

Supplementary Material

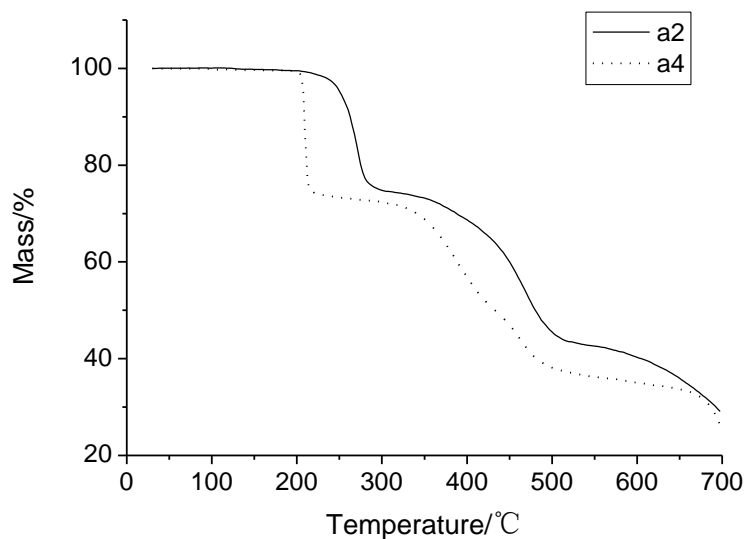
Synthesis of Flame-retardant Phosphaphenanthrene Derivatives with High Phosphorus Contents

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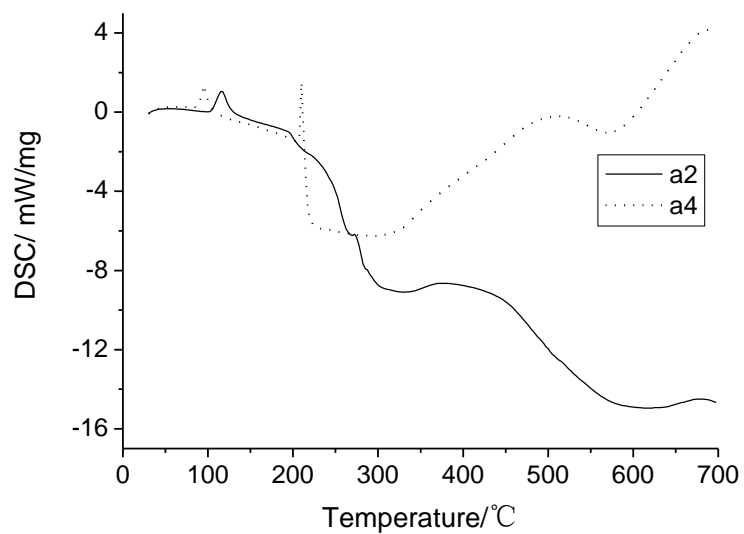
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The TGA curves of compound **a2** and **a4** in air



The DSC curves of compound **a2** and **a4** in air

The spectra of the compounds

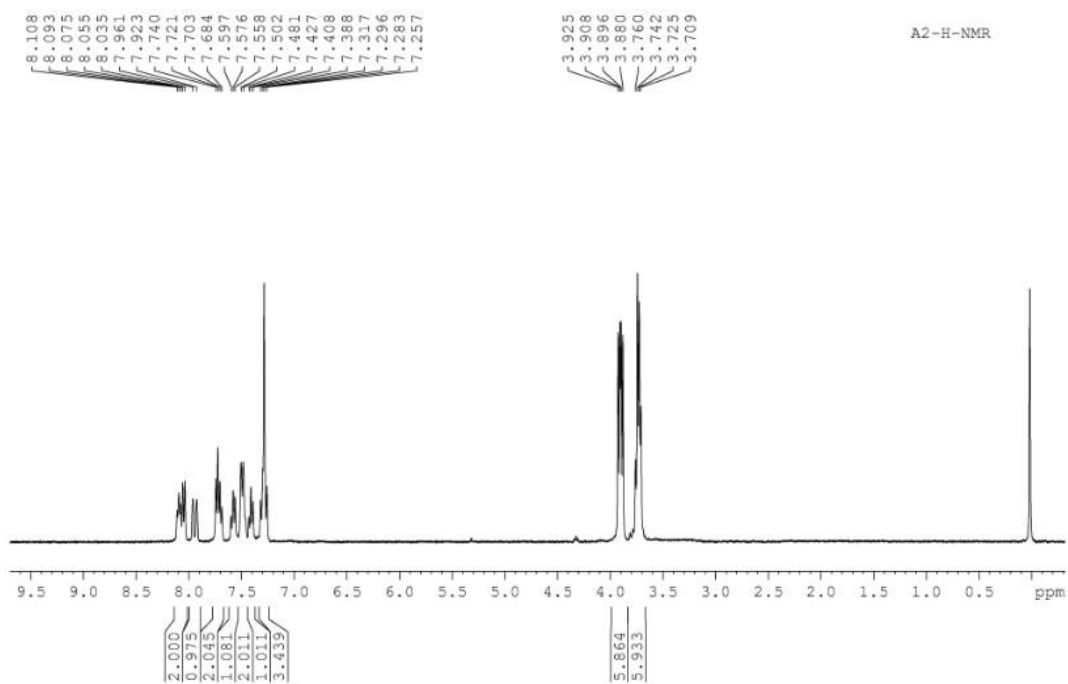


Fig. 1 The ^1H NMR spectrum of compound **a1**

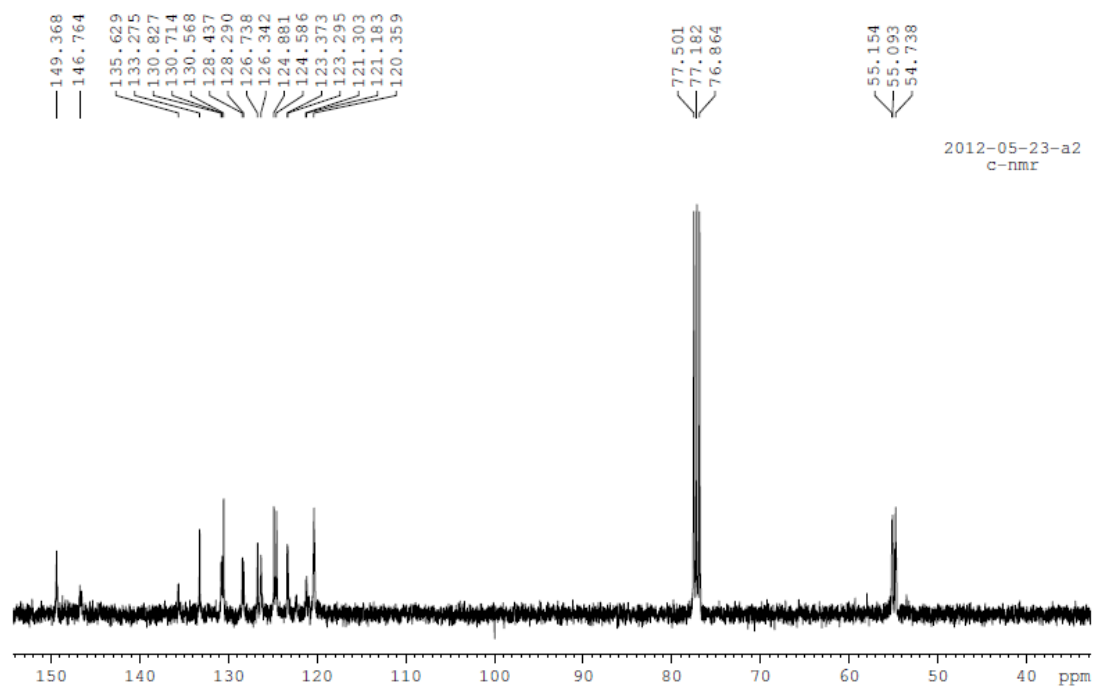


Fig. 2 The ^{13}C NMR spectrum of compound **a1**

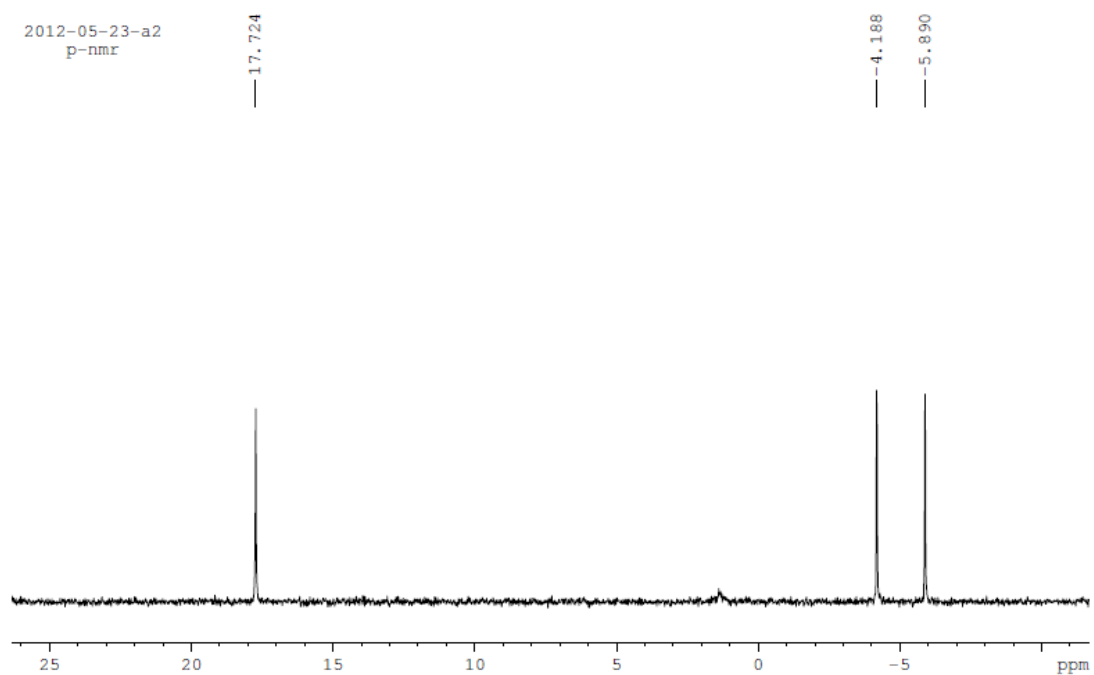


Fig. 3 The ^{31}P NMR spectrum of compound **a1**

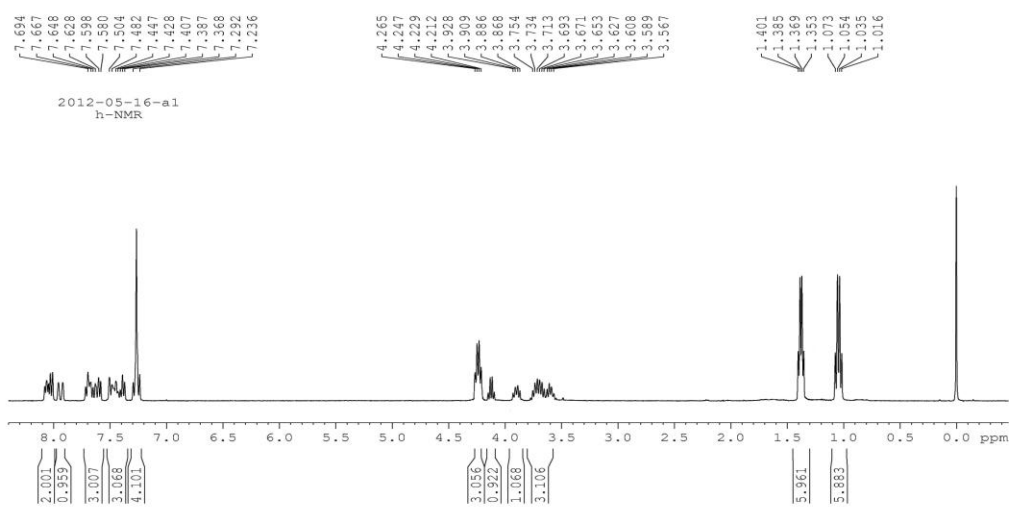


Fig. 4 The ^1H NMR spectrum of compound **a2**

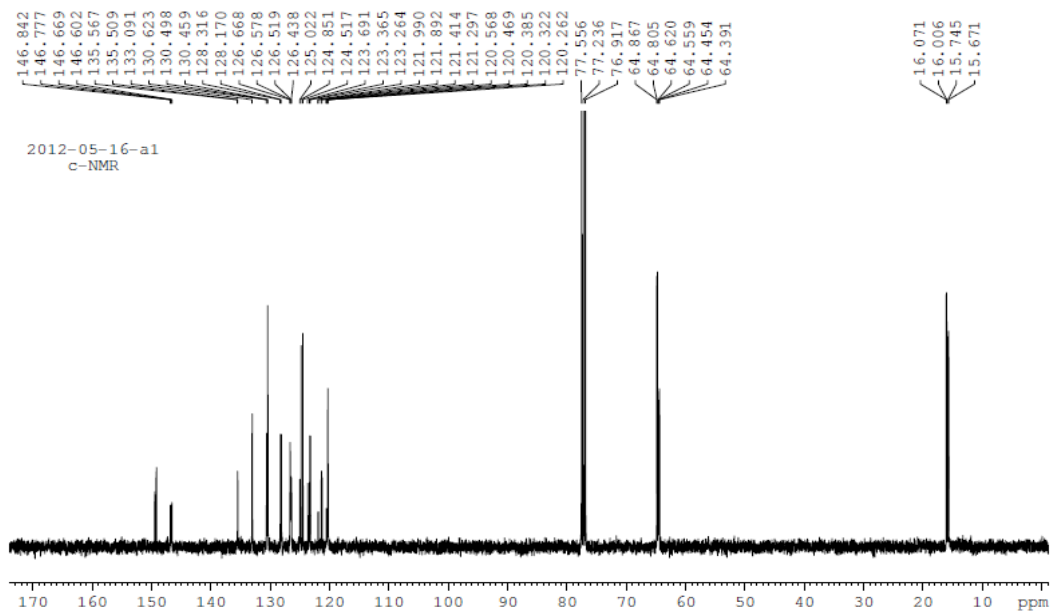


Fig. 5 The ^{13}C NMR spectrum of compound **a2**

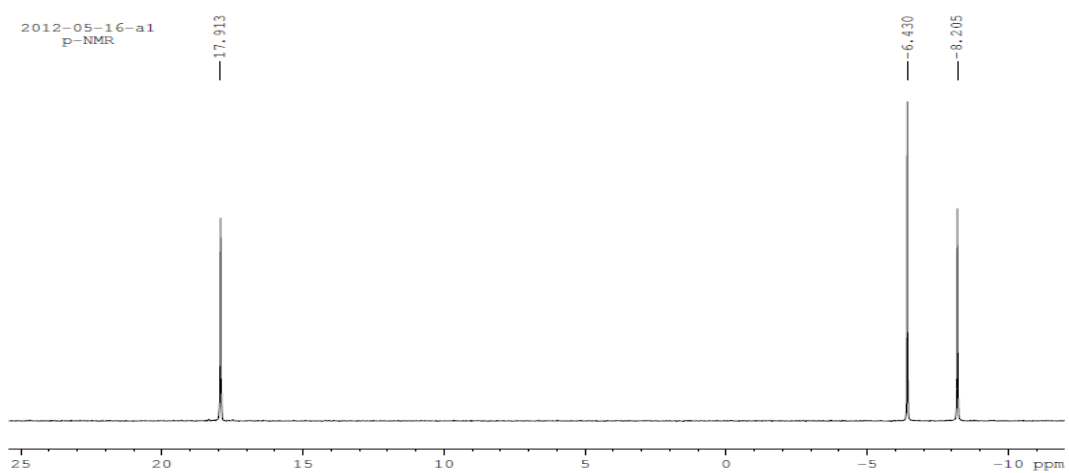


Fig. 6 The ^{31}P NMR spectrum of compound **a2**

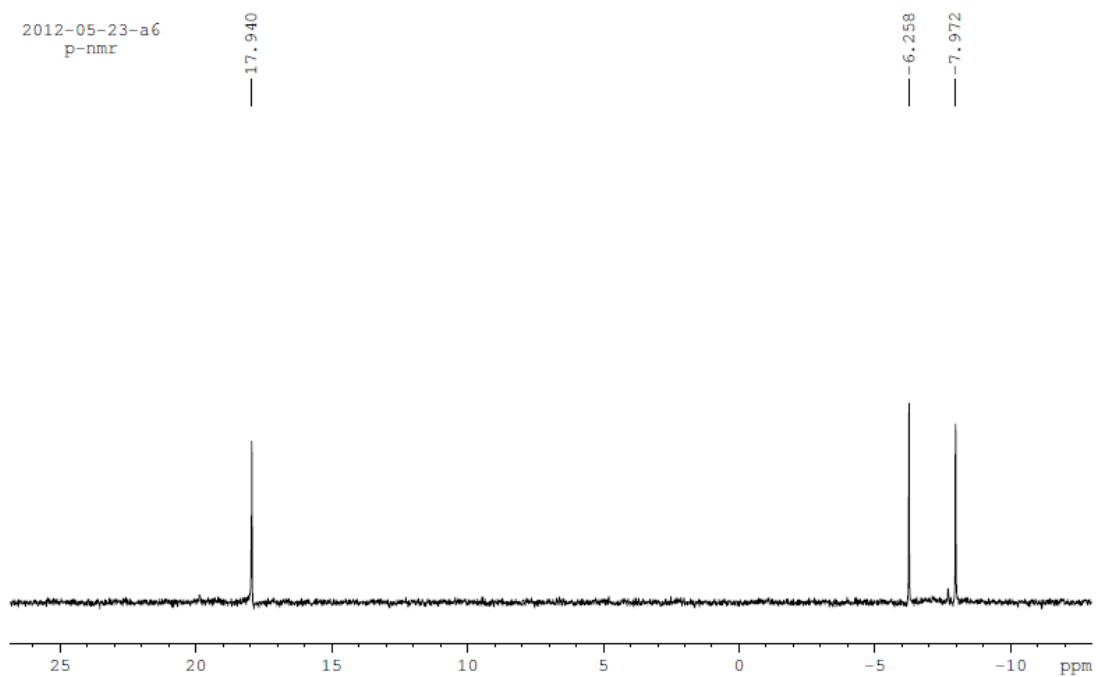


Fig. 7 The ^{31}P NMR spectrum of compound **a3**

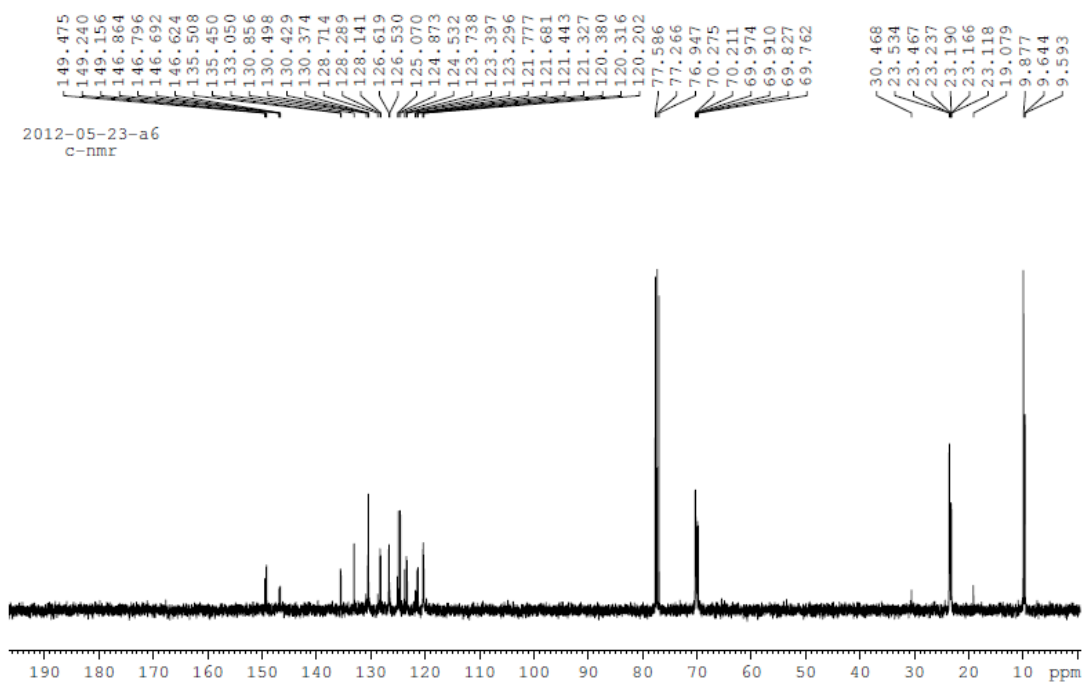


Fig. 8 The ^{13}C NMR spectrum of compound **a3**

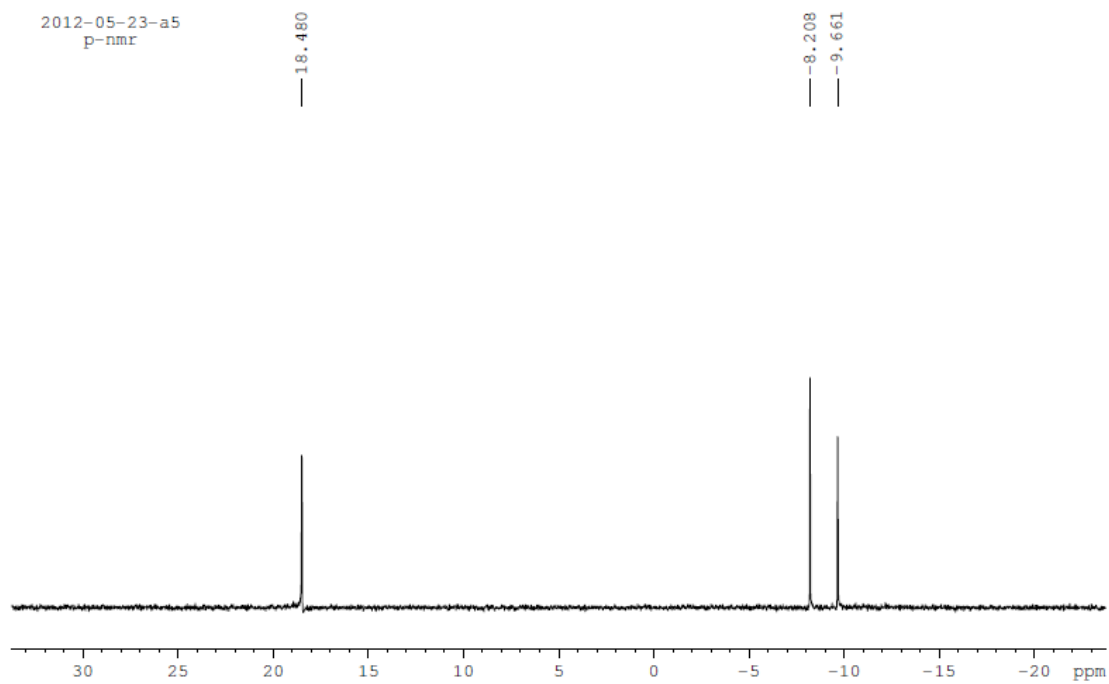


Fig. 9 The ^{31}P NMR spectrum of compound **a4**

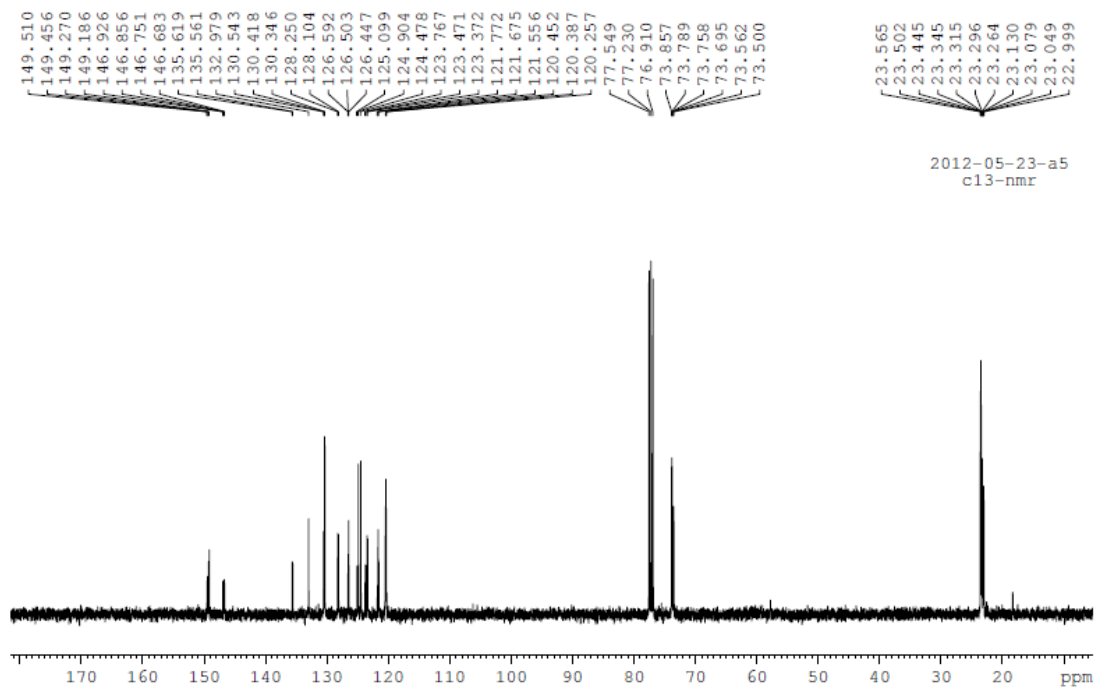


Fig. 10 The ^{13}C NMR spectrum of compound **a4**

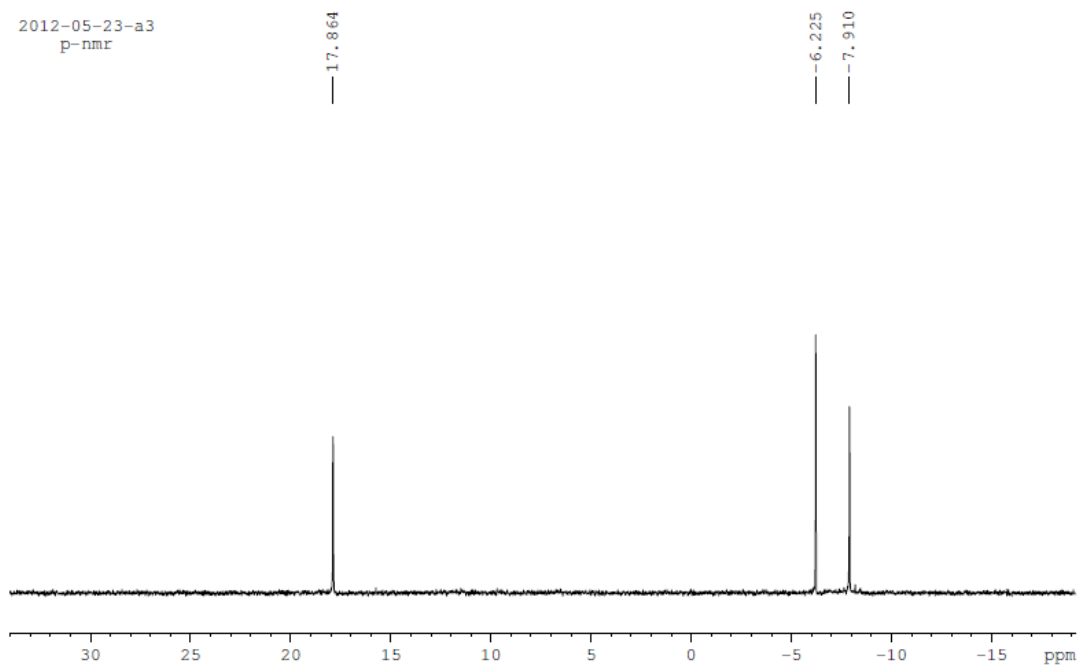


Fig. 11 The ^{31}P NMR spectrum of compound **a5**

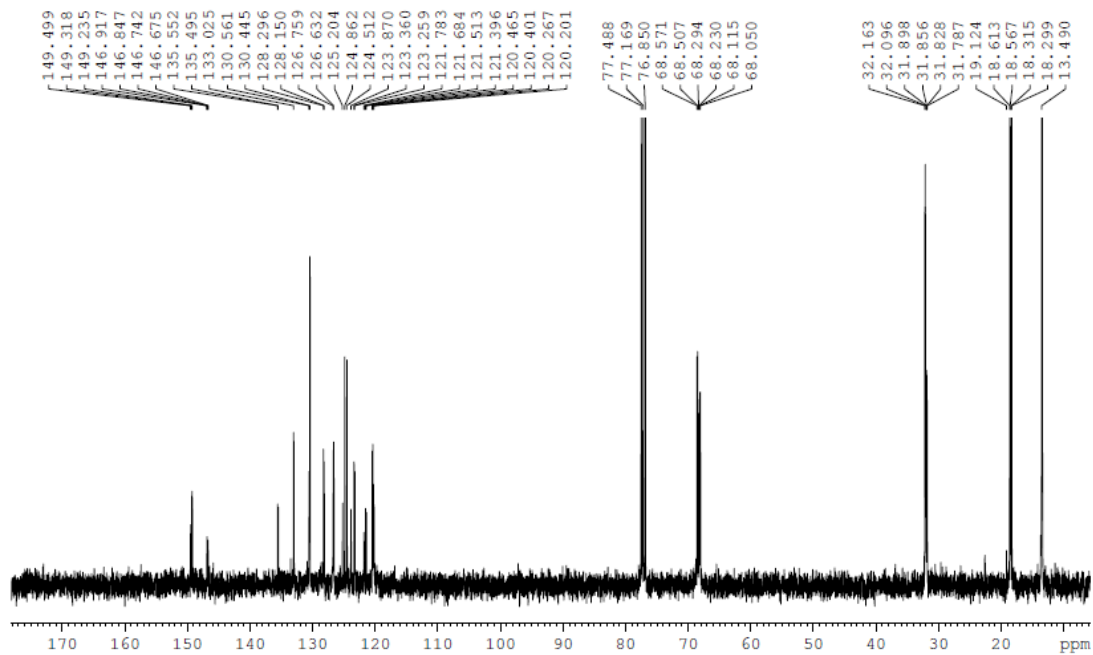


Fig. 12 The ^{13}C NMR spectrum of compound **a5**

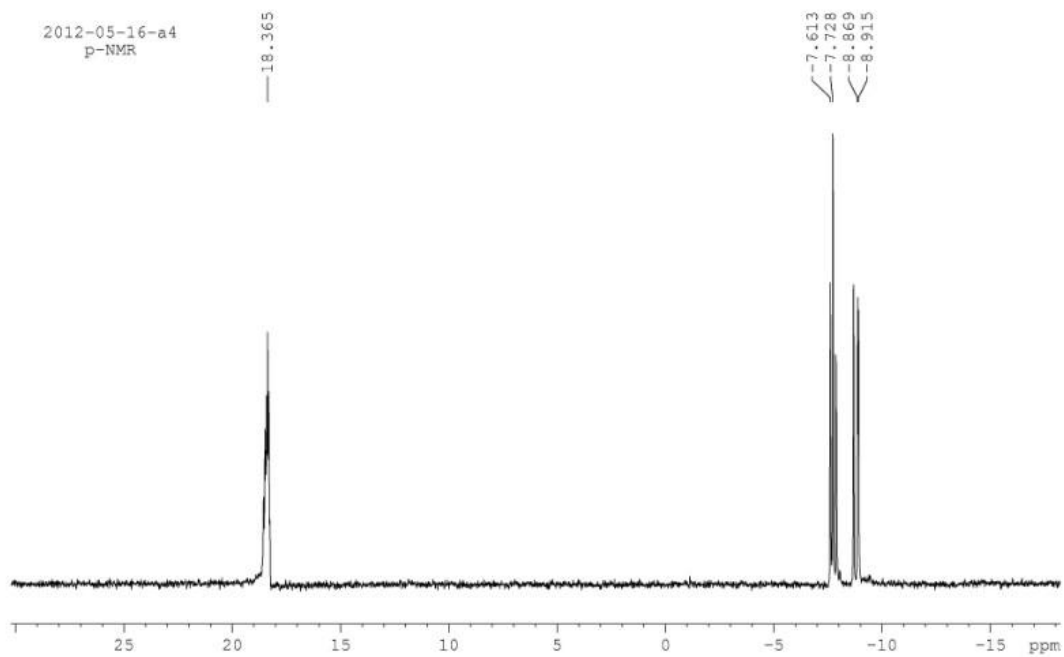


Fig. 13 The ^{31}P NMR spectrum of compound **a6**

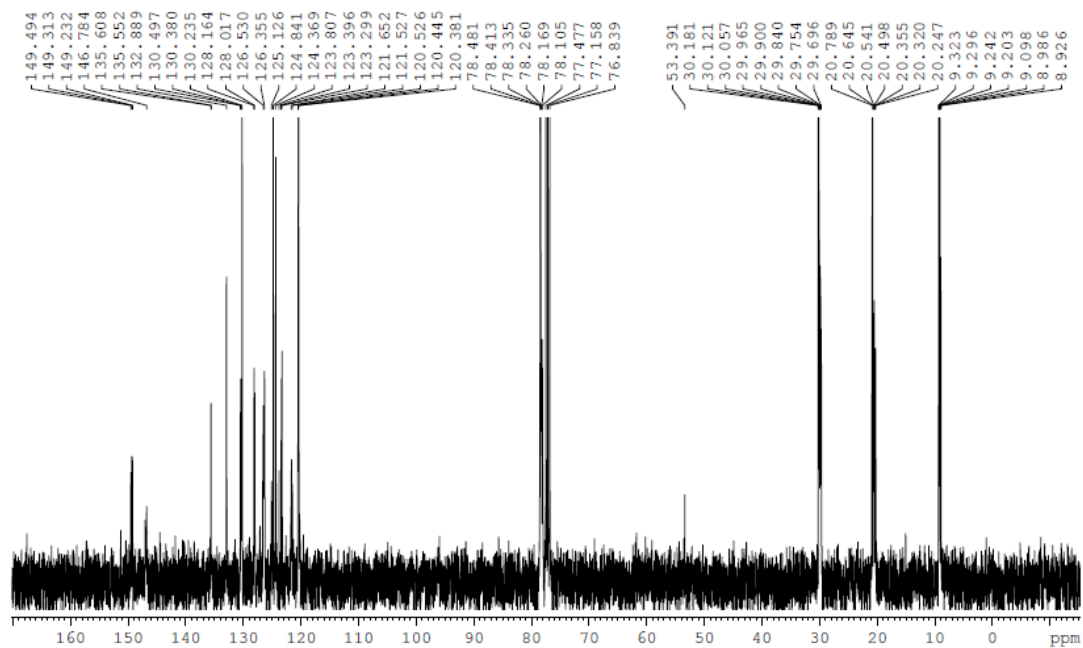


Fig. 14 The ^{13}C NMR spectrum of compound **a6**

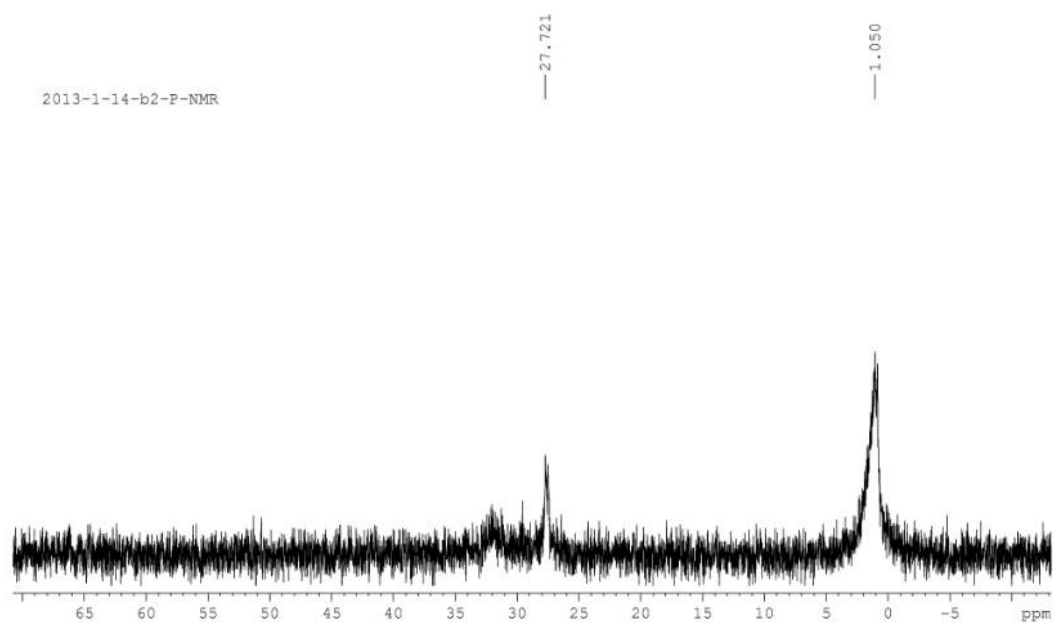


Fig. 15 The ^{31}P NMR spectrum of compound **b1**

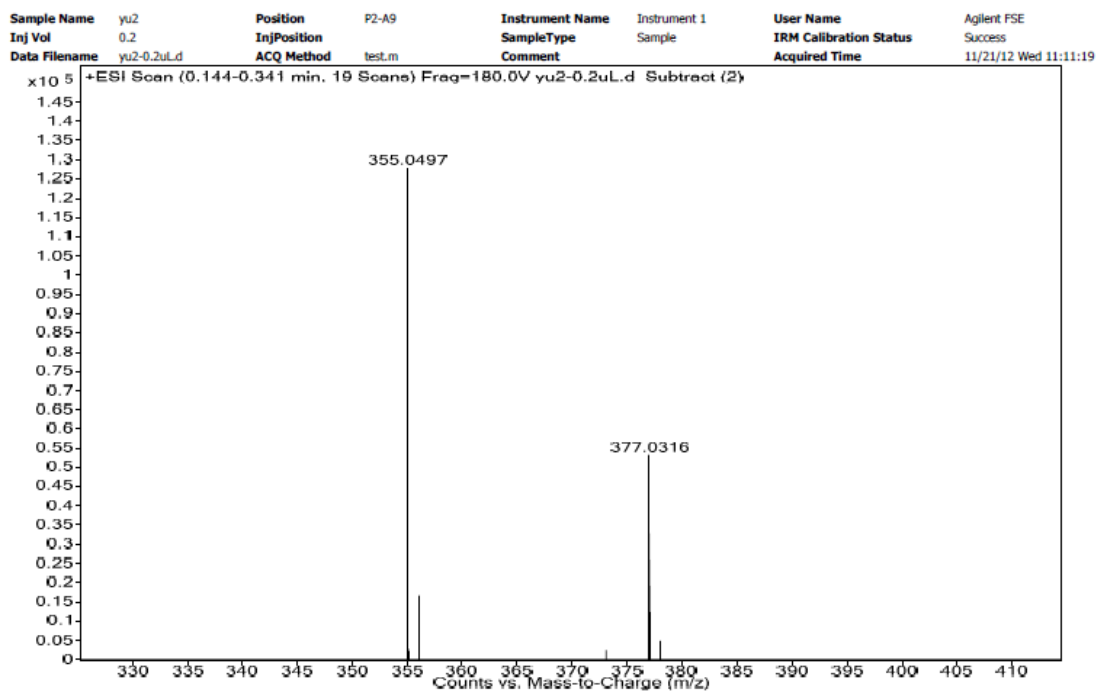


Fig. 16 The HR-MS spectrum of compound **b1**

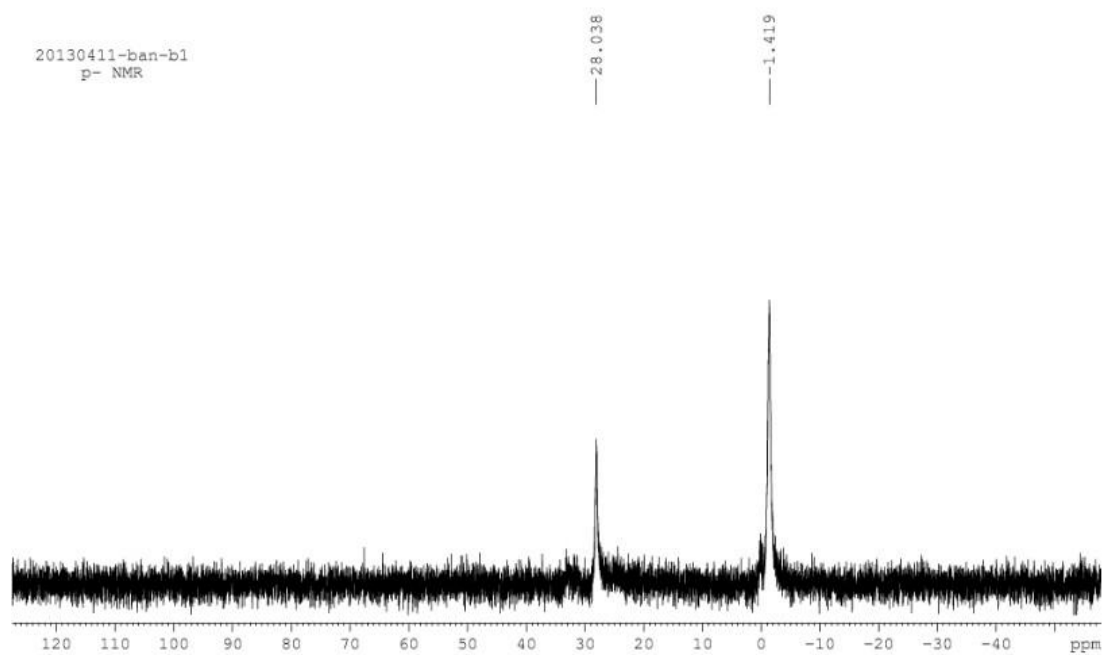


Fig. 17 The ³¹P NMR spectrum of compound **b2**

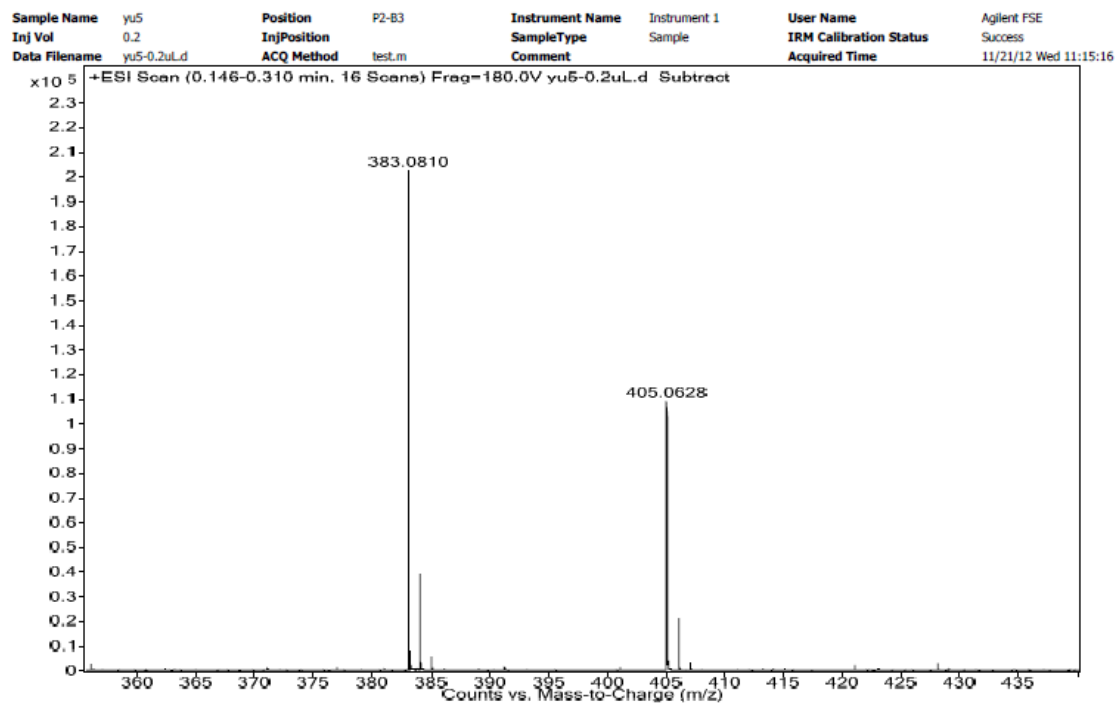


Fig. 18 The HR-MS spectrum of compound **b2**

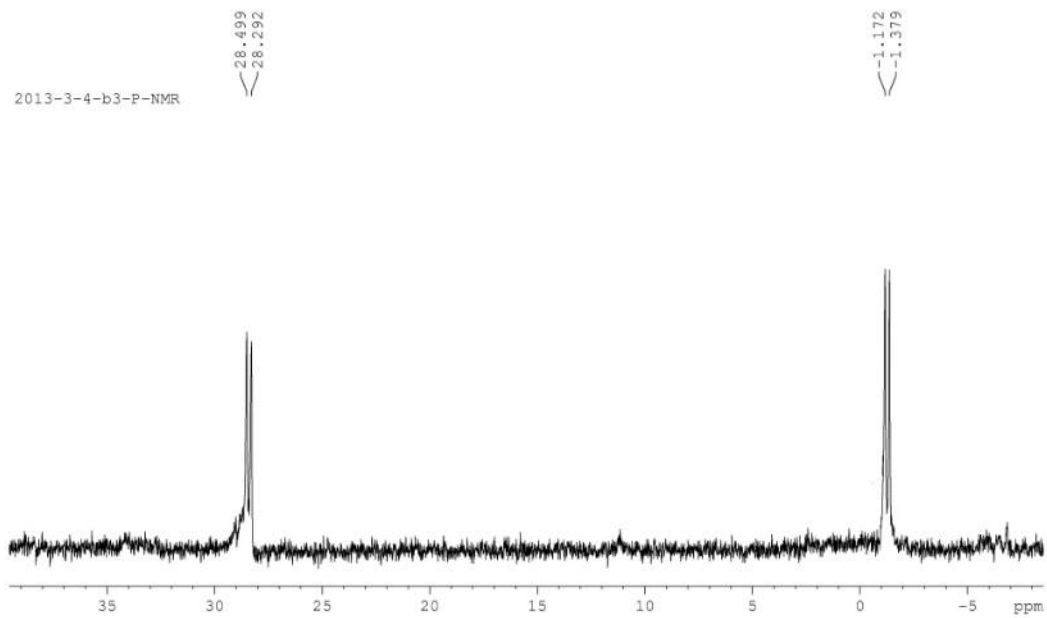


Fig. 19 The ³¹P NMR spectrum of compound **b3**

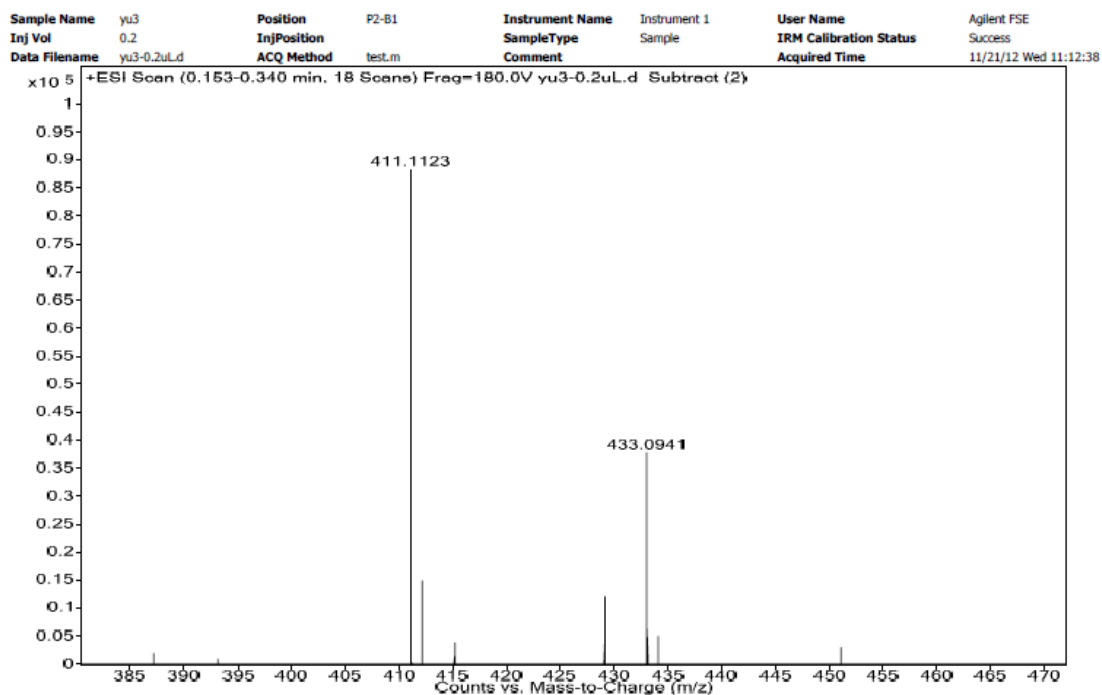


Fig. 20 The HR-MS spectrum of compound **b3**

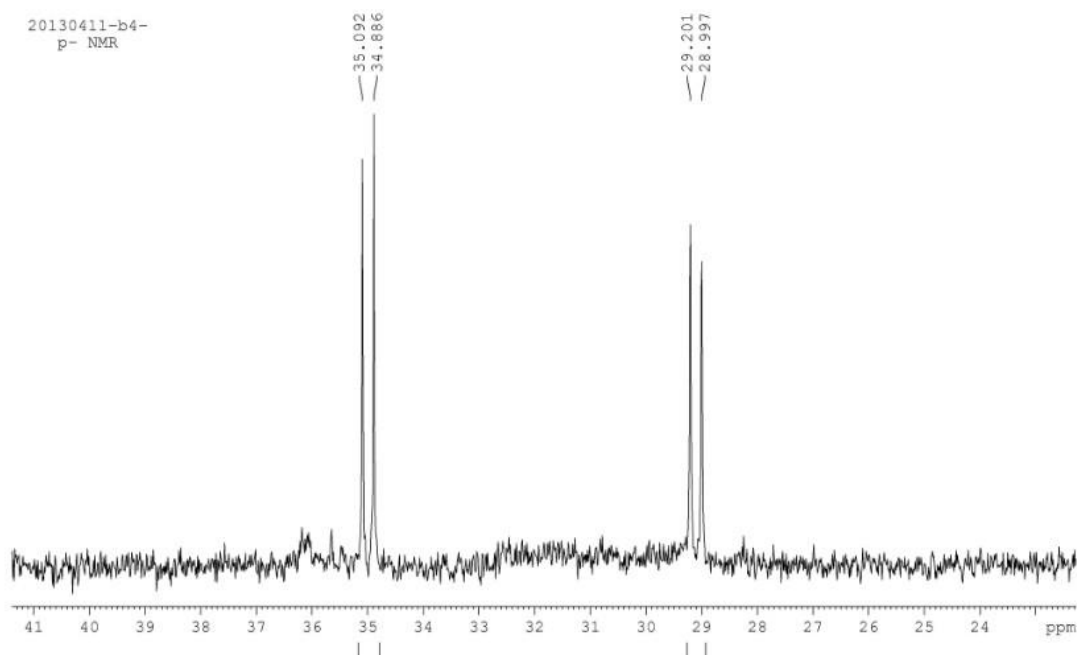


Fig. 21 The ³¹P NMR spectrum of compound **b4**

Sample Name	yu6	Position	P2-B4	Instrument Name	Instrument 1	User Name	Agilent FSE
Inj Vol	0.2	InjPosition		SampleType	Sample	IRM Calibration Status	Success
Data Filename	yu6-0.2uL.d	ACQ Method	test.m	Comment		Acquired Time	11/21/12 Wed 11:16:33

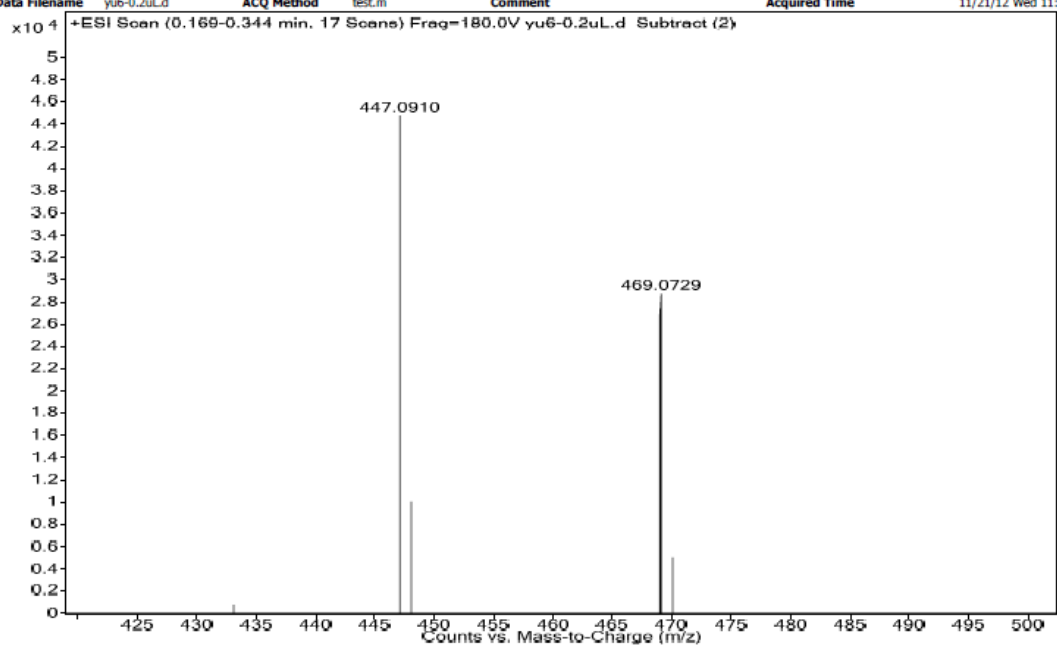


Fig. 22 The HR-MS spectrum of compound **b4**