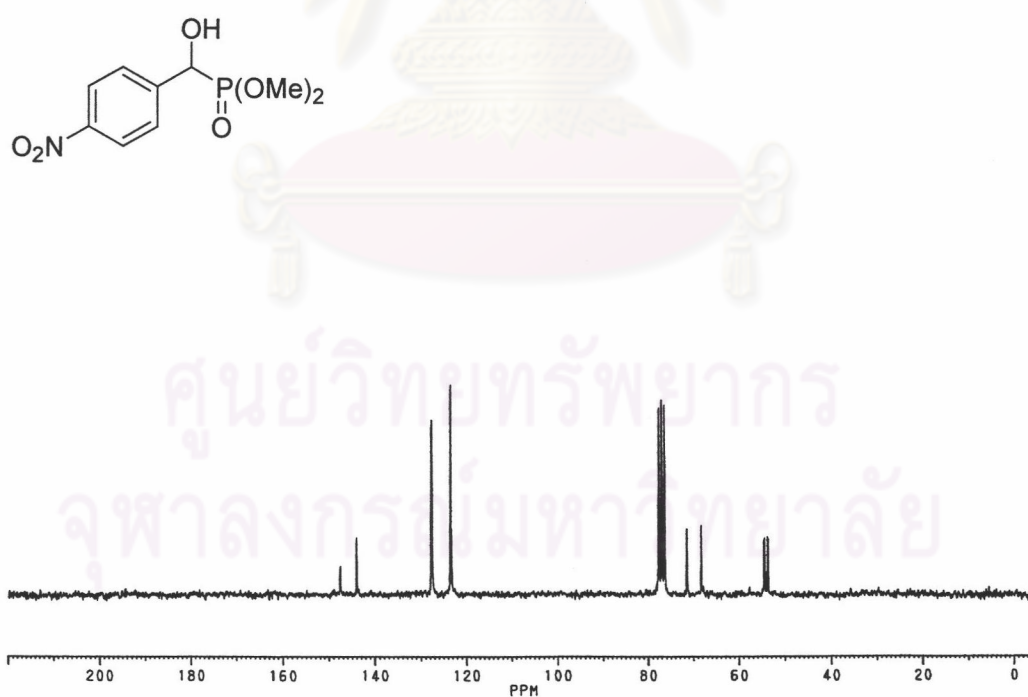


Figure 13 ¹³C NMR spectrum (CDCl₃, 50 MHz) of dimethyl 1-hydroxy-(4-nitrophenyl)methylphosphonate (**50d**).

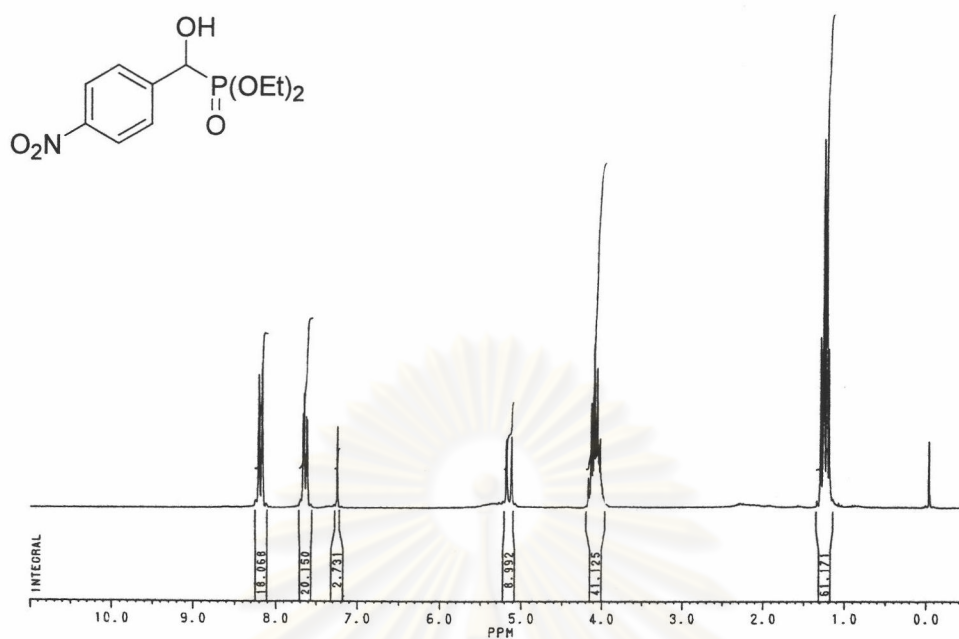


Figure 14 ¹H NMR spectrum (CDCl₃, 200 MHz) of diethyl 1-hydroxy-(4-nitrophenyl)methylphosphonate (**50e**).

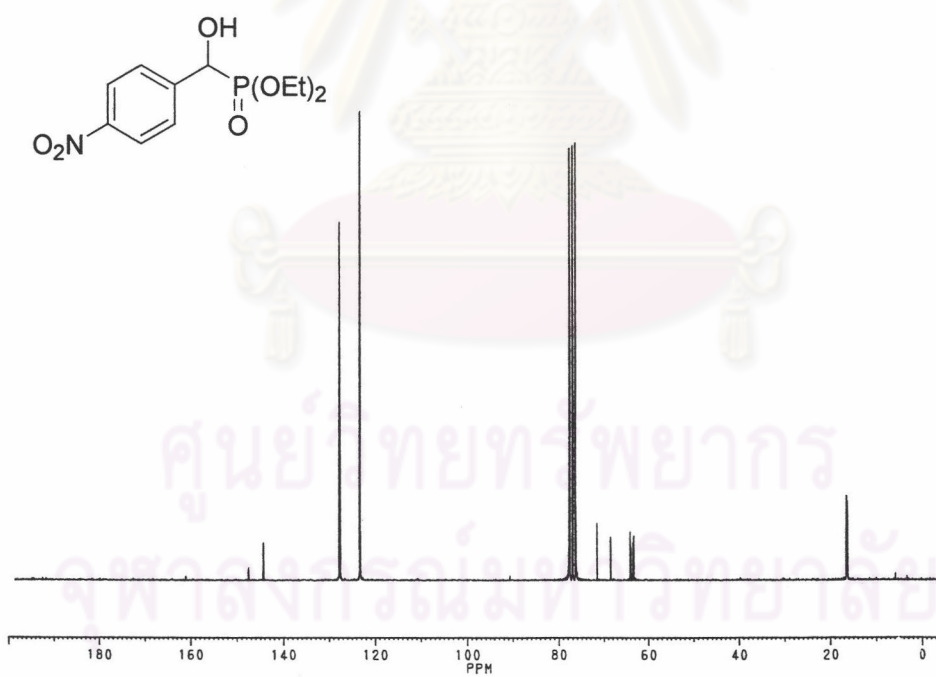


Figure 15 ¹³C NMR spectrum (CDCl₃, 50 MHz) of diethyl 1-hydroxy-(4-nitrophenyl)methylphosphonate (**50e**).

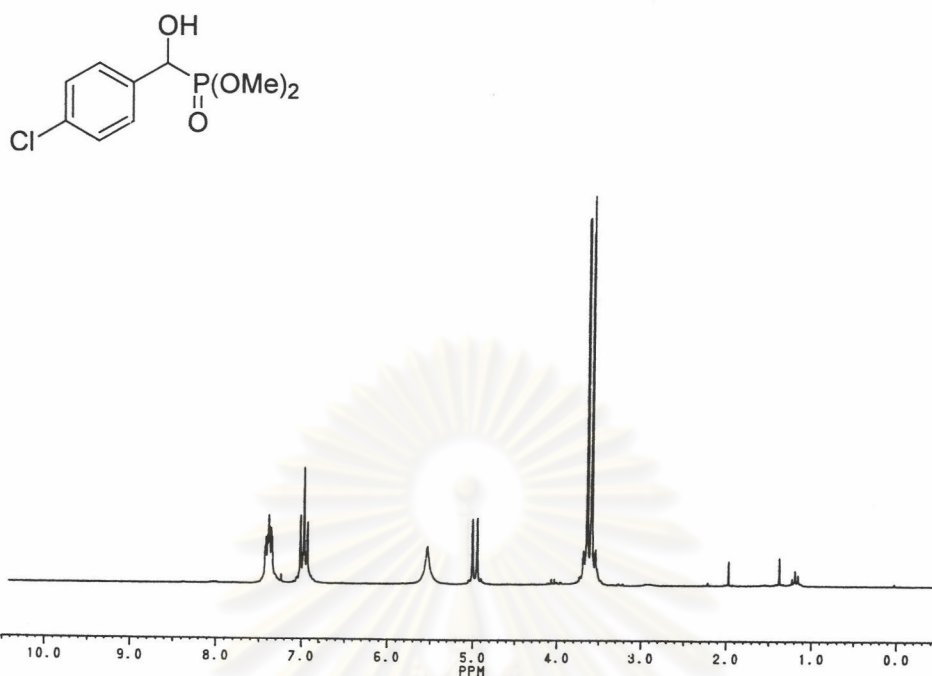


Figure 16 ^1H NMR spectrum (CDCl_3 , 200 MHz) of dimethyl 1-hydroxy-(4-chlorophenyl)methylphosphonate (**50f**).

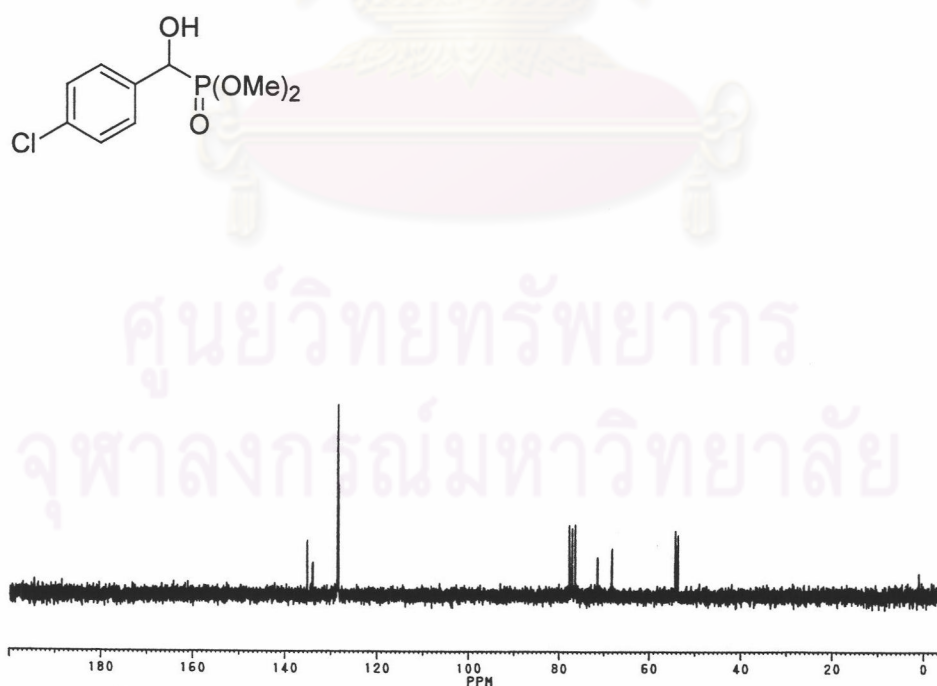


Figure 17 ^{13}C NMR spectrum (CDCl_3 , 50 MHz) of dimethyl 1-hydroxy-(4-chlorophenyl)methylphosphonate (**50f**).

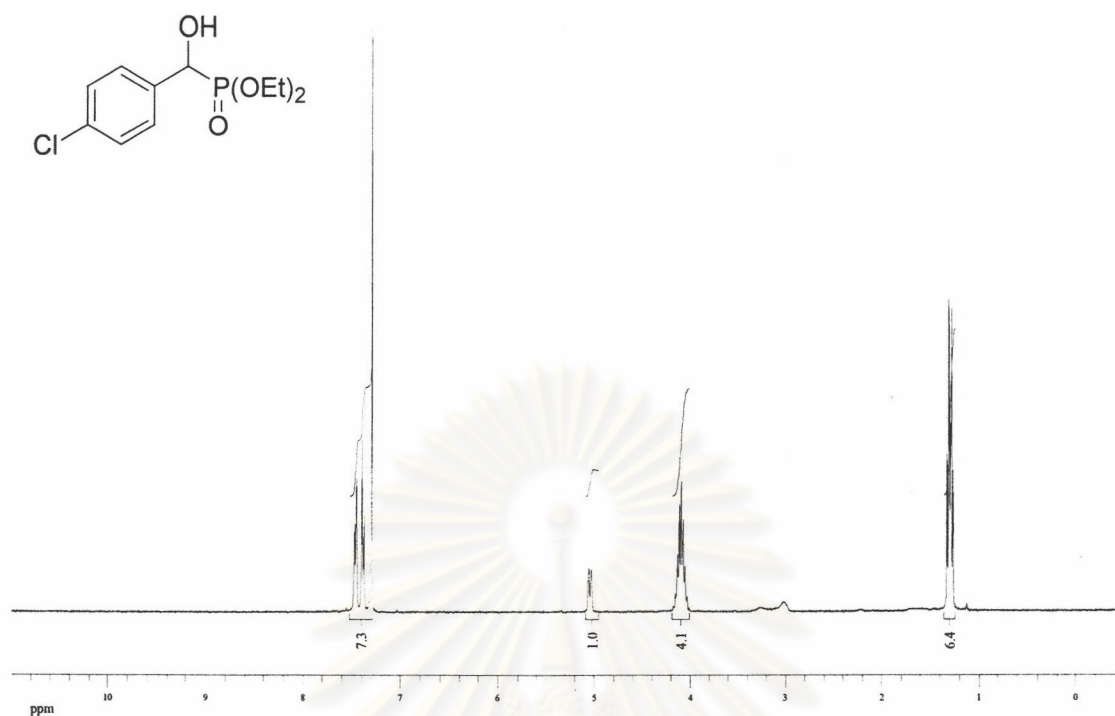


Figure 18 ¹H NMR spectrum (CDCl₃, 400 MHz) of diethyl 1-hydroxy-(4-chlorophenyl)methylphosphonate (**50g**).

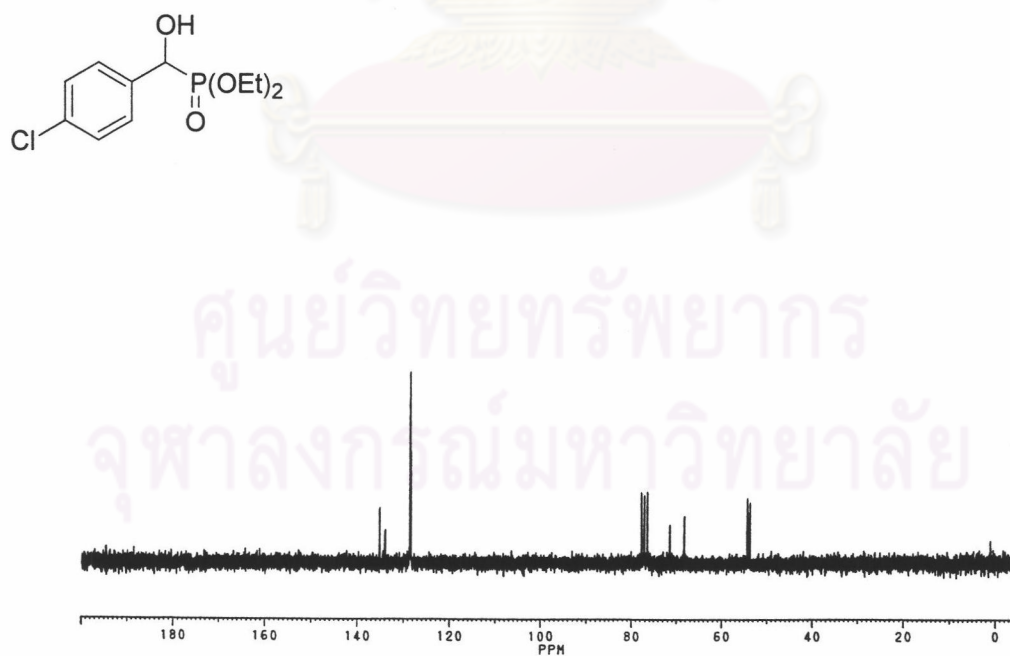


Figure 19 ¹³C NMR spectrum (CDCl₃, 50 MHz) of diethyl 1-hydroxy-(4-chlorophenyl)methylphosphonate (**50g**).

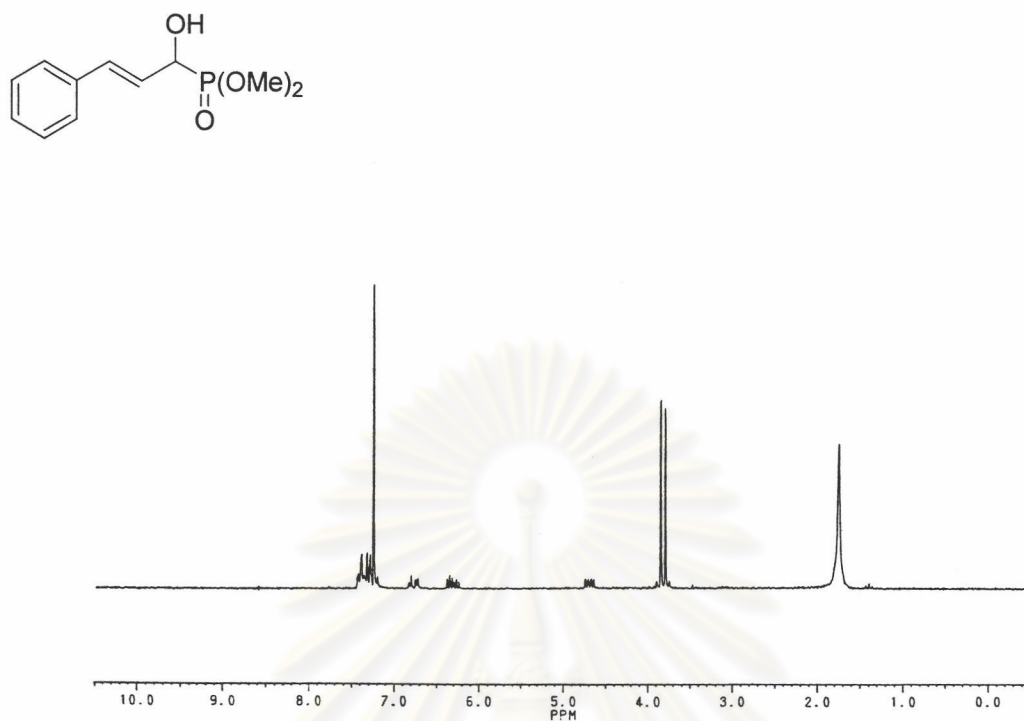


Figure 20 ^1H NMR spectrum (CDCl₃, 200 MHz) of dimethyl 1-hydroxy-3-phenyl-2-propenylphosphonate (**50h**).

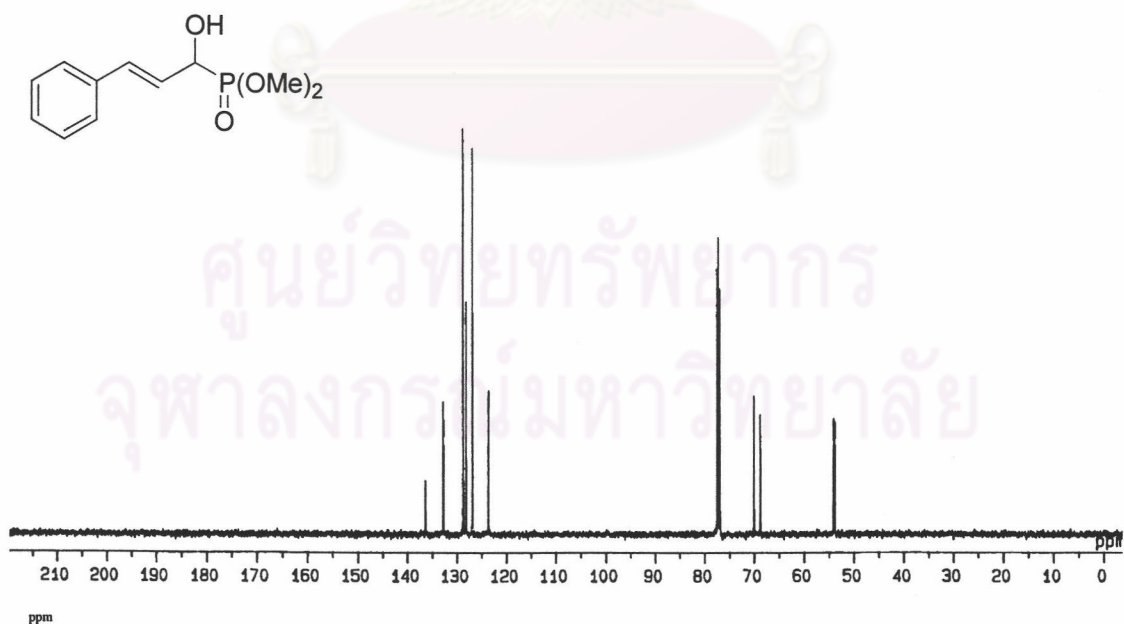


Figure 21 ^{13}C NMR spectrum (CDCl₃, 100 MHz) of dimethyl 1-hydroxy-3-phenyl-2-propenylphosphonate (**50h**).

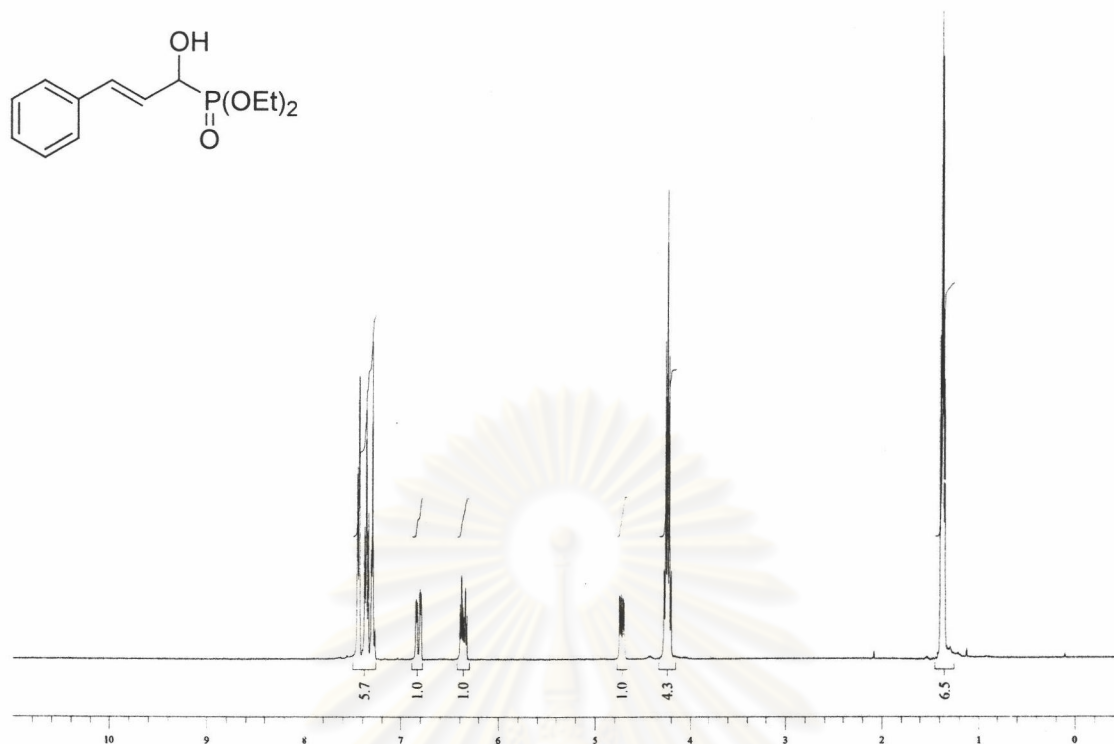


Figure 22 ^1H NMR spectrum (CDCl₃, 400 MHz) of diethyl 1-hydroxy-3-phenyl-2-propenylphosphonate (50i).

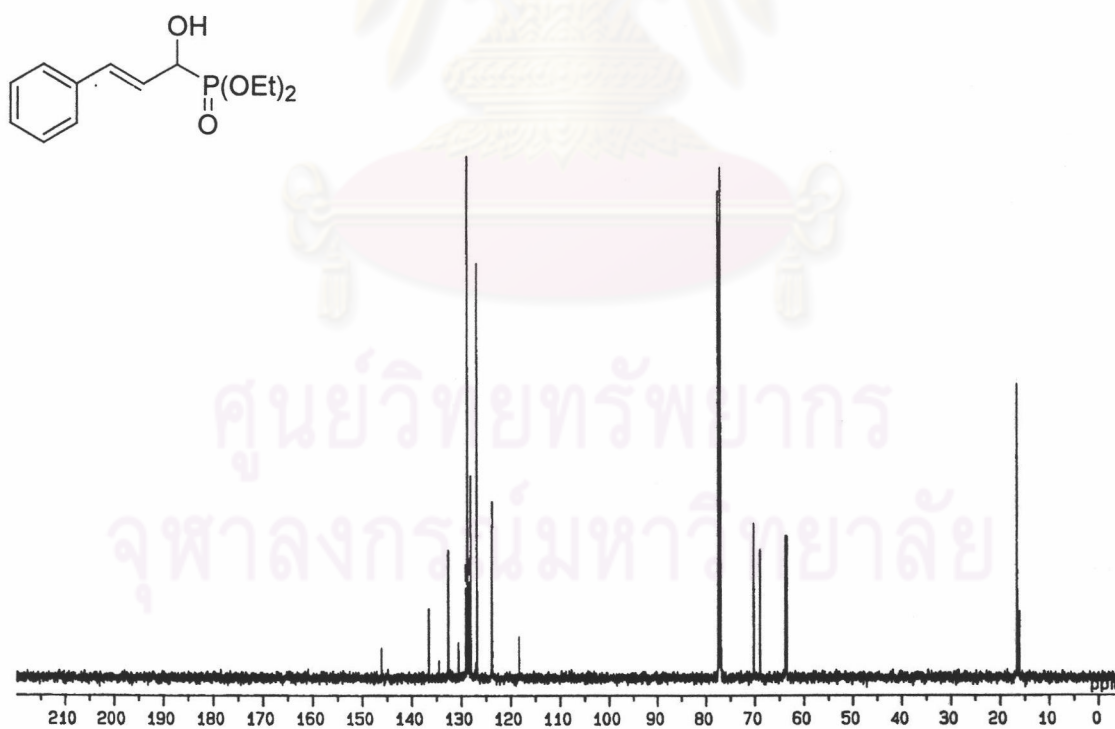


Figure 23 ^{13}C NMR spectrum (CDCl₃, 100 MHz) of diethyl 1-hydroxy-3-phenyl-2-propenylphosphonate (50i).

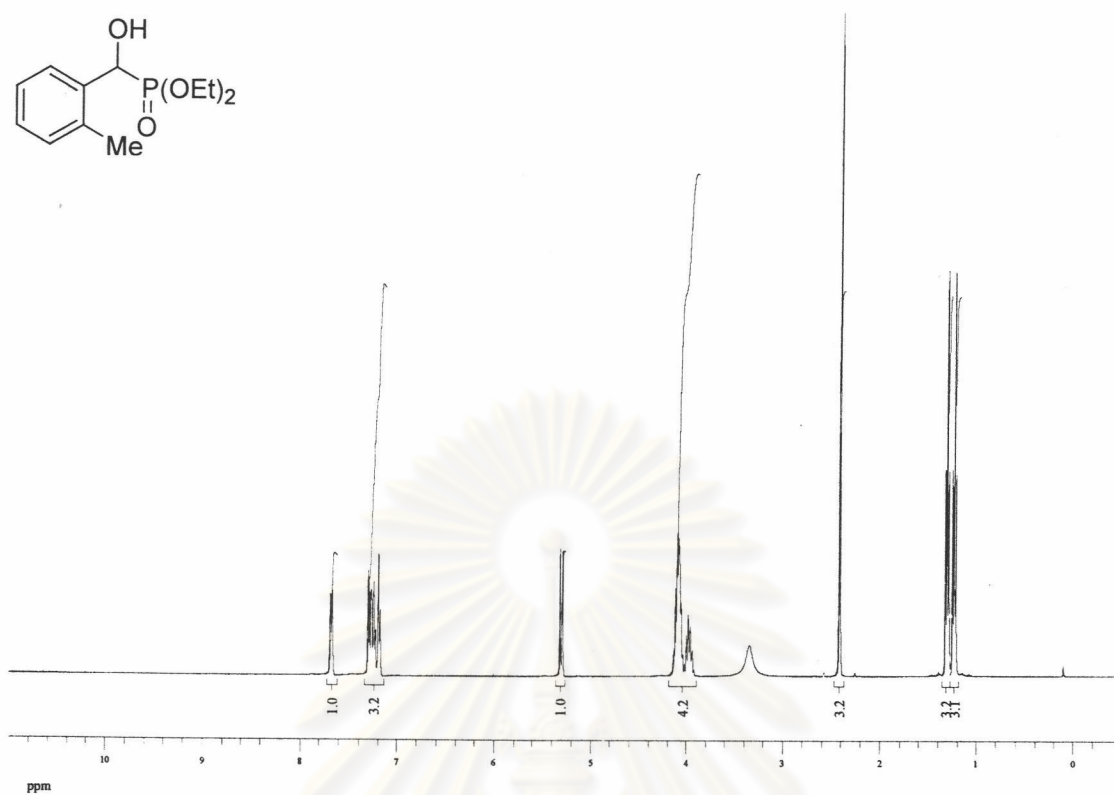


Figure 24 ¹H NMR spectrum (CDCl₃, 400 MHz) of diethyl 1-hydroxy-(2-methylphenyl)methylphosphonate (**50j**).

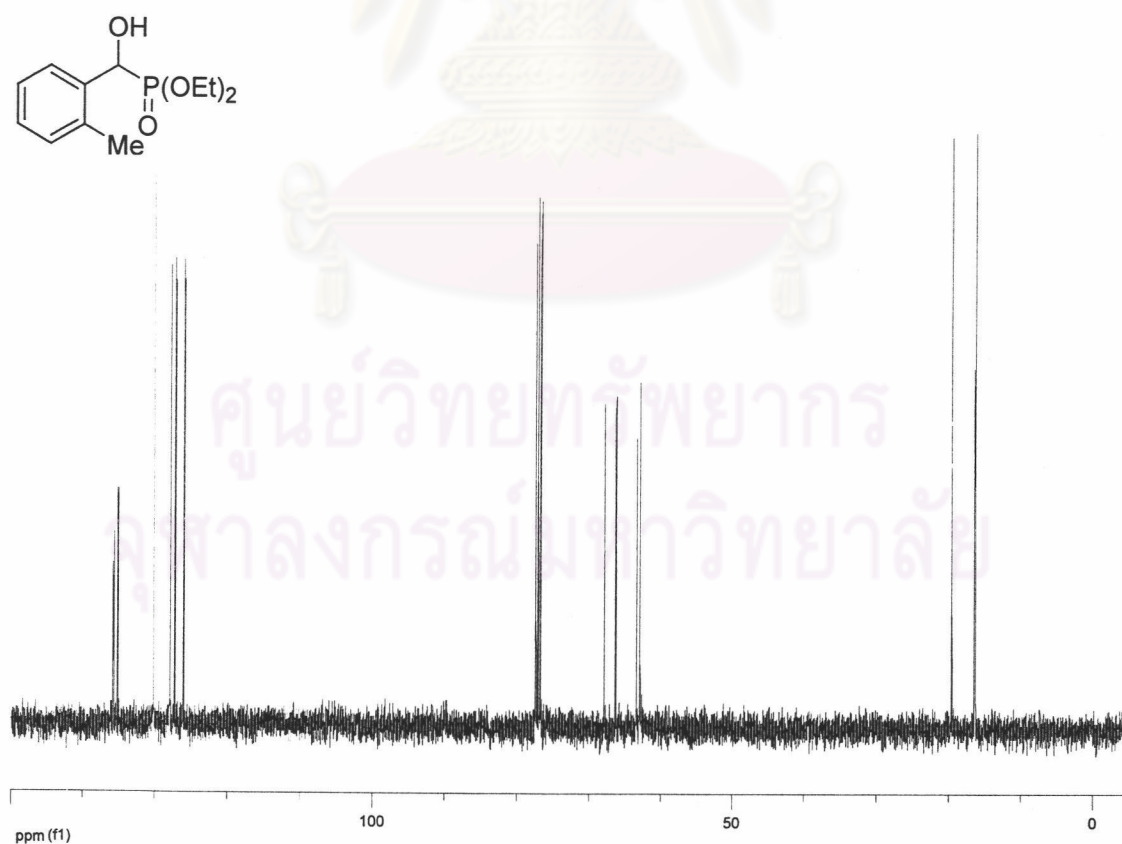


Figure 25 ¹³C NMR spectrum (CDCl₃, 100 MHz) of diethyl 1-hydroxy-(2-methylphenyl)methylphosphonate (**50j**).

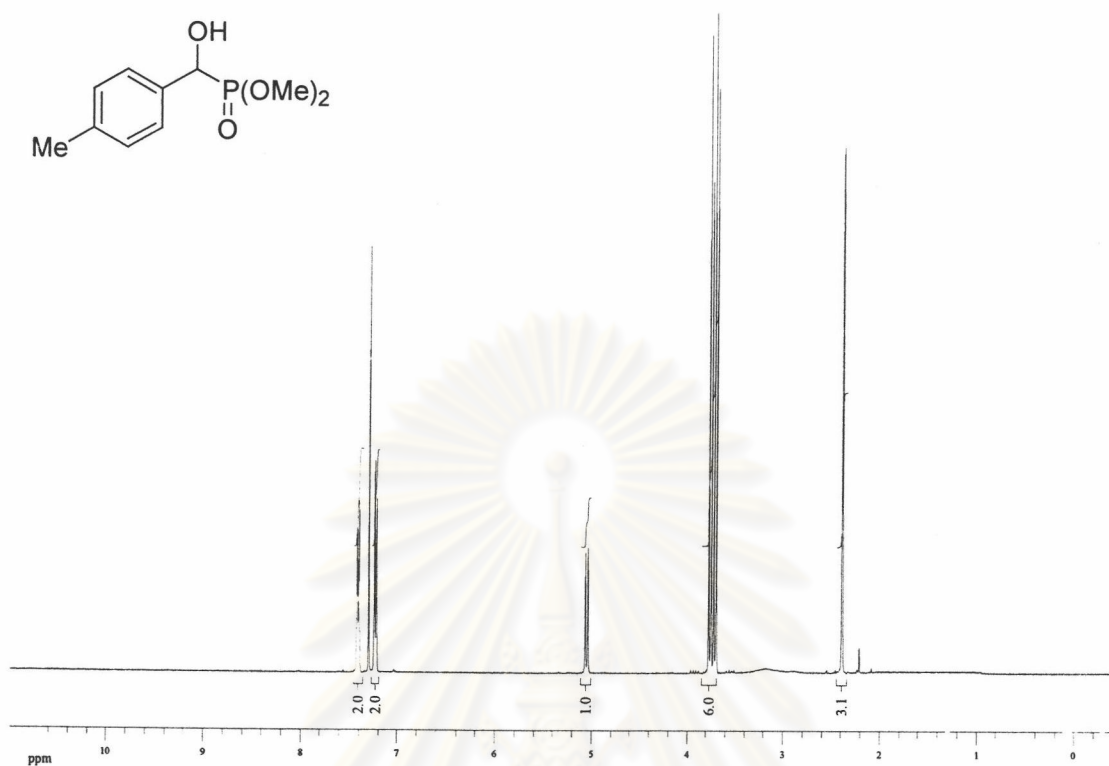


Figure 26 ¹H NMR spectrum (CDCl₃, 400 MHz) of dimethyl 1-hydroxy-(4-methylphenyl)methylphosphonate (**50k**).

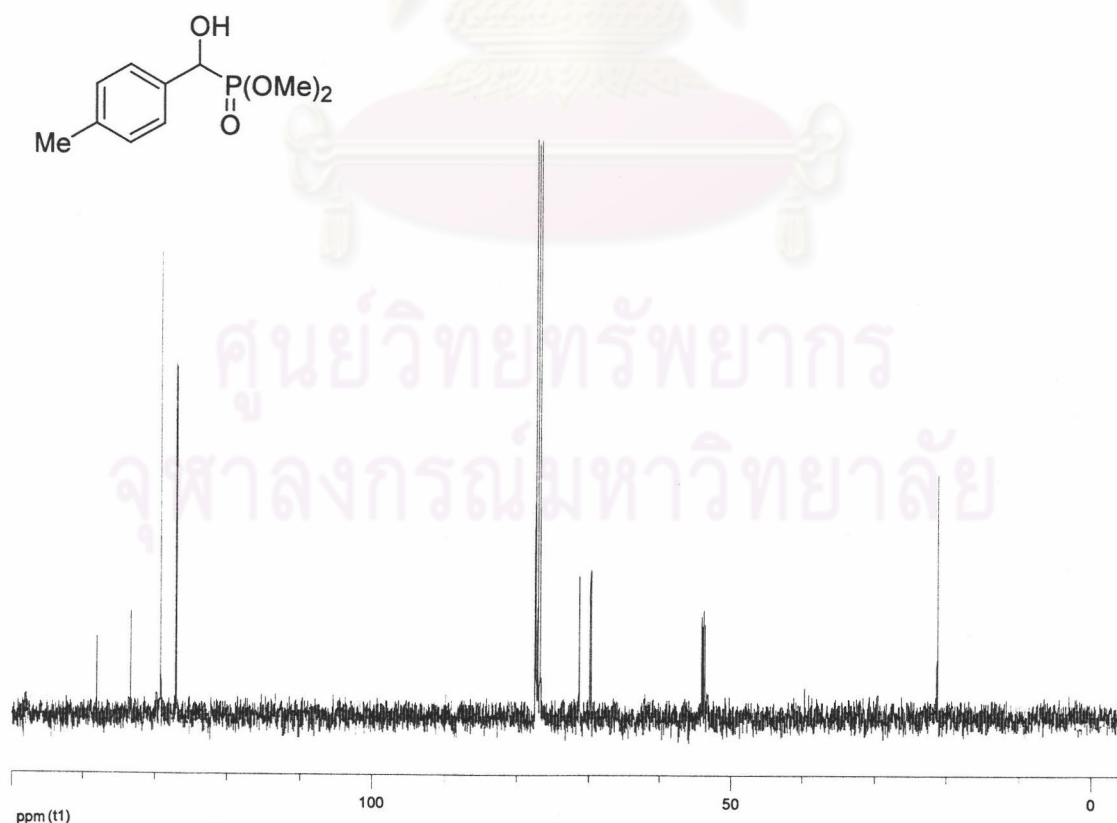


Figure 27 ¹³C NMR spectrum (CDCl₃, 100 MHz) of dimethyl 1-hydroxy-(4-methylphenyl)methylphosphonate (**50k**).

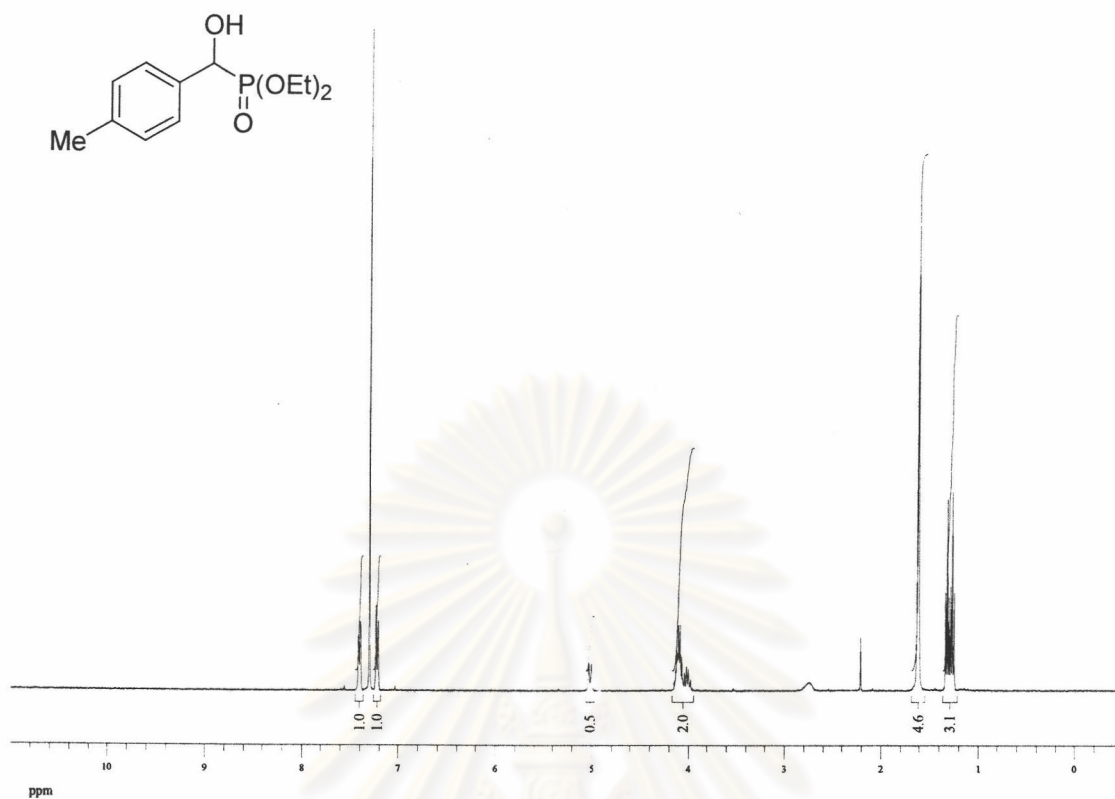


Figure 28 ¹H NMR spectrum (CDCl₃, 400 MHz) of diethyl 1-hydroxy-(4-methyl phenyl)methylphosphonate (**50I**).

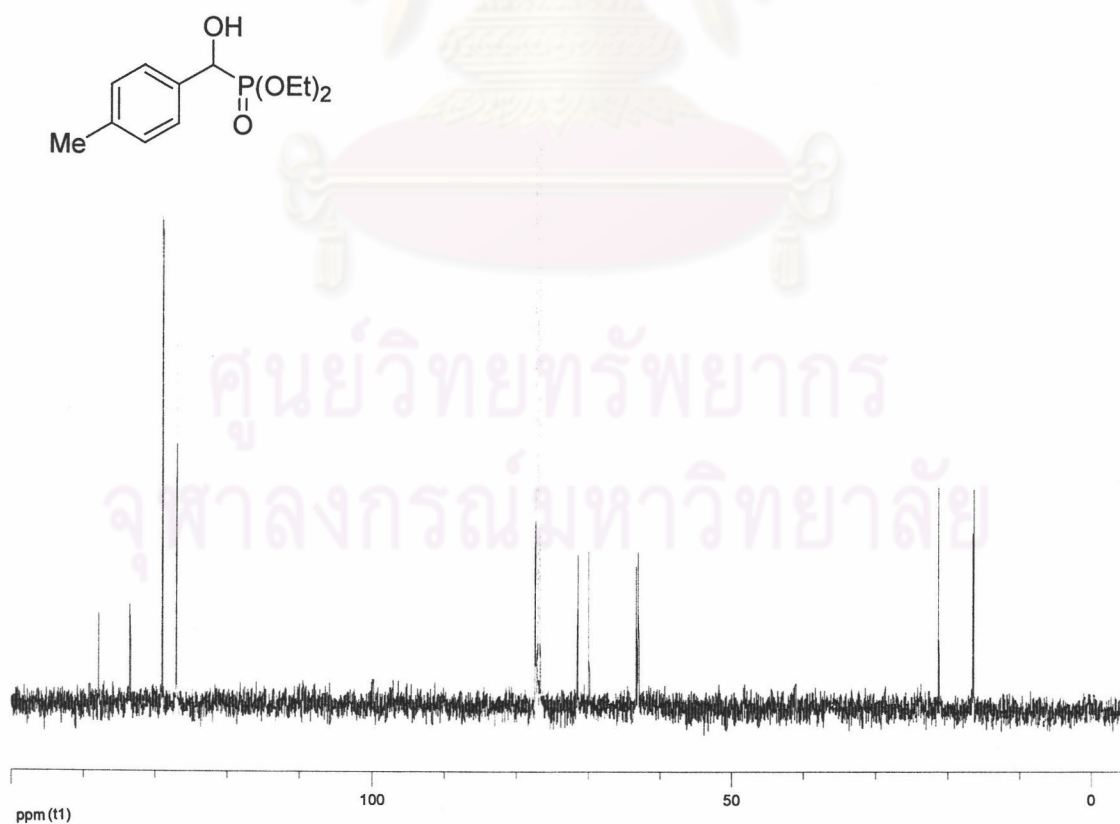


Figure 29 ¹³C NMR spectrum (CDCl₃, 100 MHz) of diethyl 1-hydroxy-(4-methyl phenyl)methylphosphonate (**50I**).

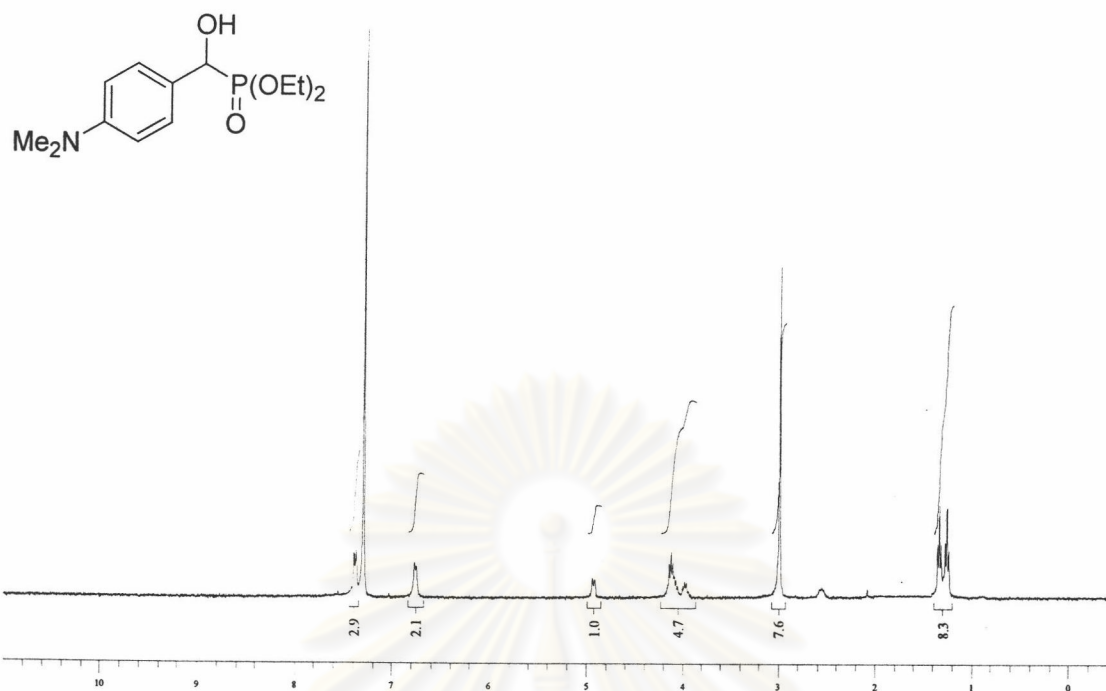


Figure 30 ¹H NMR spectrum (CDCl₃, 400 MHz) of diethyl 1-hydroxy-(4-dimethylaminophenyl)methylphosphonate (**50m**).

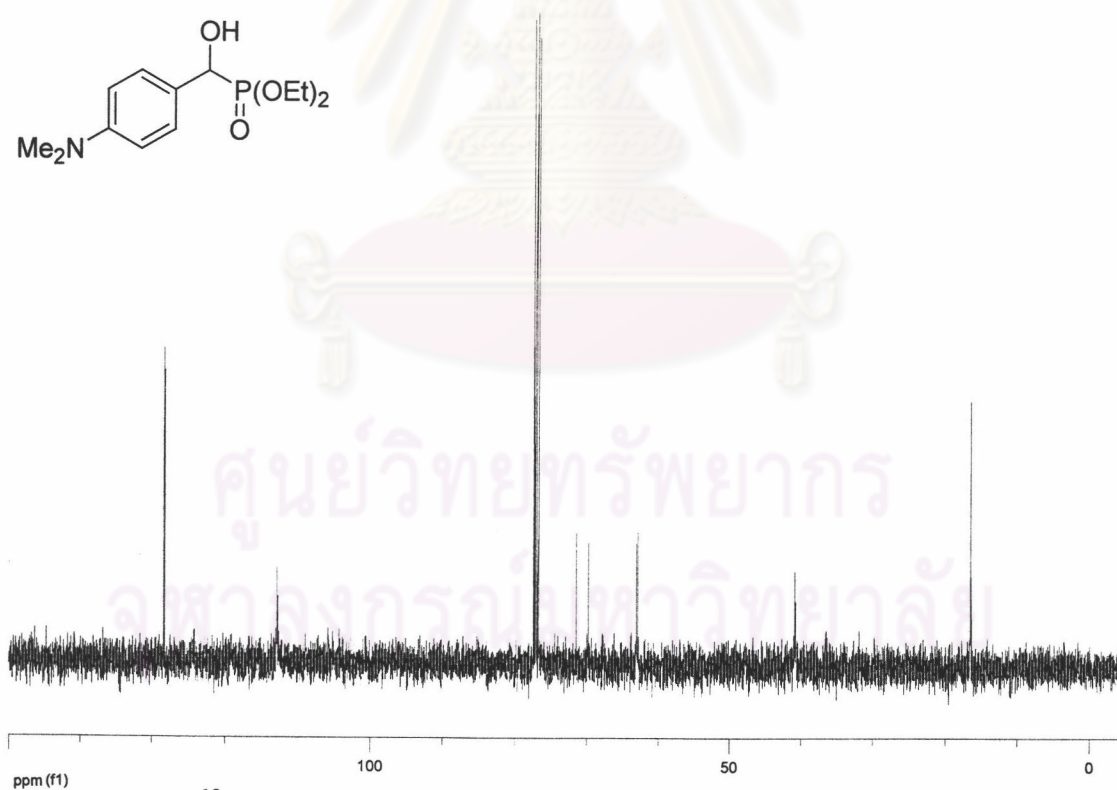


Figure 31 ¹³C NMR spectrum (CDCl₃, 100 MHz) of diethyl 1-hydroxy-(4-dimethylaminophenyl)methylphosphonate (**50m**).

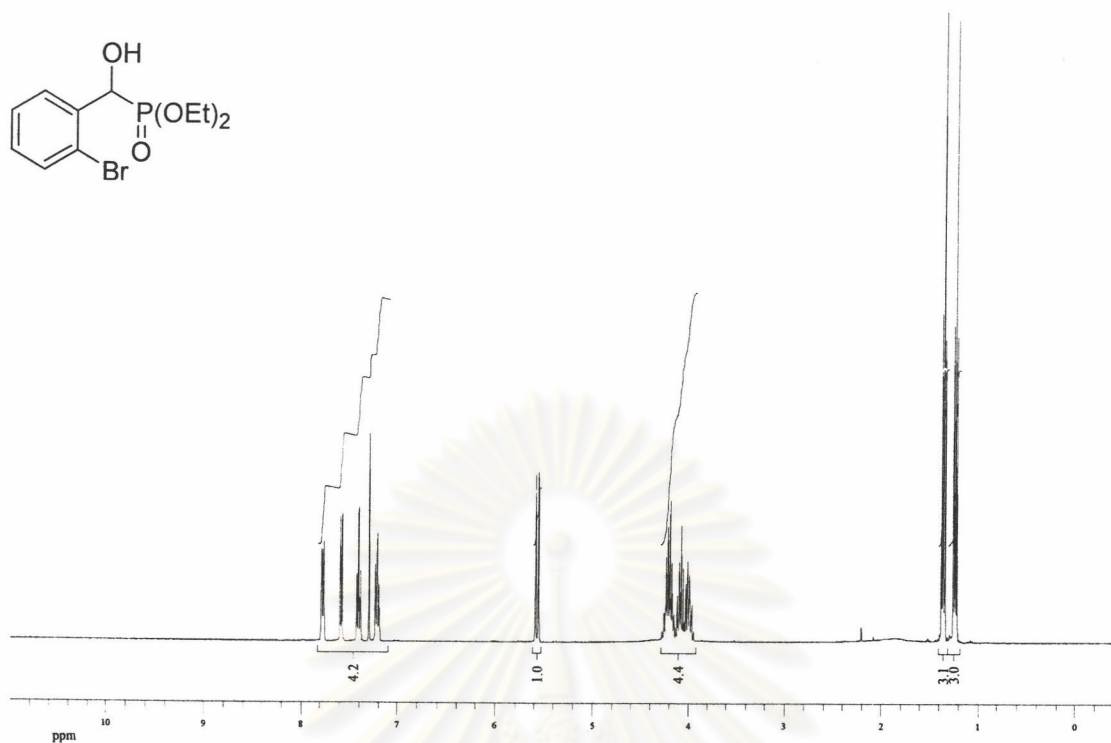


Figure 32 ¹H NMR spectrum (CDCl₃, 400 MHz) of dimethyl 1-hydroxy-(2-bromophenyl)methylphosphonate (**50n**).

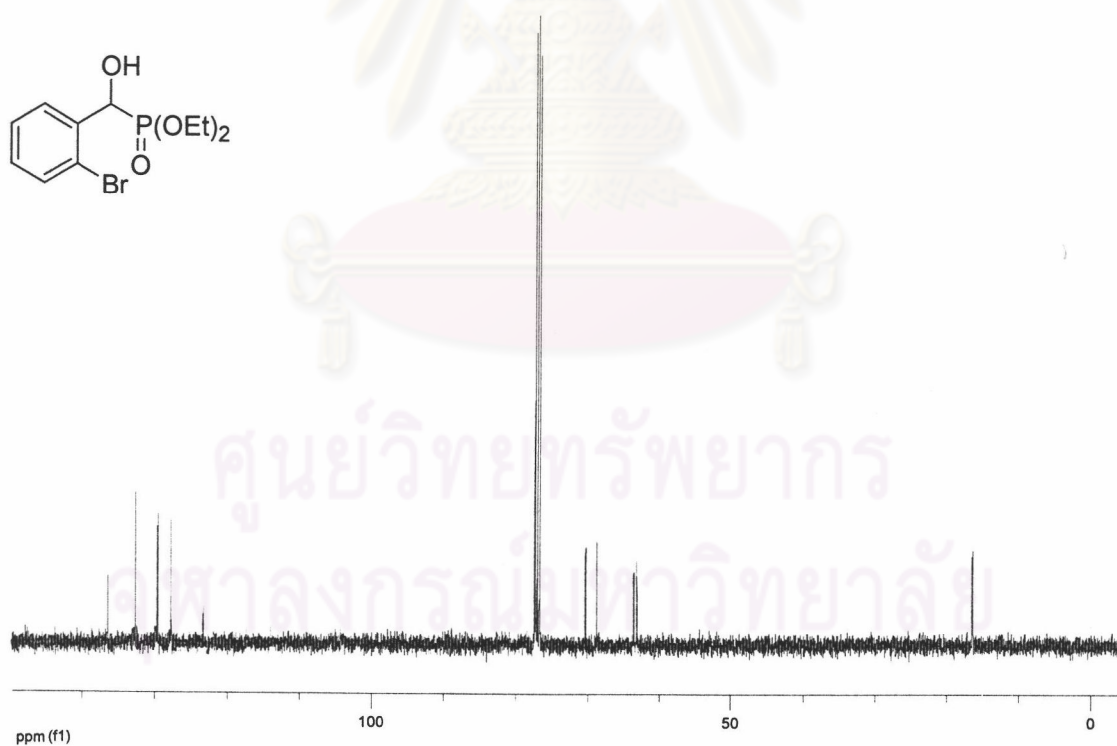


Figure 33 ¹³C NMR spectrum (CDCl₃, 100 MHz) of dimethyl 1-hydroxy-(2-bromophenyl)methylphosphonate (**50n**).

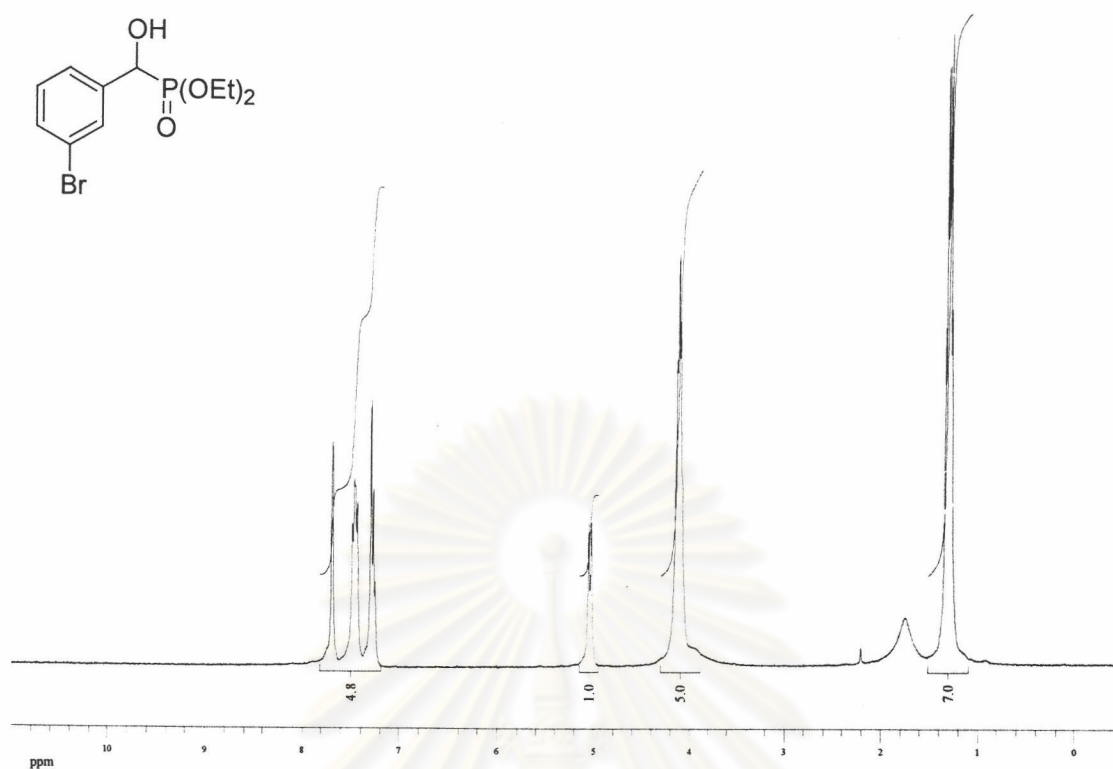


Figure 34 ¹H NMR spectrum (CDCl₃, 400 MHz) of diethyl 1-hydroxy-(3-bromophenyl)methylphosphonate (**50o**).

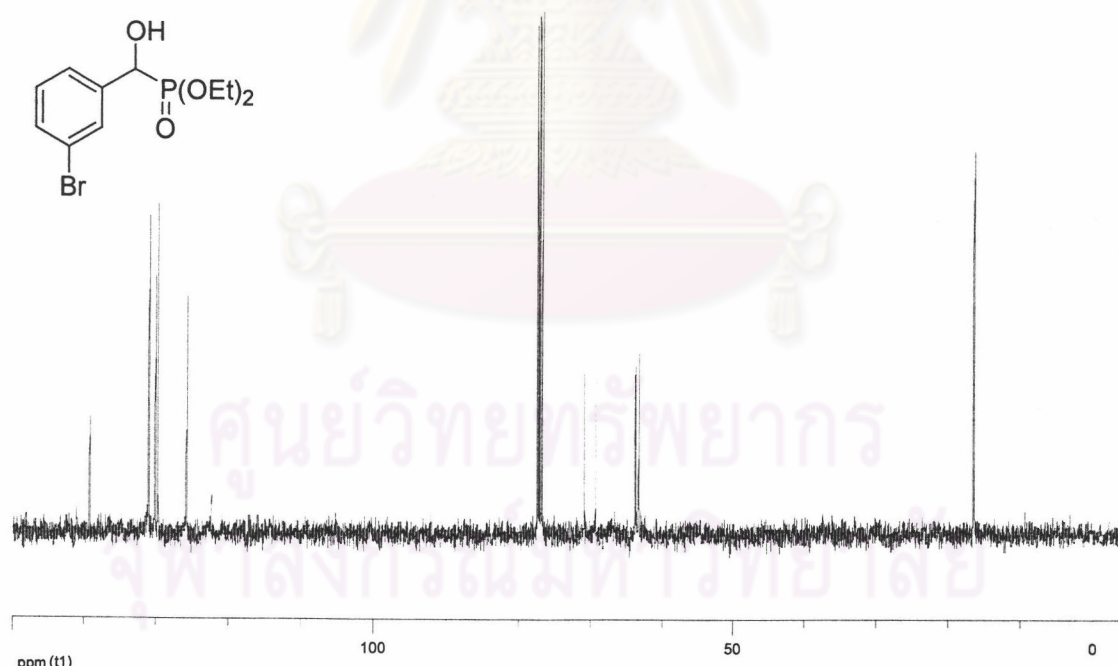


Figure 35 ¹³C NMR spectrum (CDCl₃, 100 MHz) of diethyl 1-hydroxy-(3-bromophenyl)methylphosphonate (**50o**).

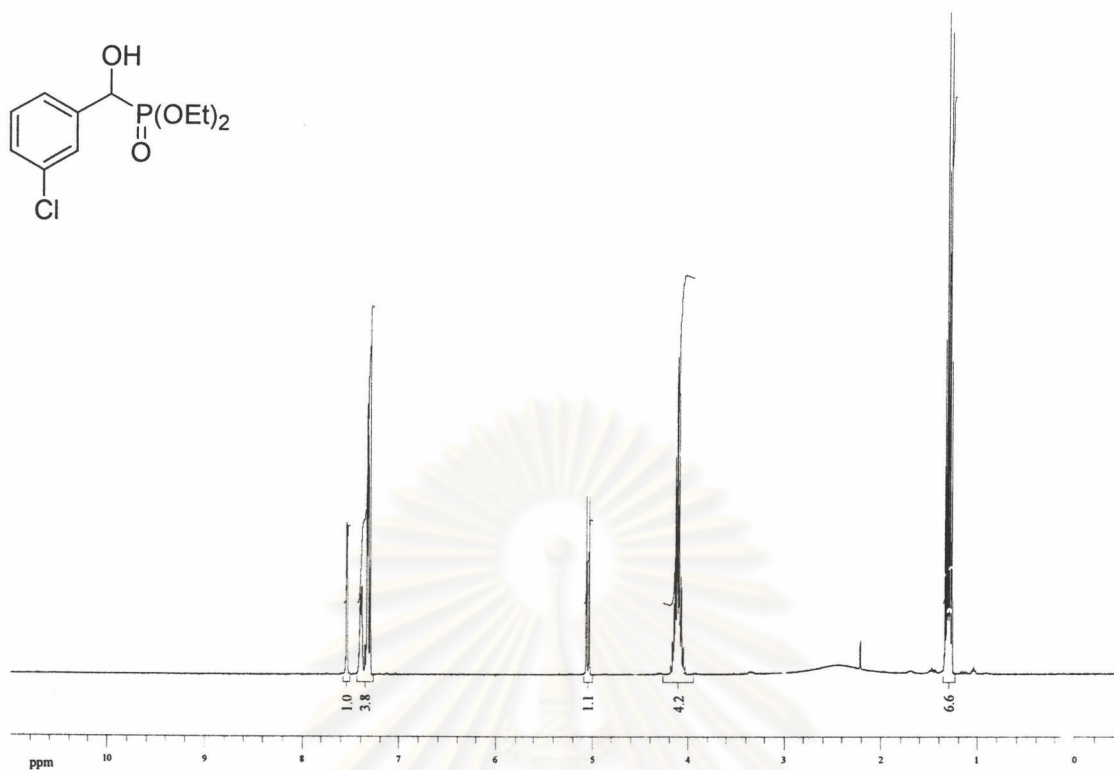


Figure 36 ¹H NMR spectrum (CDCl₃, 400 MHz) of diethyl 1-hydroxy-(3-chlorophenyl)methylphosphonate (**50p**).

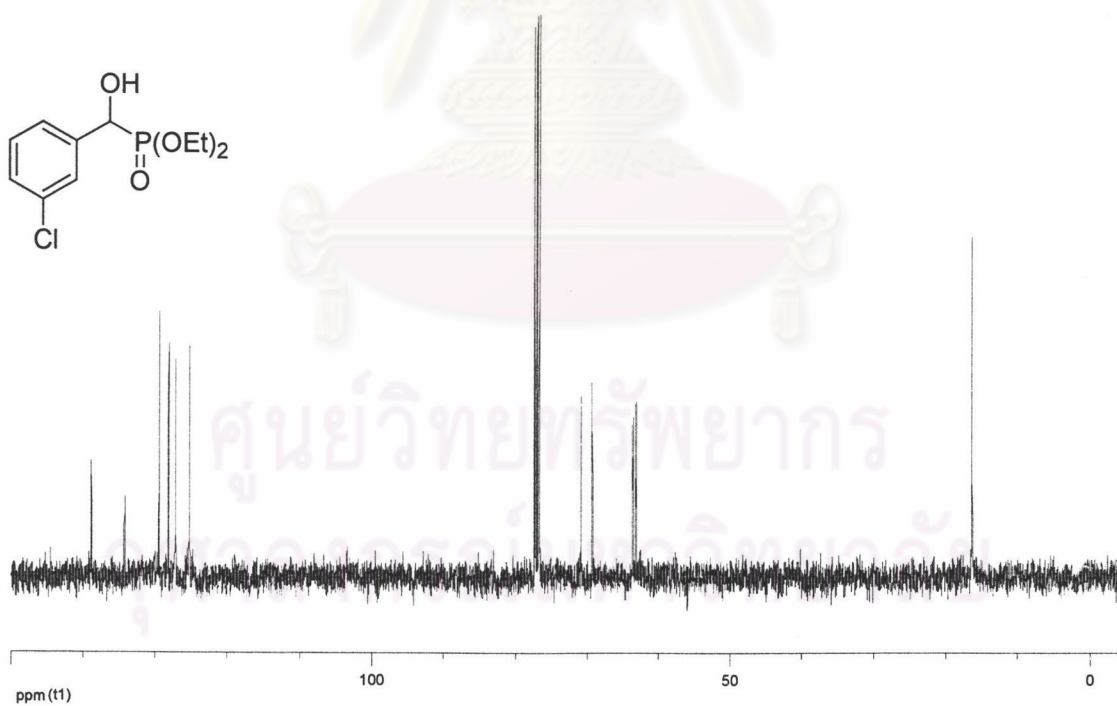


Figure 37 ¹³C NMR spectrum (CDCl₃, 100 MHz) of diethyl 1-hydroxy-(3-chlorophenyl)methylphosphonate (**50p**).

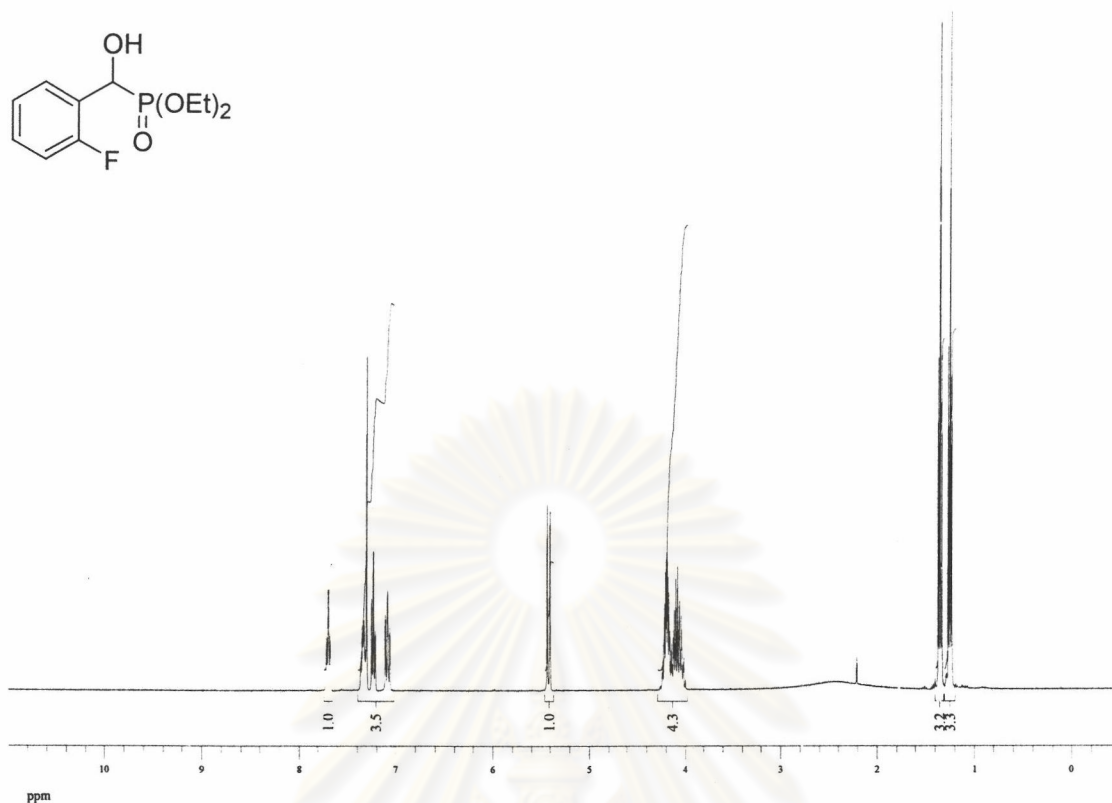


Figure 38 ¹H NMR spectrum (CDCl₃, 400 MHz) of diethyl 1-hydroxy-(2-fluorophenyl)methylphosphonate (**50q**).

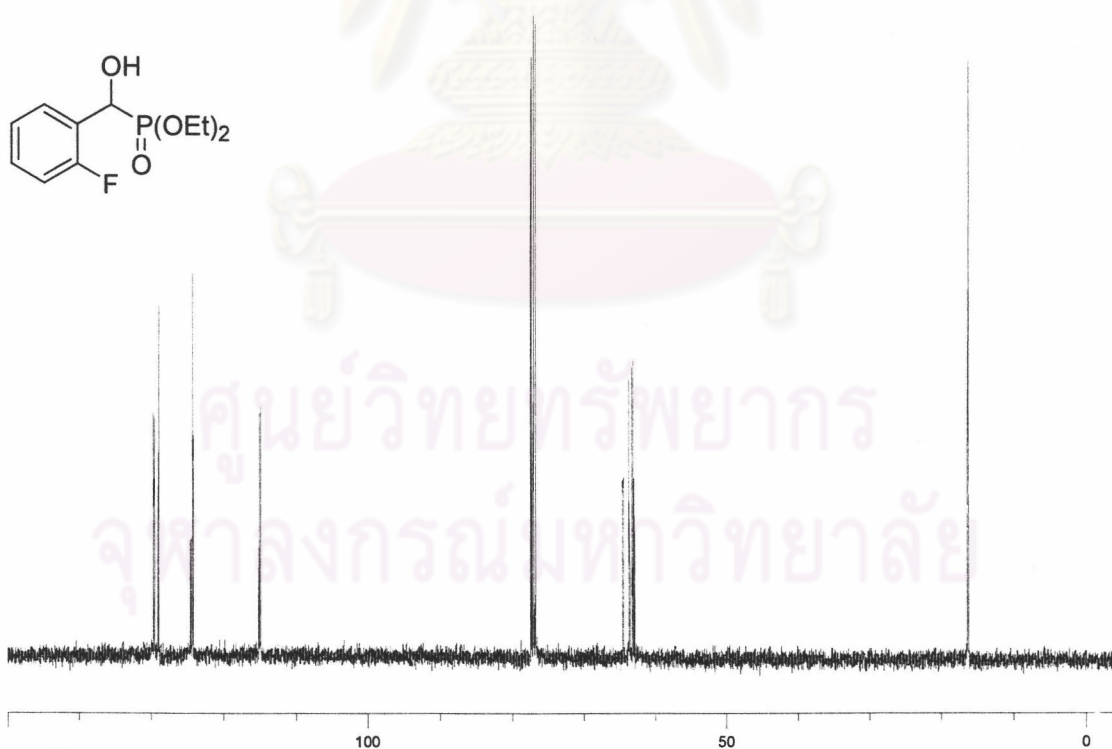


Figure 39 ¹³C NMR spectrum (CDCl₃, 100 MHz) of diethyl 1-hydroxy-(2-fluorophenyl)methylphosphonate (**50q**).

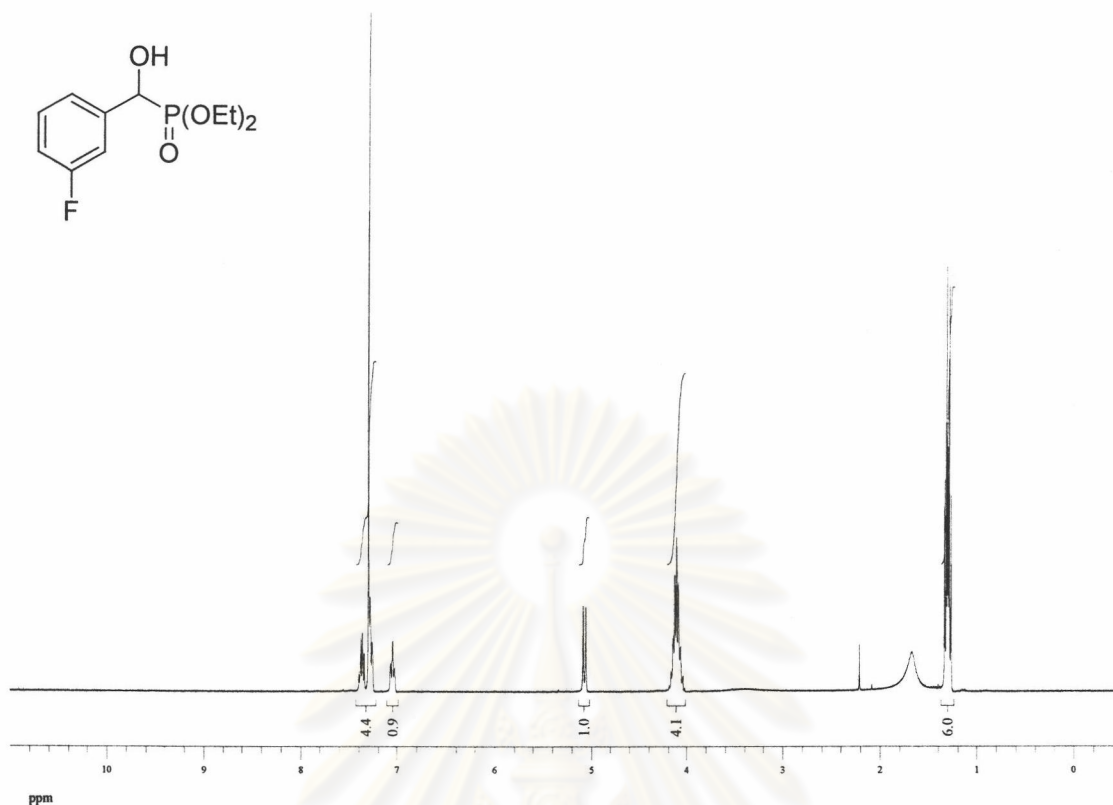


Figure 40 ^1H NMR spectrum (CDCl_3 , 400 MHz) of diethyl 1-hydroxy-(3-fluorophenyl)methylphosphonate (**50r**).

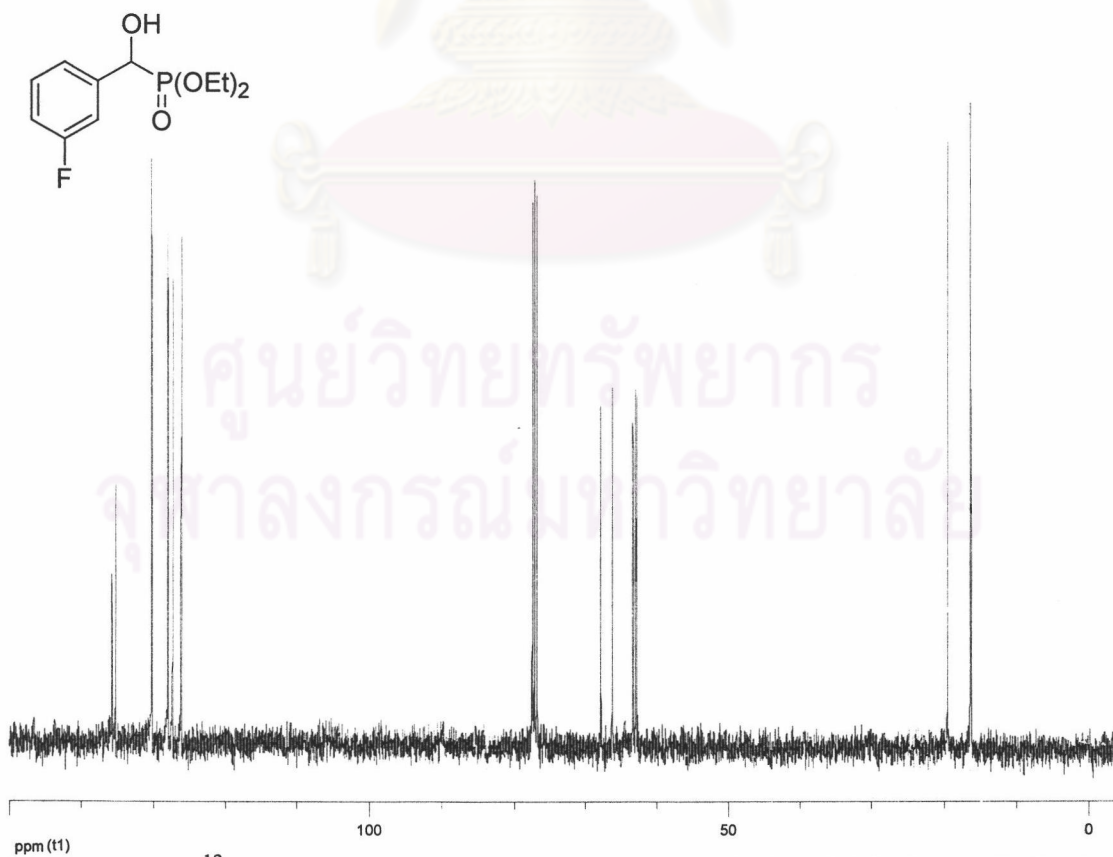


Figure 41 ^{13}C NMR spectrum (CDCl_3 , 100 MHz) of diethyl 1-hydroxy-(3-fluorophenyl)methylphosphonate (**50r**).

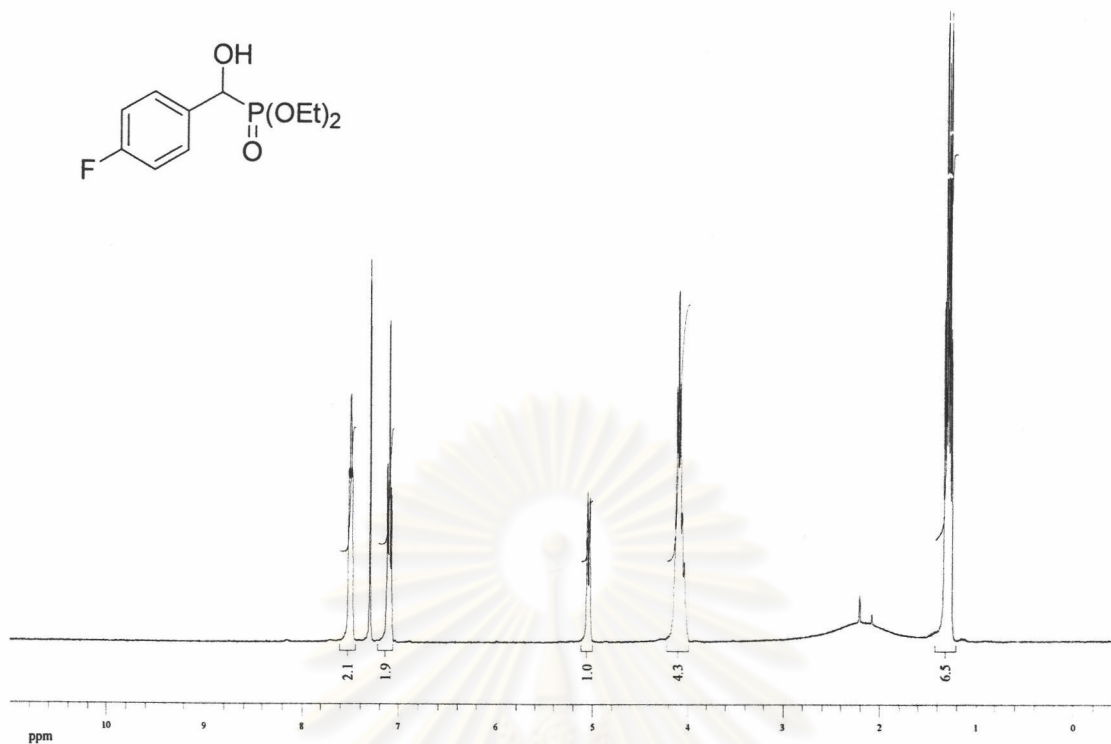


Figure 42 ^1H NMR spectrum (CDCl_3 , 400 MHz) of diethyl 1-hydroxy-(4-fluorophenyl)methylphosphonate (**50s**).

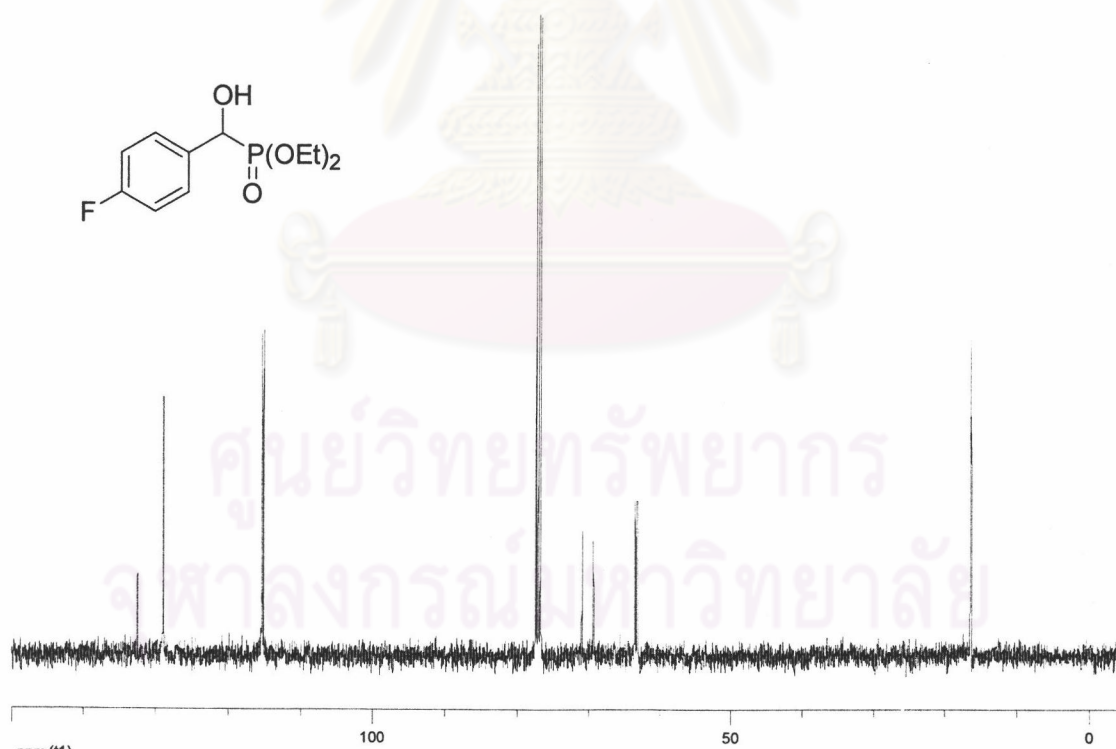


Figure 43 ^{13}C NMR spectrum (CDCl_3 , 100 MHz) of diethyl 1-hydroxy-(4-fluorophenyl)methylphosphonate (**50s**).

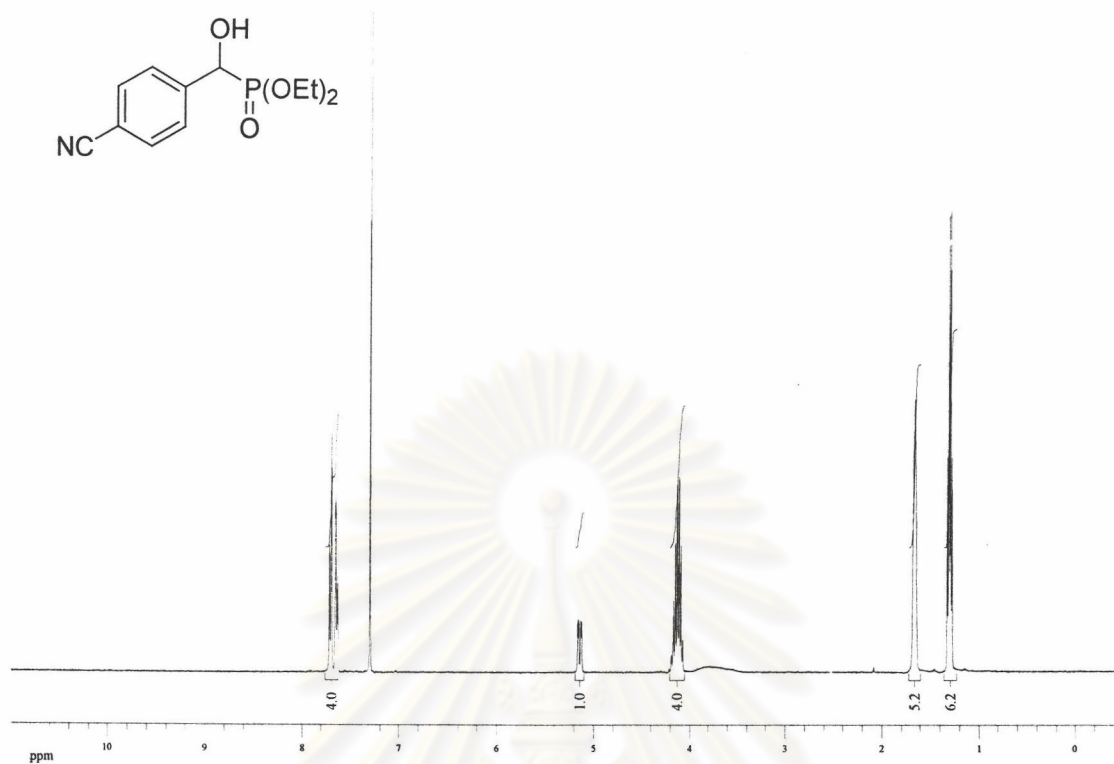


Figure 44 ¹H NMR spectrum (CDCl₃, 400 MHz) of diehtyl 1-hydroxy-(4-cyano phenyl)methylphosphonate (50t).

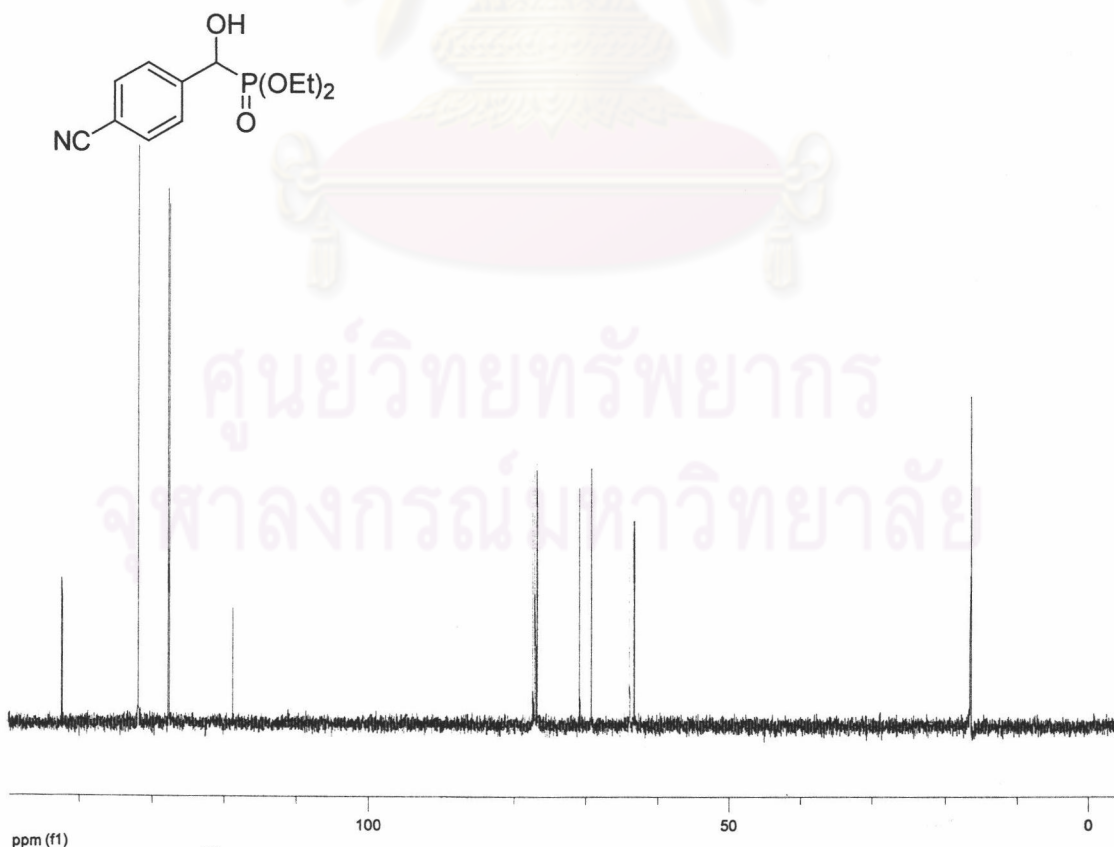


Figure 45 ¹³C NMR spectrum (CDCl₃, 100 MHz) of diehtyl 1-hydroxy-(4-cyano phenyl)methylphosphonate (50t).

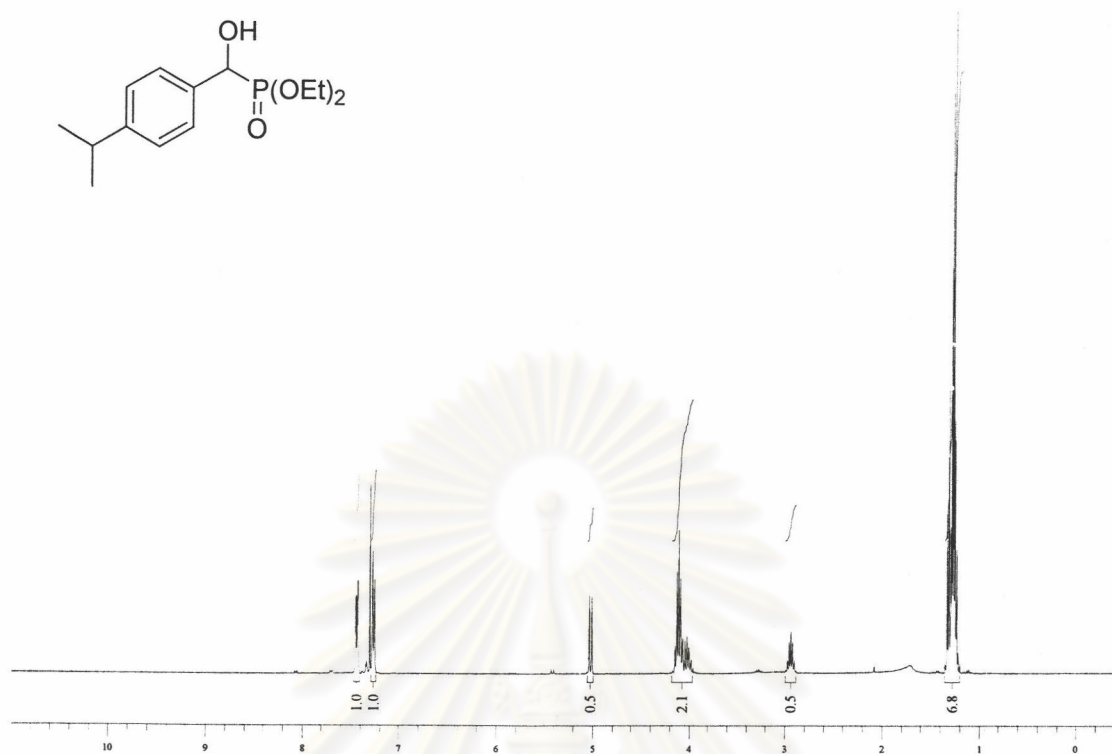


Figure 46 ¹H NMR spectrum (CDCl₃, 400 MHz) of diethyl 1-hydroxy-(4-isopropylphenyl)methylphosphonate (**50u**).

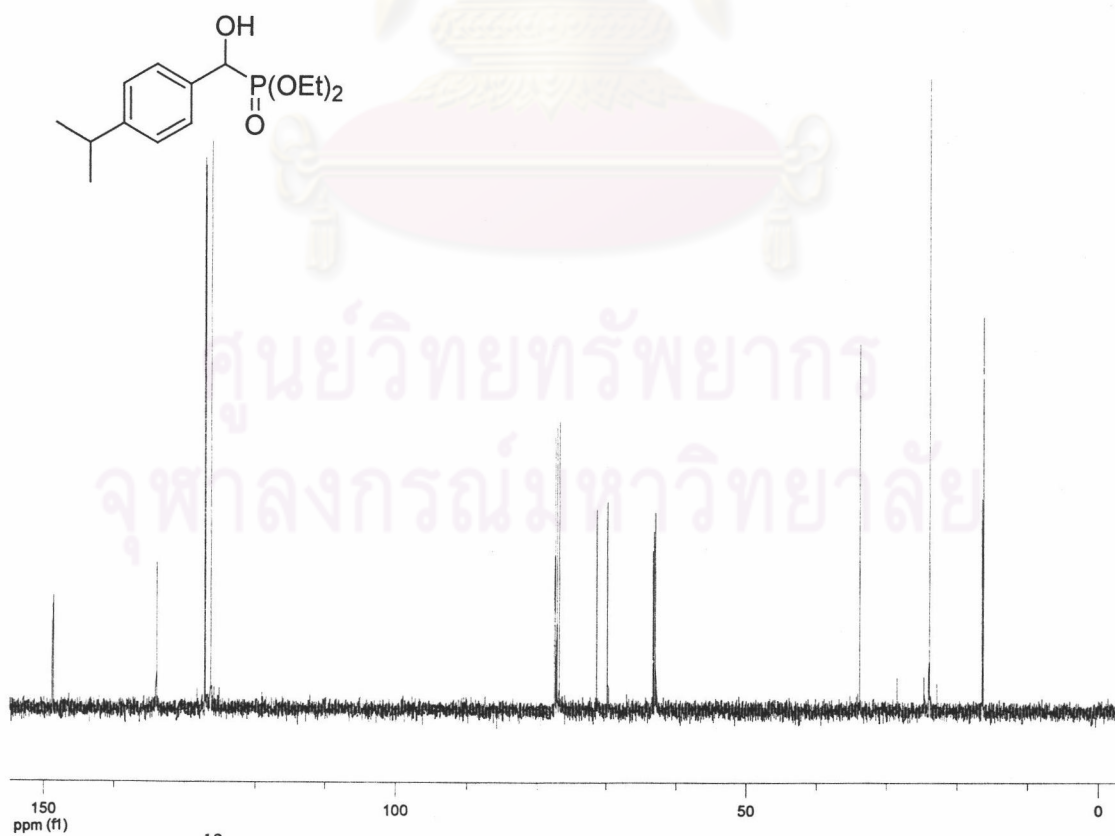


Figure 47 ¹³C NMR spectrum (CDCl₃, 100 MHz) of diethyl 1-hydroxy-(4-isopropylphenyl)methylphosphonate (**50u**).

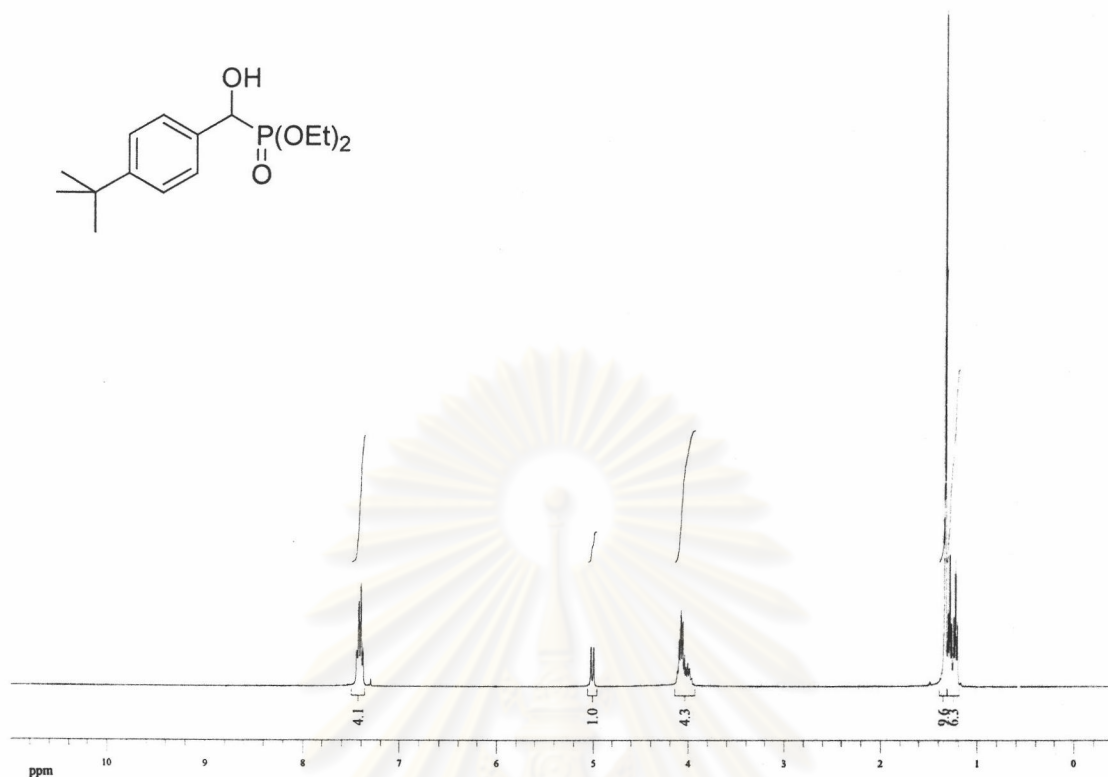


Figure 48 ¹H NMR spectrum (CDCl₃, 400 MHz) of diethyl 1-hydroxy-(4-*tert*-butylphenyl)methylphosphonate (**50v**).

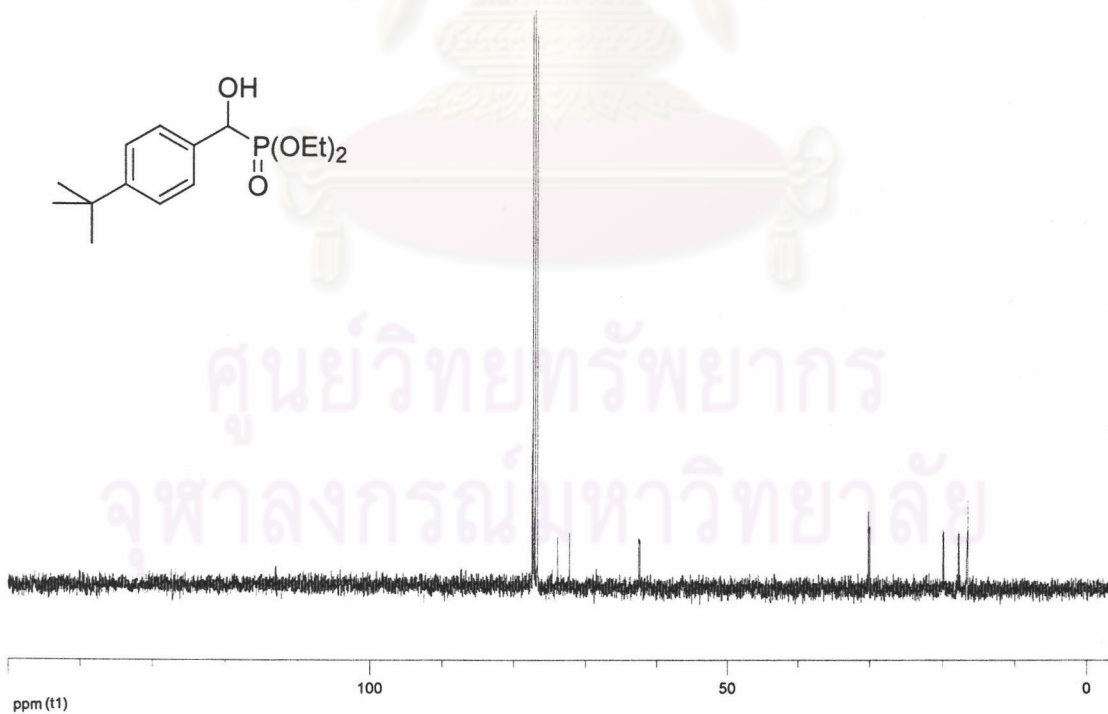


Figure 49 ¹³C NMR spectrum (CDCl₃, 100 MHz) of diethyl 1-hydroxy-(4-*tert*-butylphenyl)methylphosphonate (**50v**).

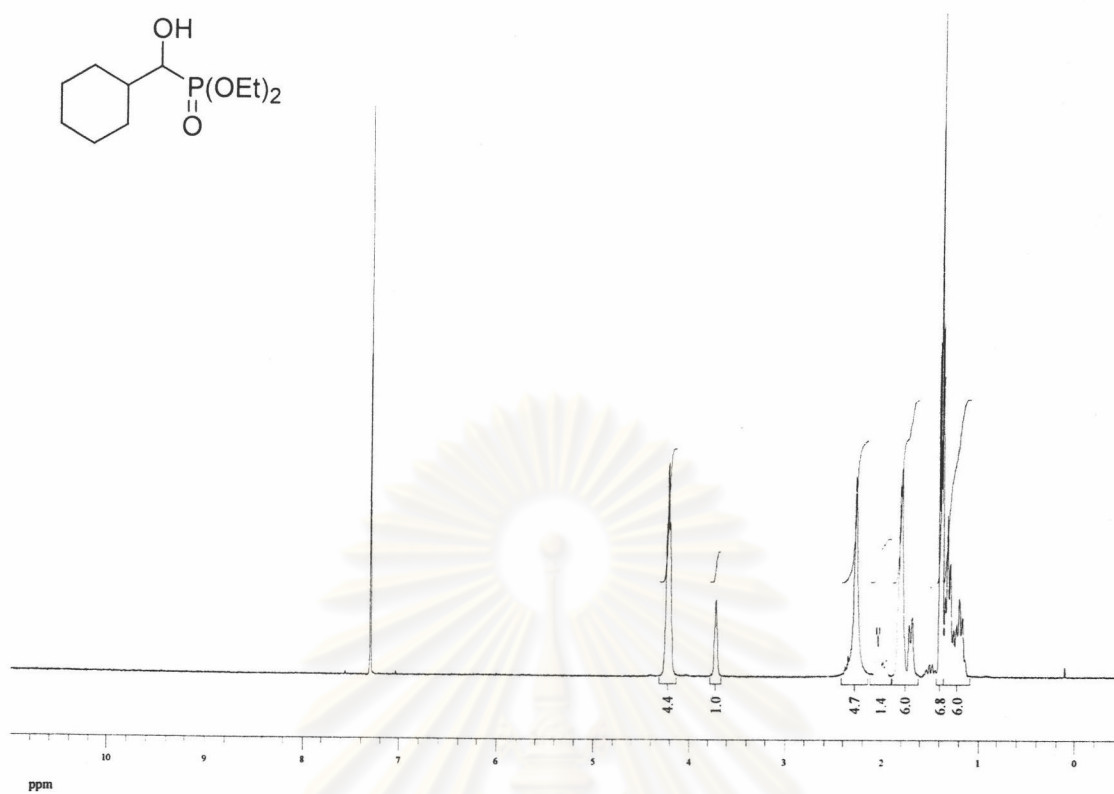


Figure 50 ¹H NMR spectrum (CDCl₃, 400 MHz) of diethyl 1-hydroxycyclohexyl phosphonate (**50w**).

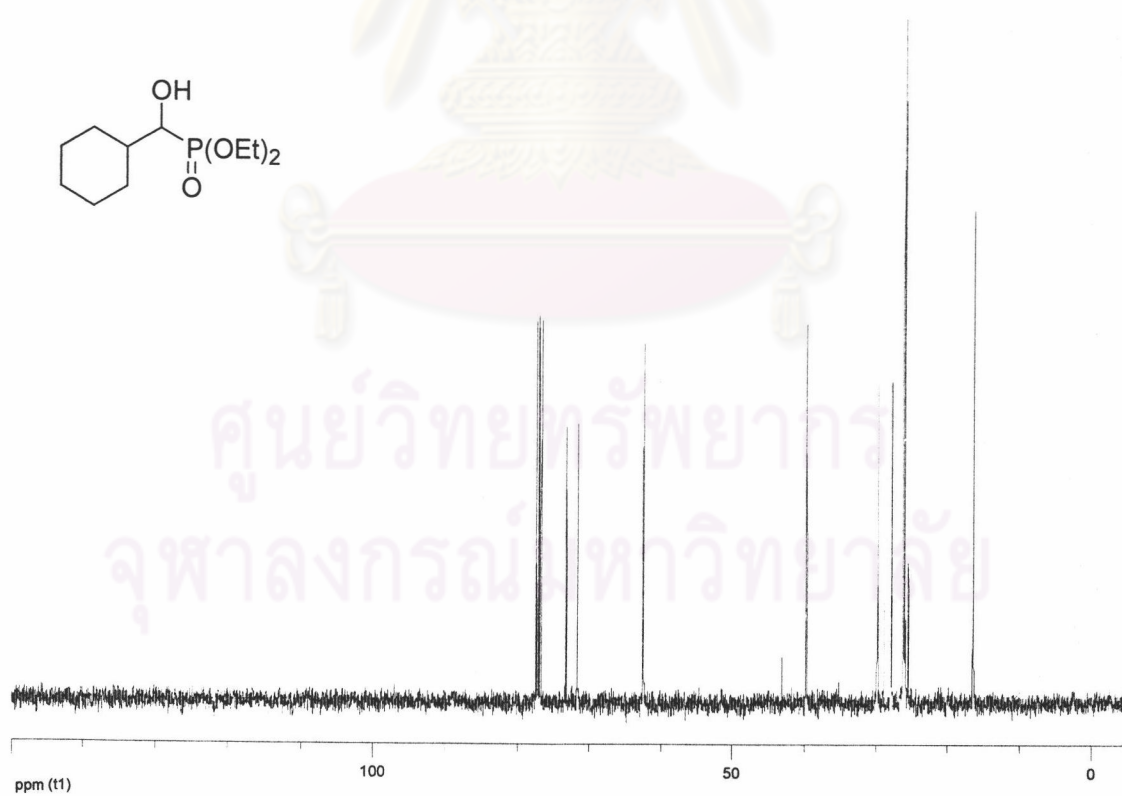


Figure 51 ¹³C NMR spectrum (CDCl₃, 100 MHz) of diethyl 1-hydroxycyclohexyl phosphonate (**50w**).

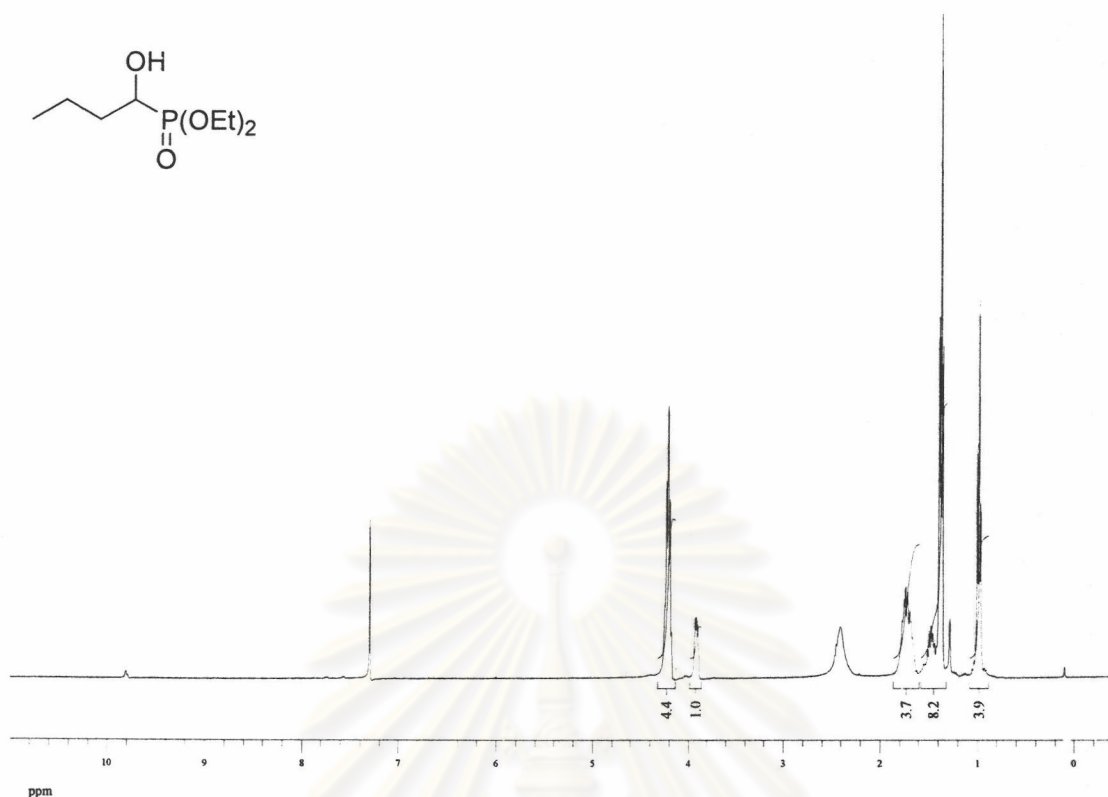


Figure 52 ¹H NMR spectrum (CDCl₃, 400 MHz) of diethyl 1-hydroxybutyl phosphonate (50x).

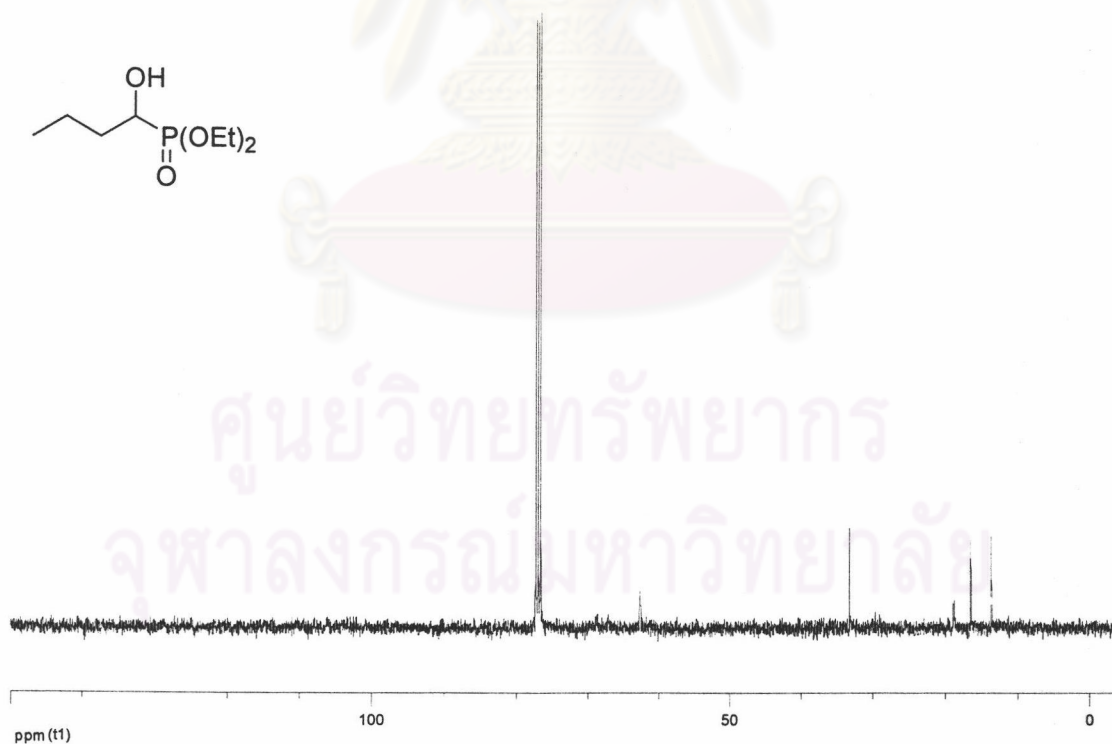


Figure 53 ¹³C NMR spectrum (CDCl₃, 100 MHz) of diethyl 1-hydroxybutyl phosphonate (50x).

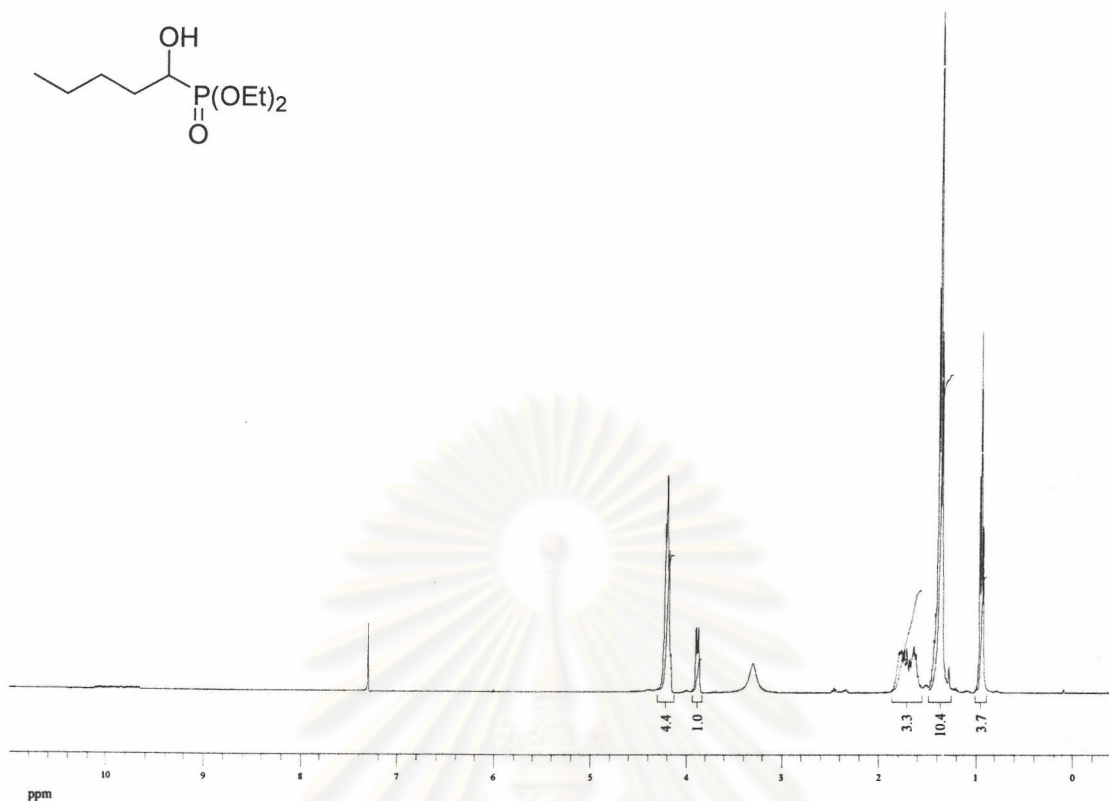


Figure 54 ¹H NMR spectrum (CDCl₃, 400 MHz) of diethyl 1-hydroxypentyl phosphonate (**50y**).

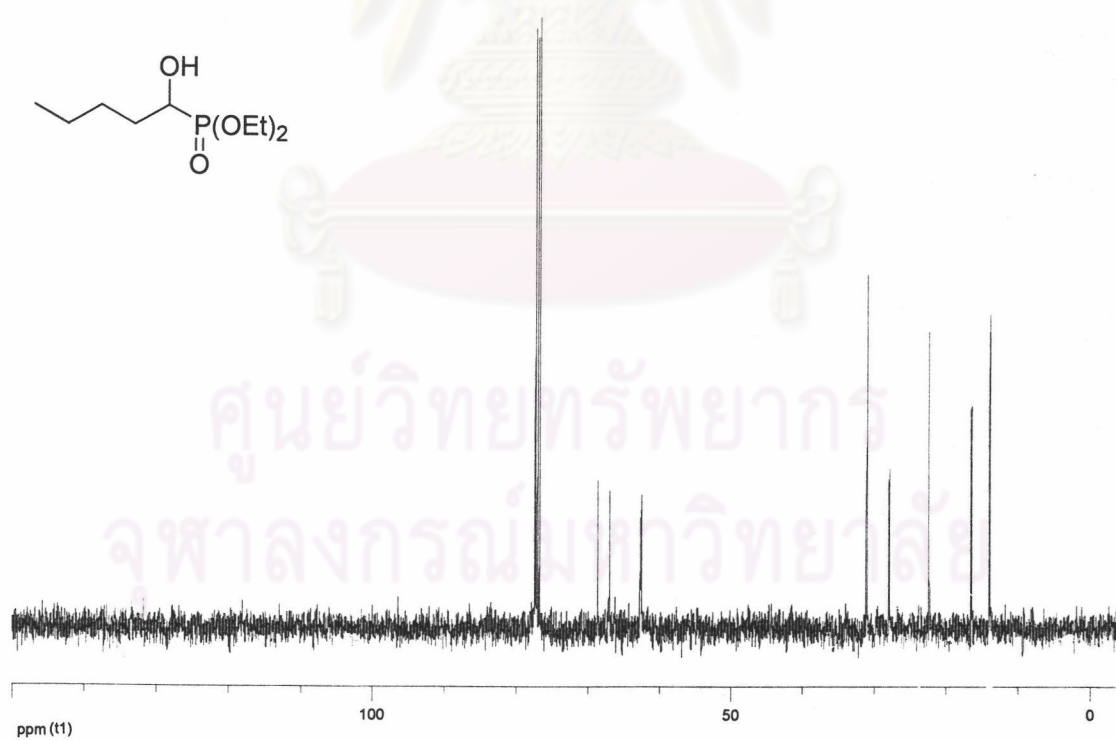


Figure 55 ¹³C NMR spectrum (CDCl₃, 100 MHz) of diethyl 1-hydroxypentyl phosphonate (**50y**).

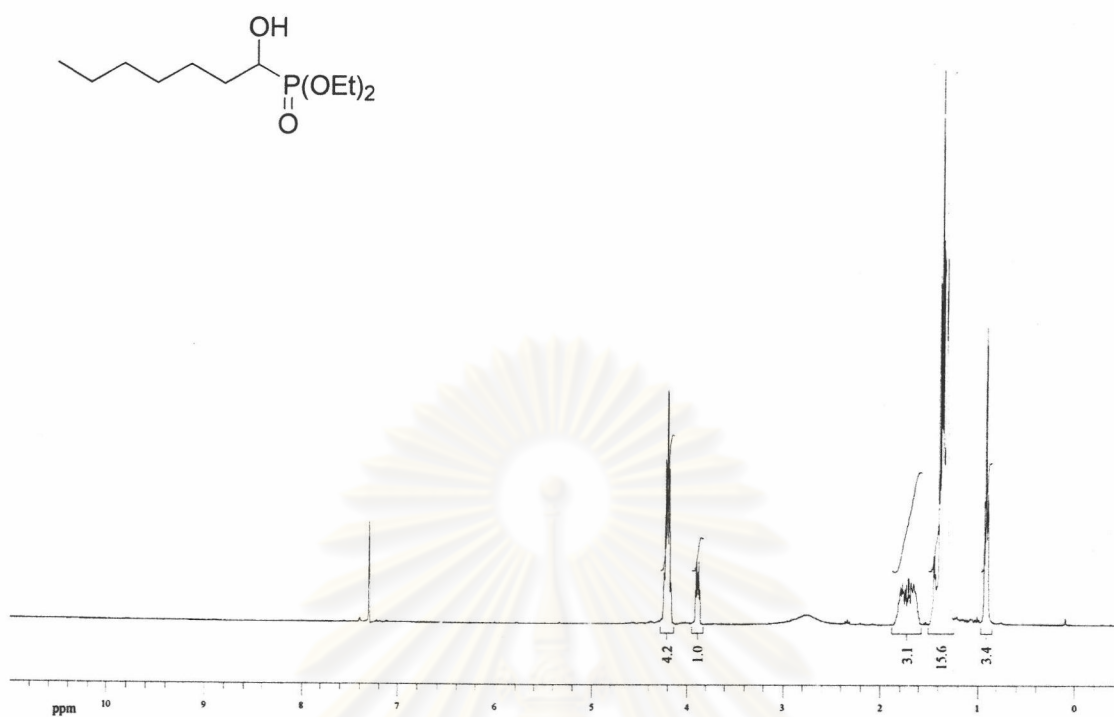


Figure 56 ¹H NMR spectrum (CDCl₃, 400 MHz) of diethyl 1-hydroxyheptyl phosphonate (**50z**).

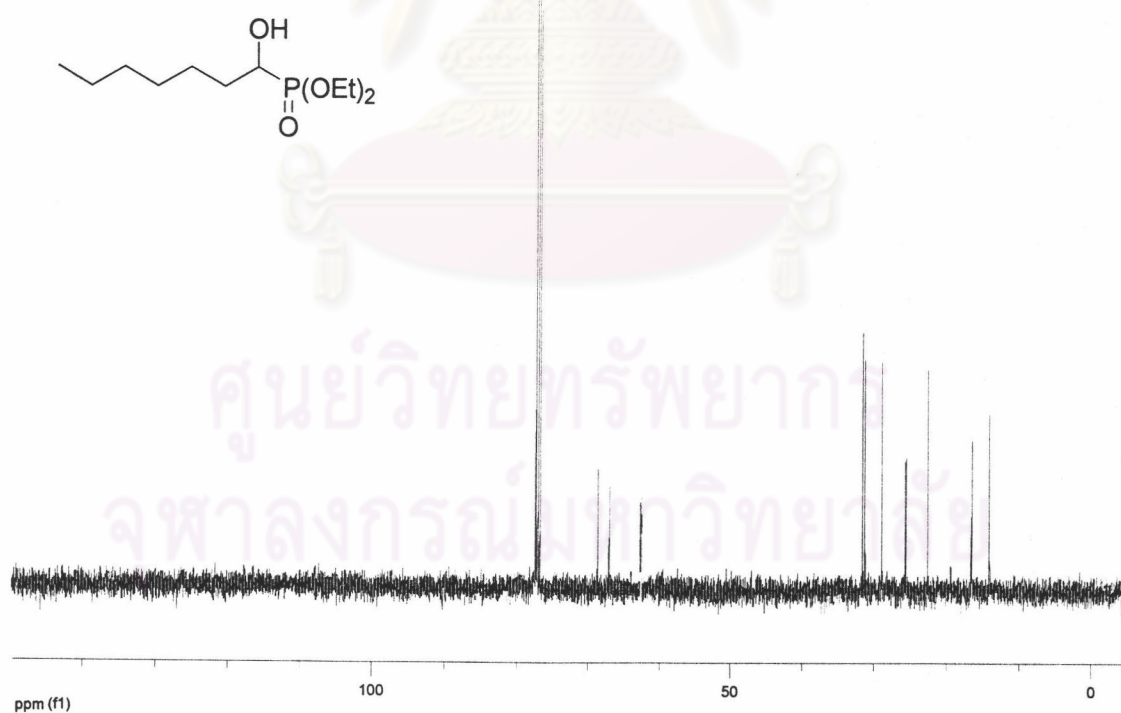


Figure 57 ¹³C NMR spectrum (CDCl₃, 100 MHz) of diethyl 1-hydroxyheptyl phosphonate (**50z**).

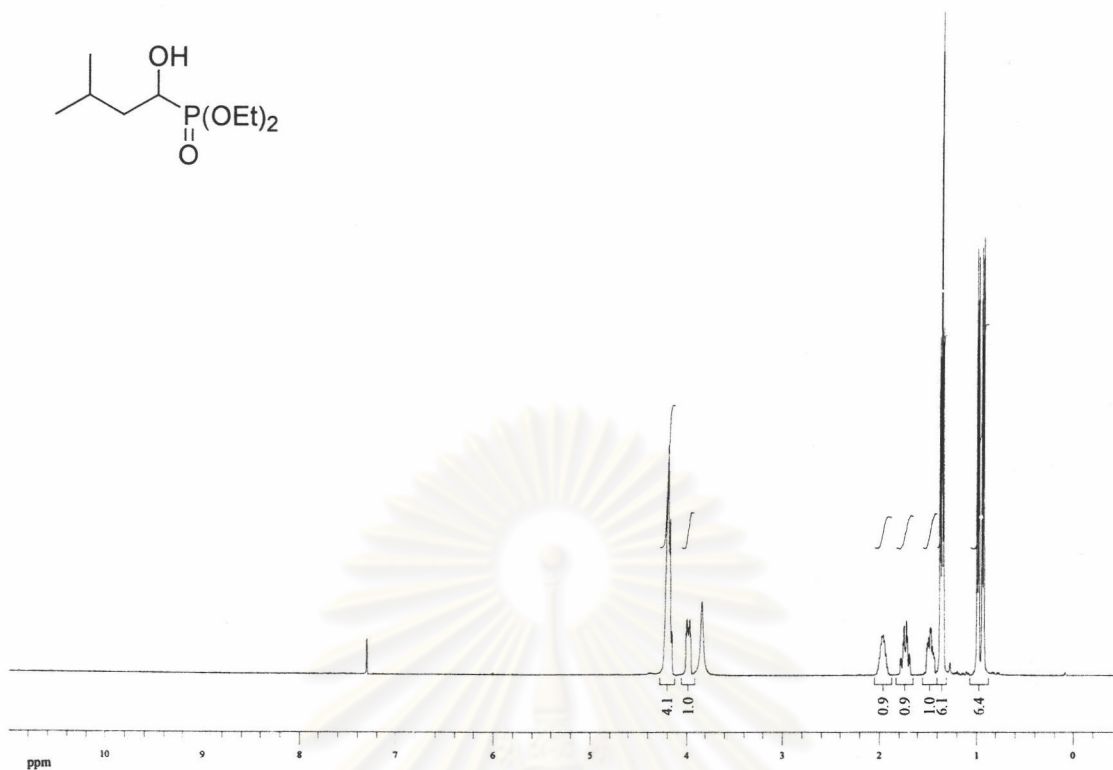


Figure 58 ¹H NMR spectrum (CDCl₃, 400 MHz) of diethyl 1-hydroxy-3-methyl butylphosphonate (**50aa**).

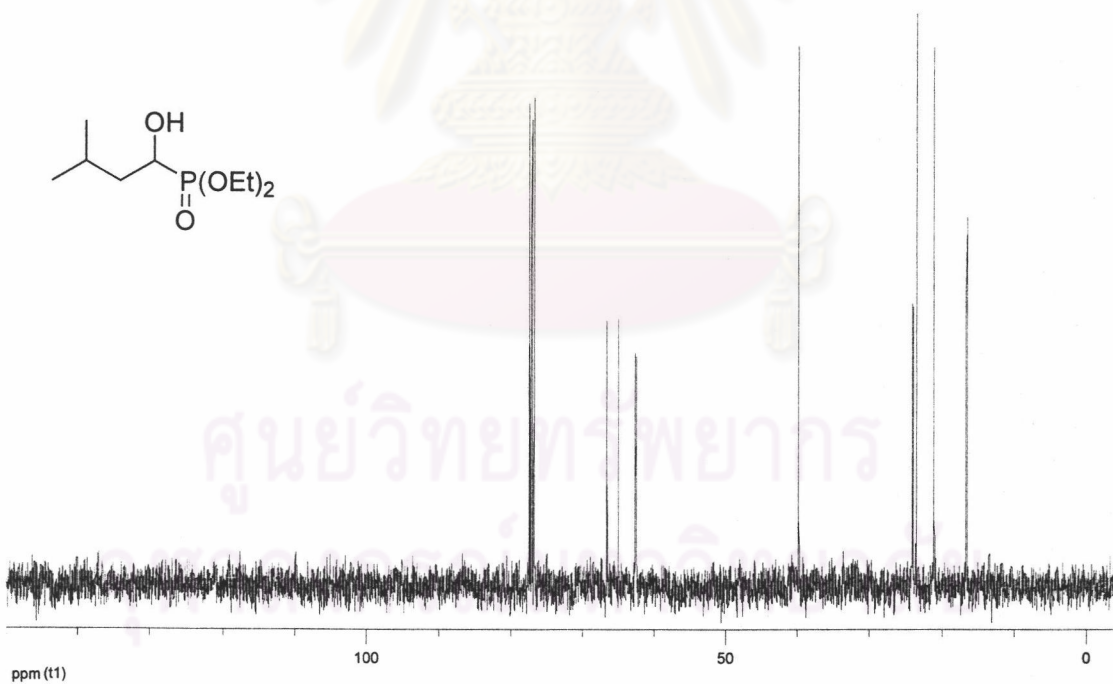


Figure 59 ¹³C NMR spectrum (CDCl₃, 100 MHz) of diethyl 1-hydroxy-3-methyl butylphosphonate (**50aa**).

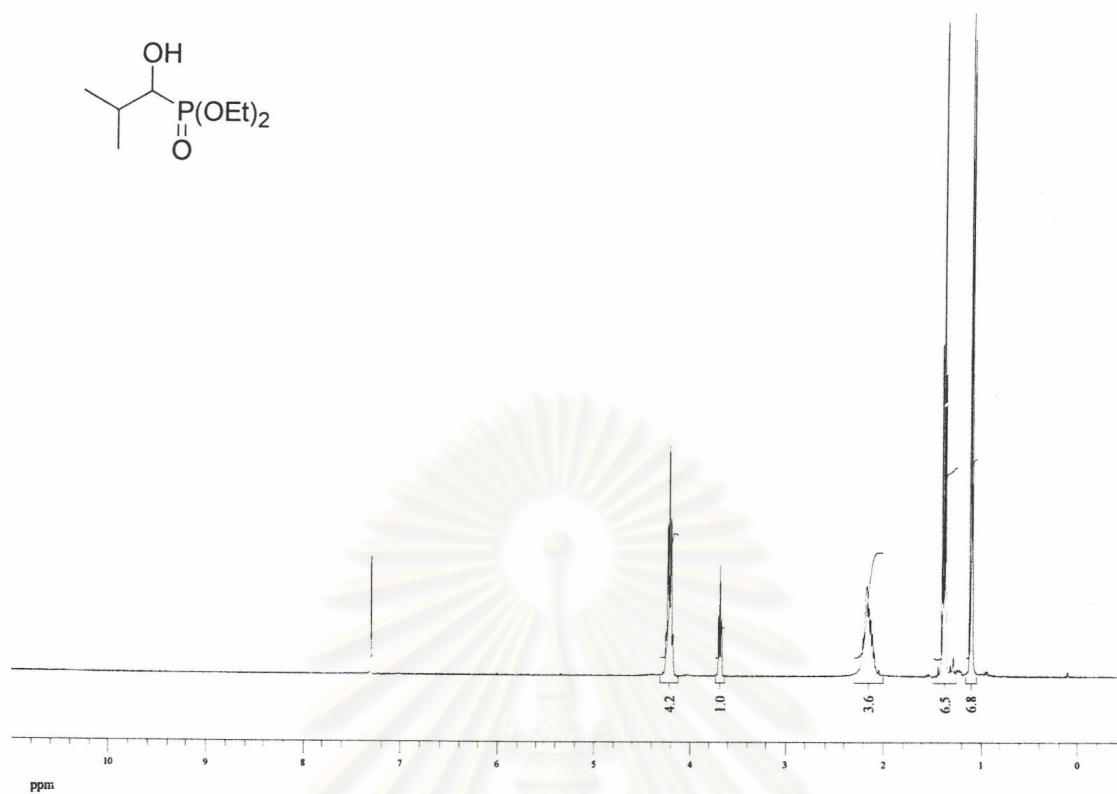


Figure 60 ¹H NMR spectrum (CDCl₃, 400 MHz) of diethyl 1-hydroxy-2-methyl propylphosphonate (**50bb**).

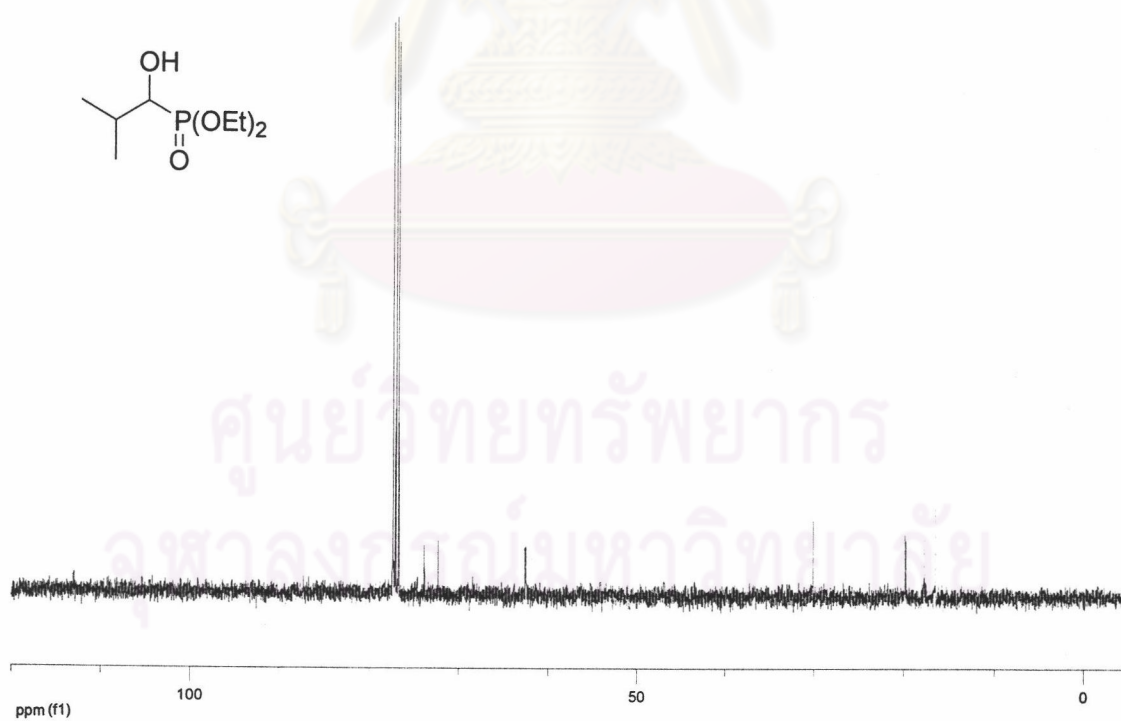


Figure 61 ¹³C NMR spectrum (CDCl₃, 100 MHz) of diethyl 1-hydroxy-2-methyl propylphosphonate (**50bb**).

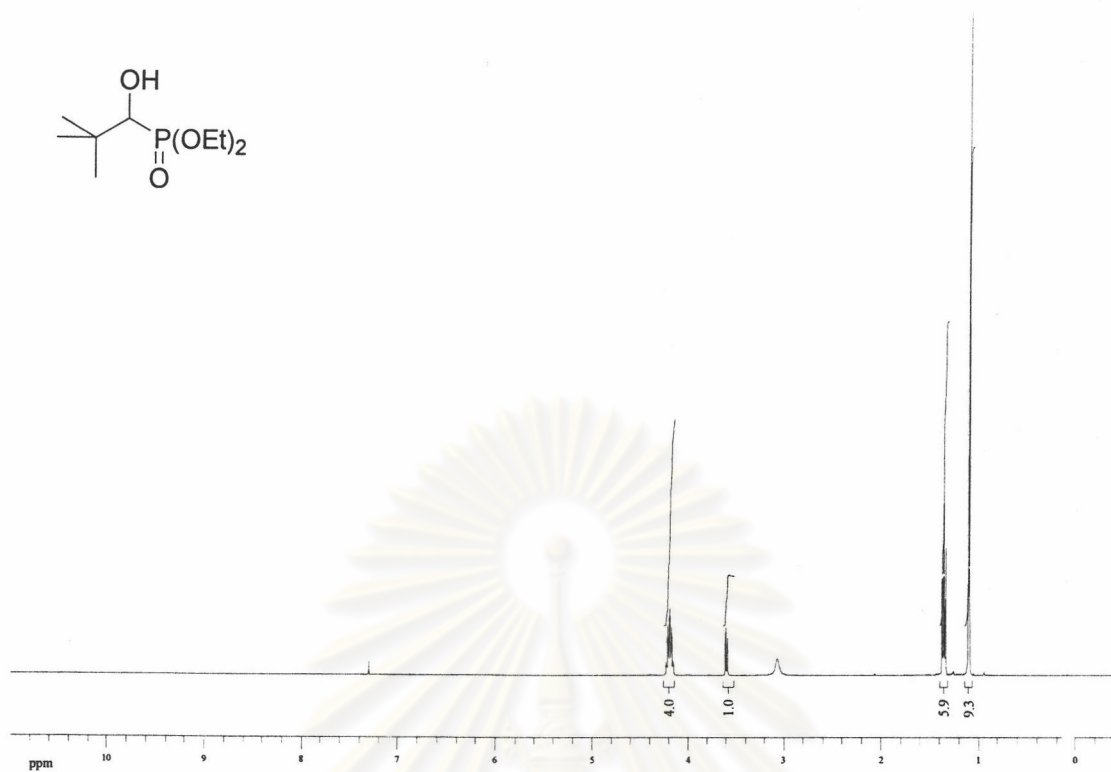


Figure 62 ^1H NMR spectrum (CDCl_3 , 400 MHz) of diethyl 1-hydroxy-2,2-dimethylpropylphosphonate (**50cc**).

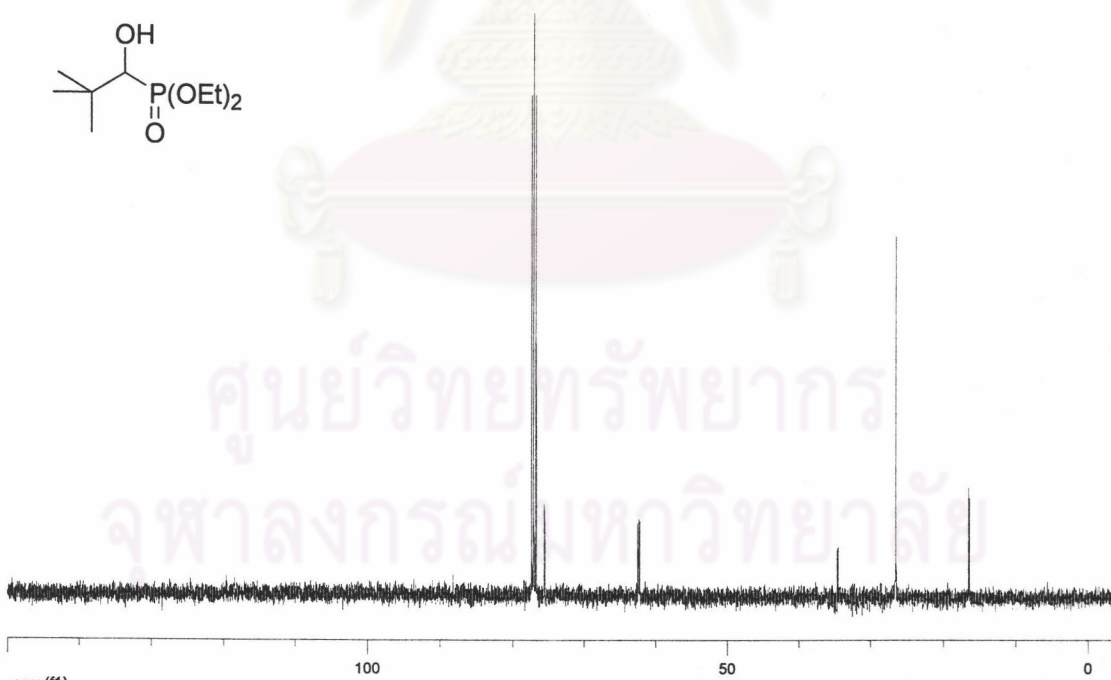


Figure 63 ^{13}C NMR spectrum (CDCl_3 , 100 MHz) of diethyl 1-hydroxy-2,2-dimethylpropylphosphonate (**50cc**).

VITAE

Miss Jintana Nammoonoy was born on October 30th, 1978 in Khonkaen, Thailand. She received a Bachelor's Degree of Science, majoring in chemistry from Khonkaen University in 2000. Since 2000, she has been a graduate student studying organic chemistry as her major course at Chulalongkorn University. During her studies, she was financially supported by a DPST in 1996-2003 and was supported by a grant for her Master degree's thesis from the Graduate School, Chulalongkorn University.

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