
Synthesis of Diketones, Ketoesters and Tetraketones by Electrochemical Oxidative Decarboxylation of Malonic Acid Derivatives: Application to the Synthesis of *cis*-Jasmone

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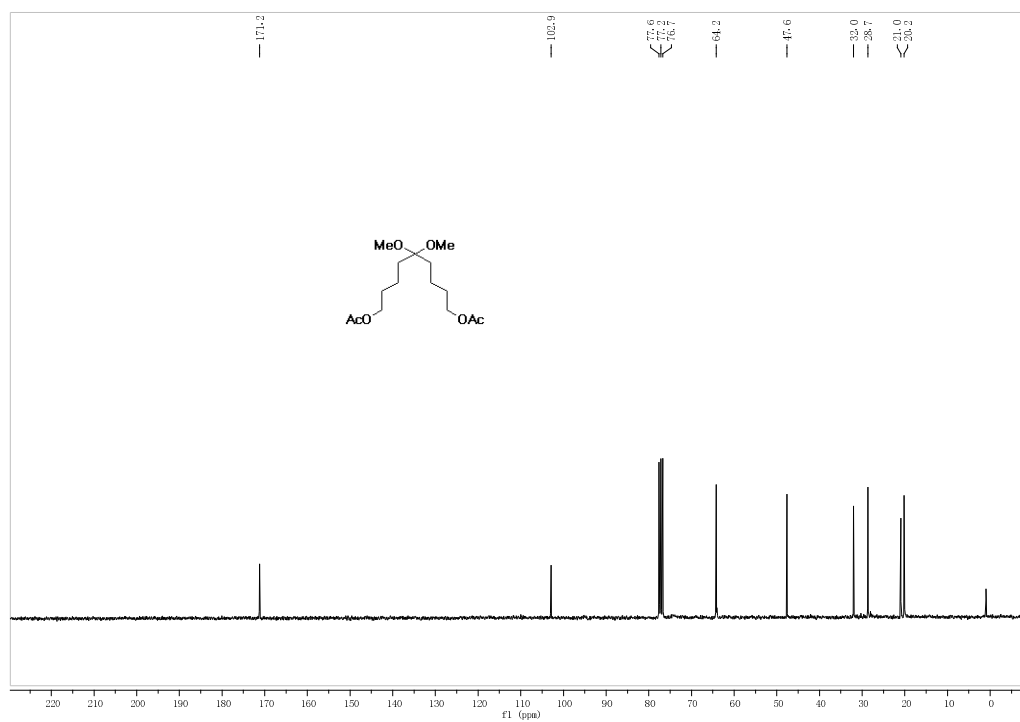
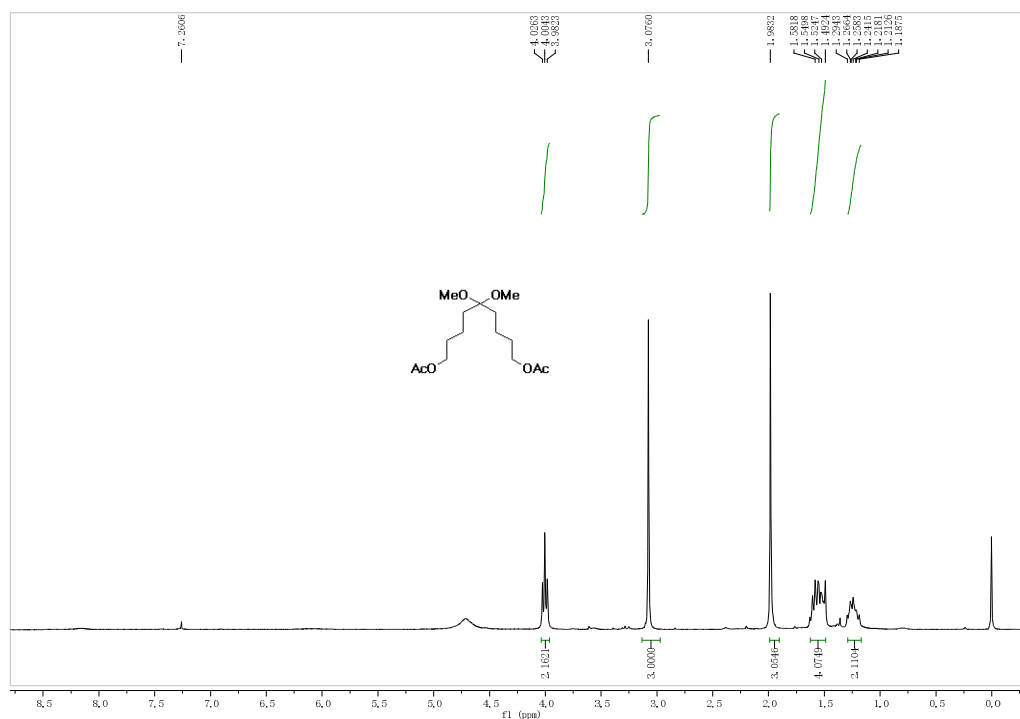
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† Deceased on the 31st of July 2017

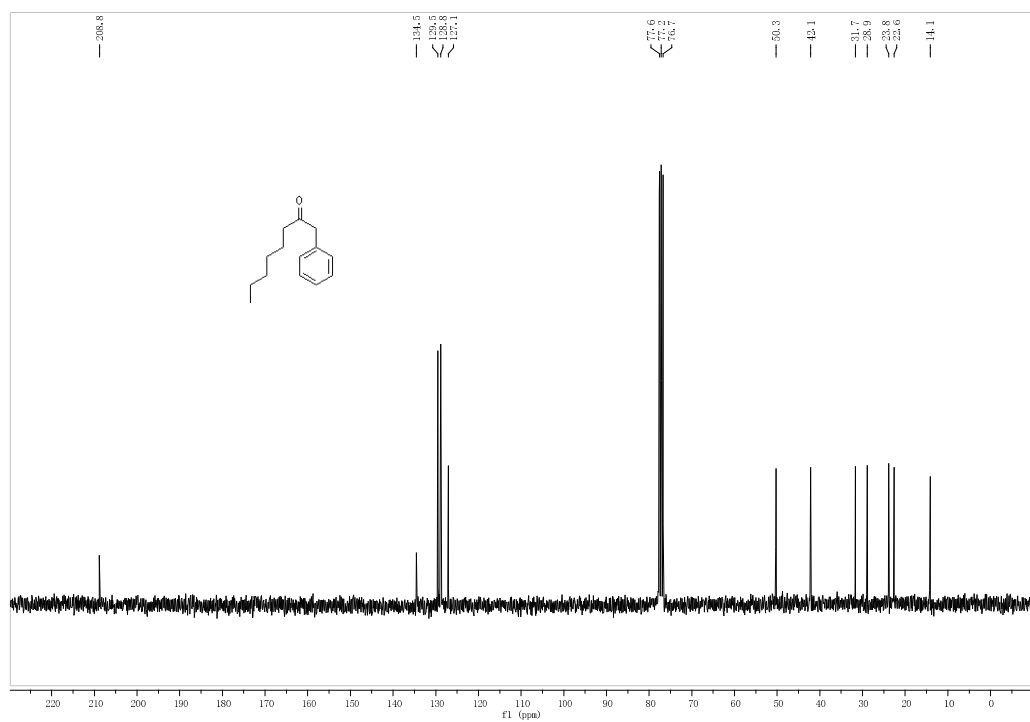
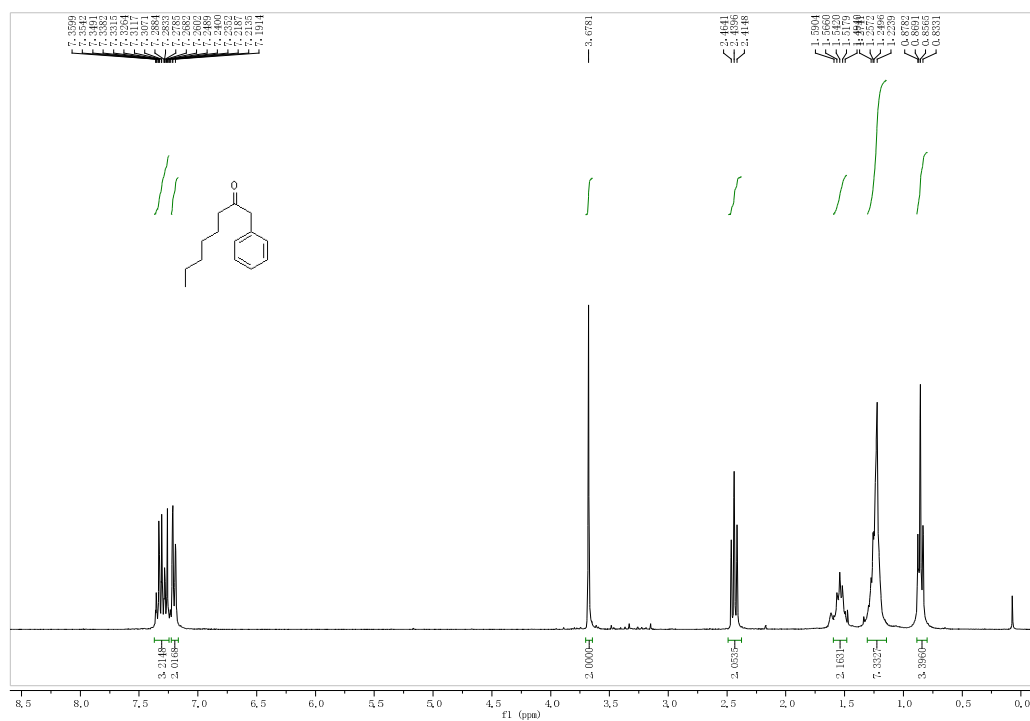
* E-mail: k.lam@greenwich.ac.uk.

* E-mail: xm16367@bristol.ac.uk.

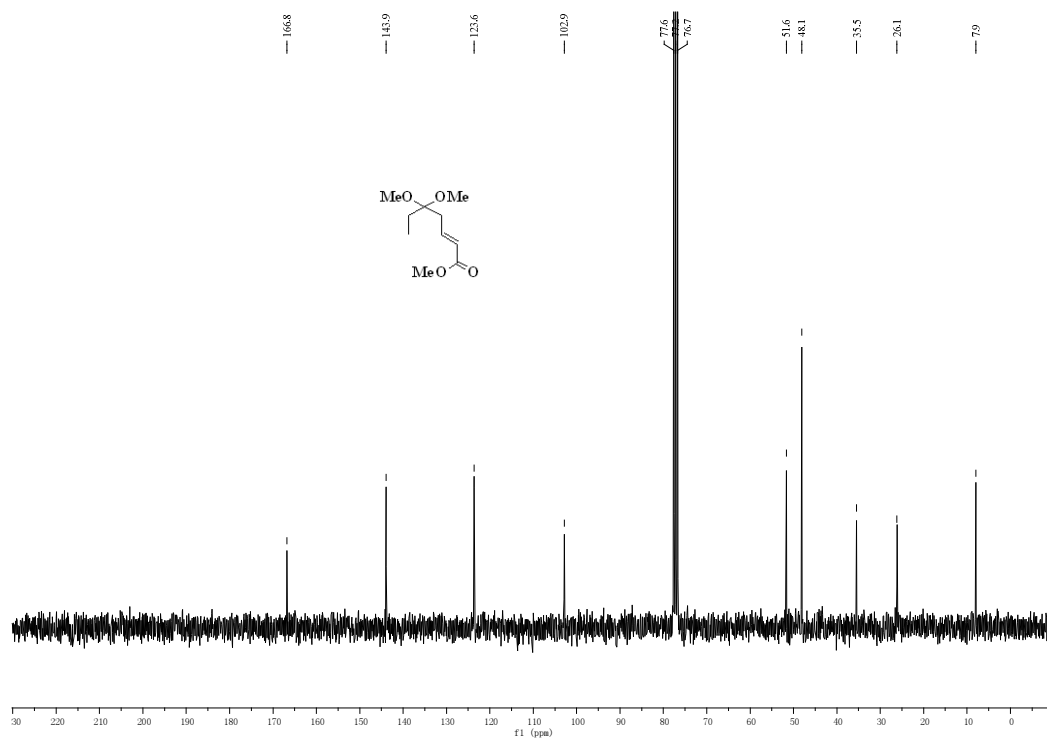
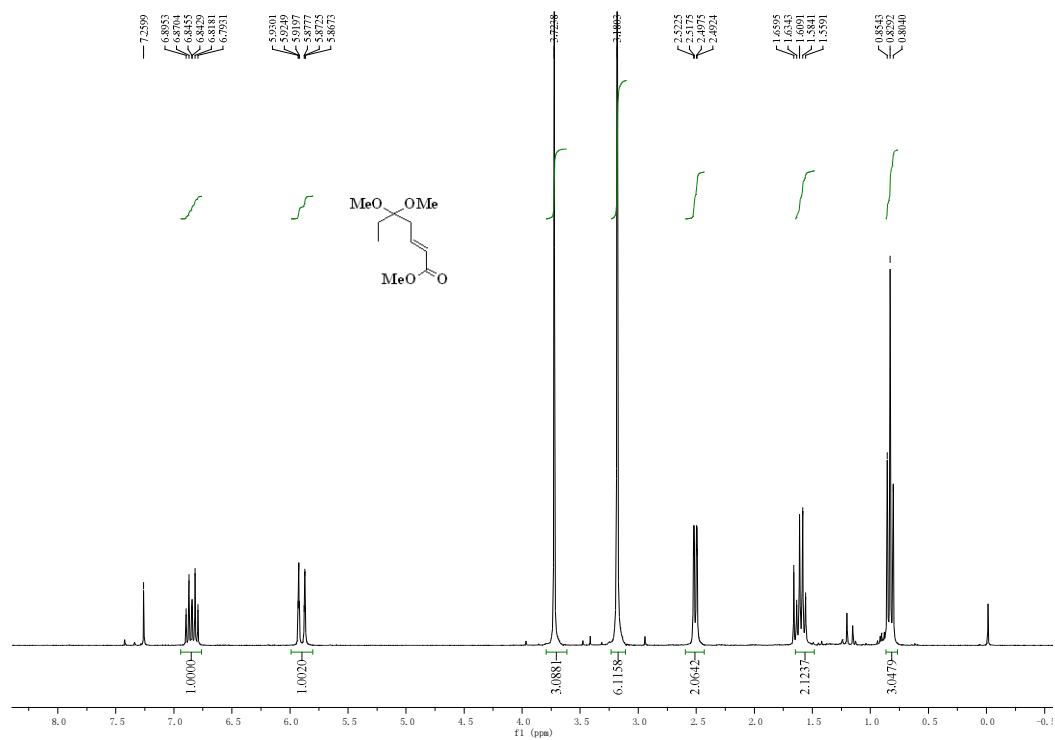
5,5-Dimethoxynonane-1,9-diyl diacetate (22a)



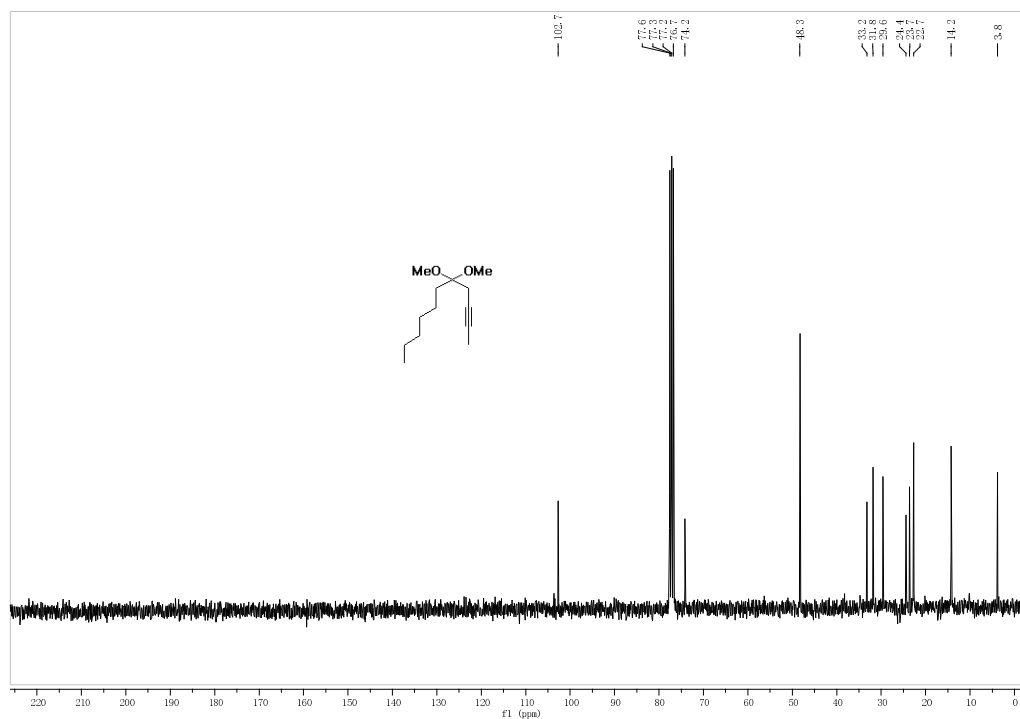
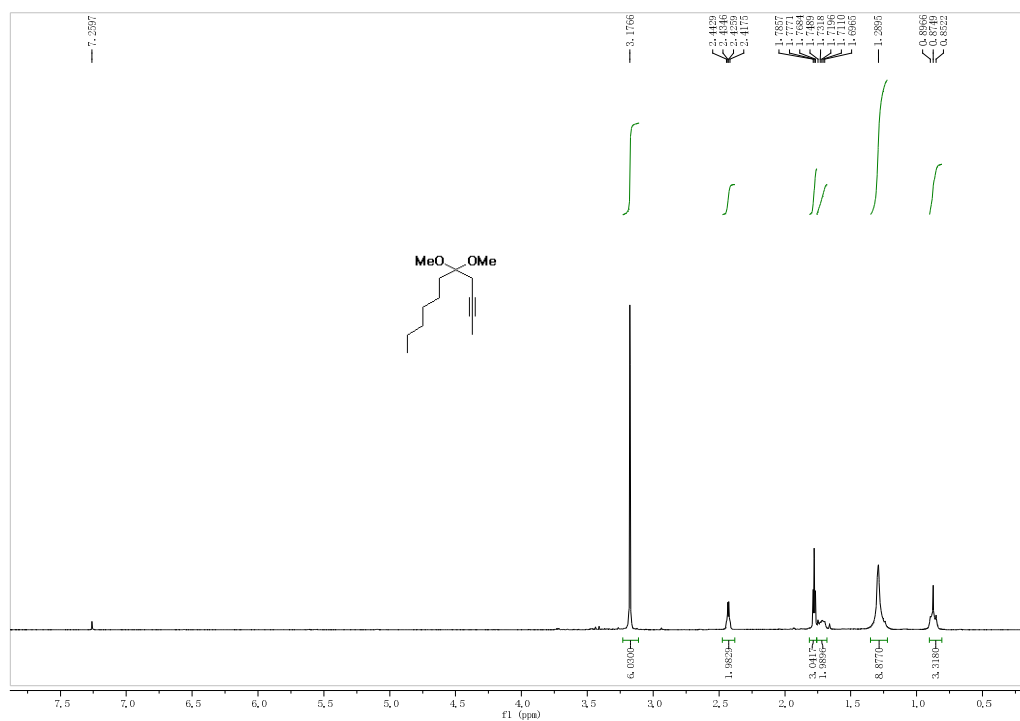
1-Phenyloctan-2-one (23b)



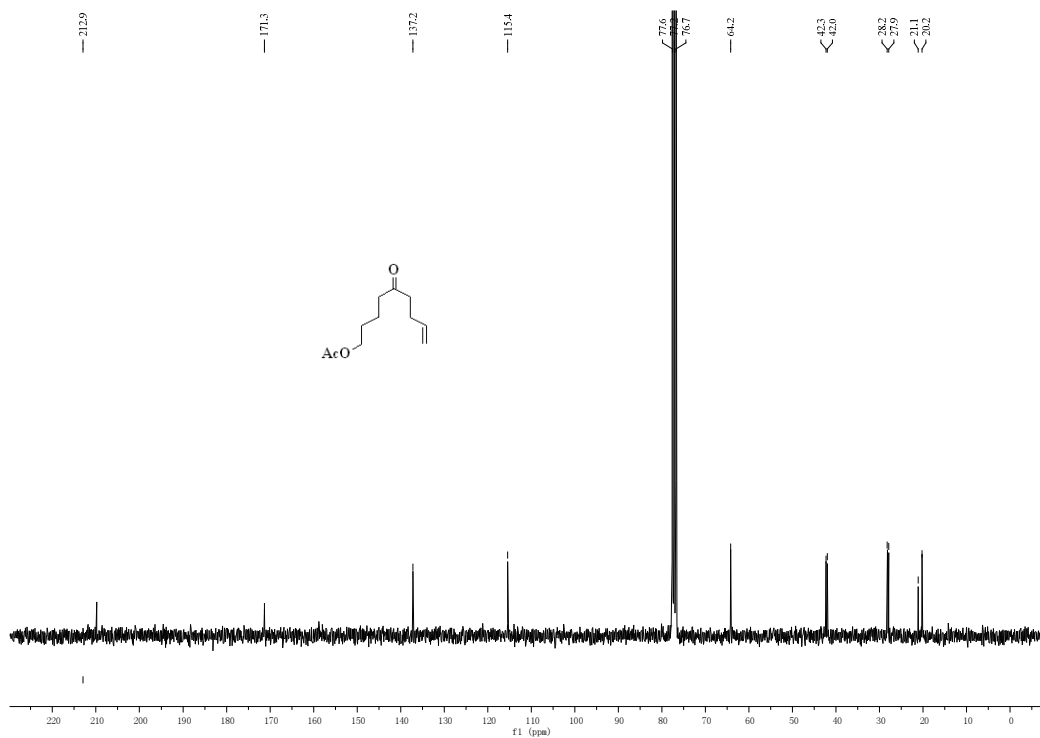
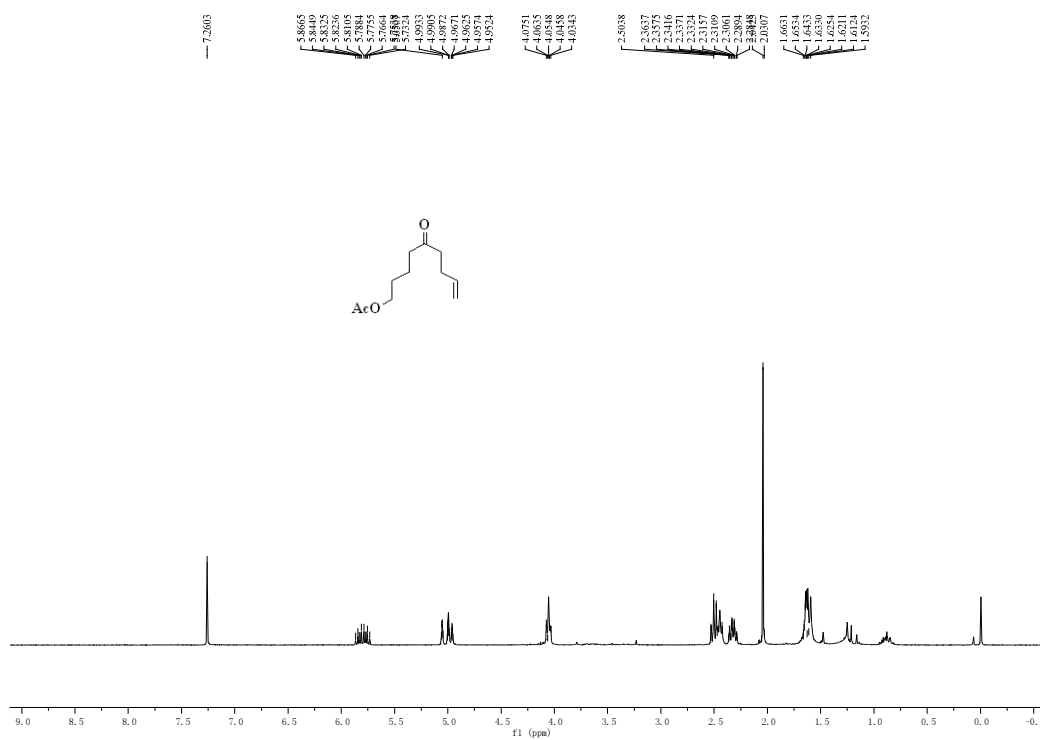
(E)-Methyl 5,5-dimethoxyhept-2-enoate (22c)



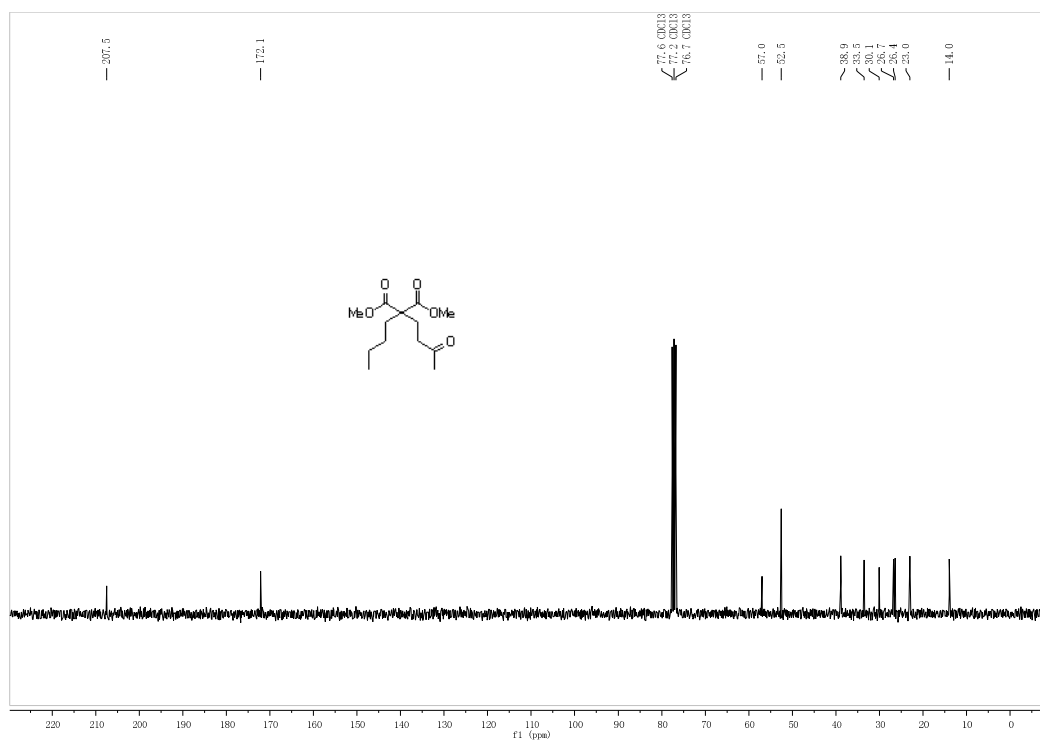
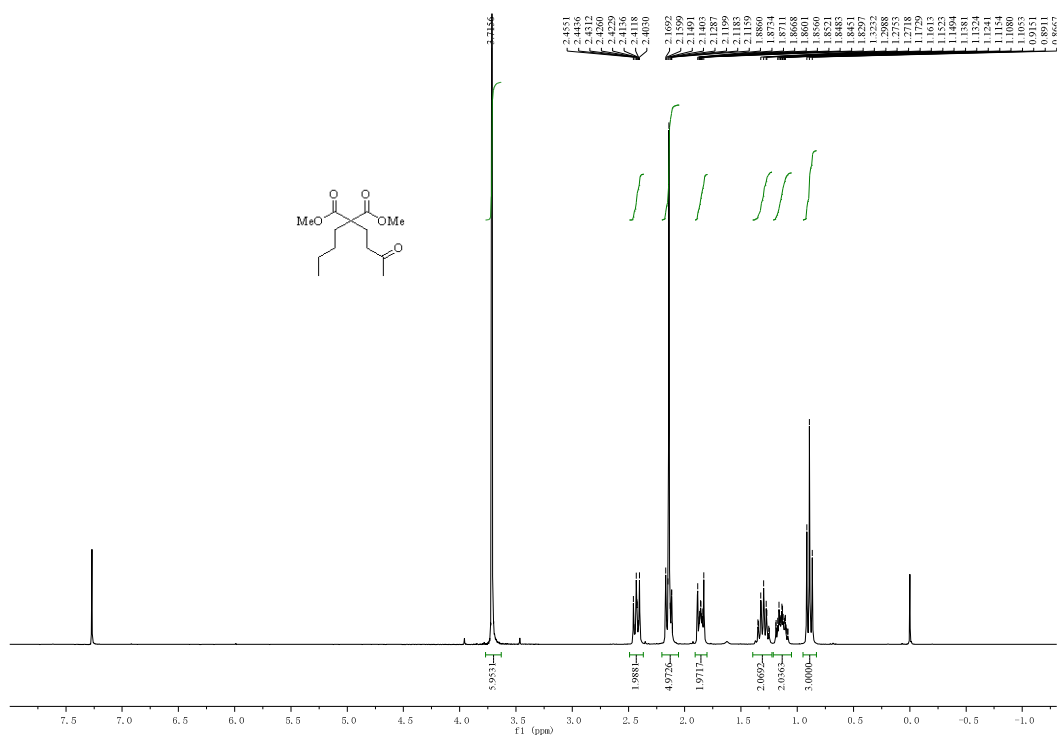
5,5-Dimethoxyundec-2-yne (22d)



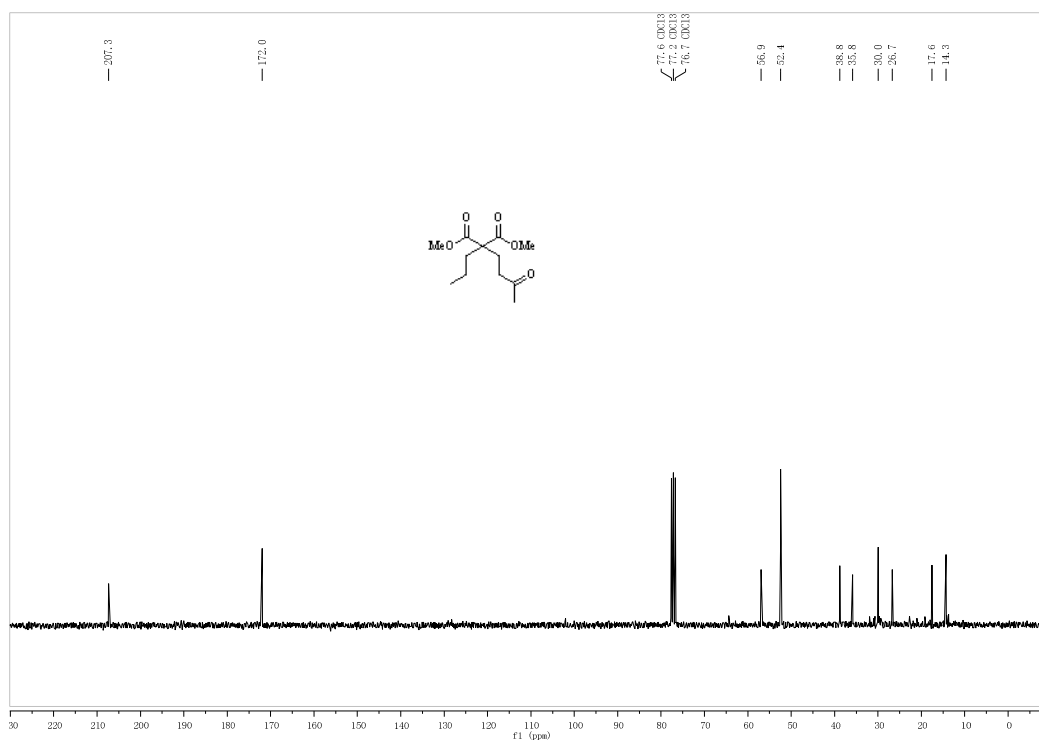
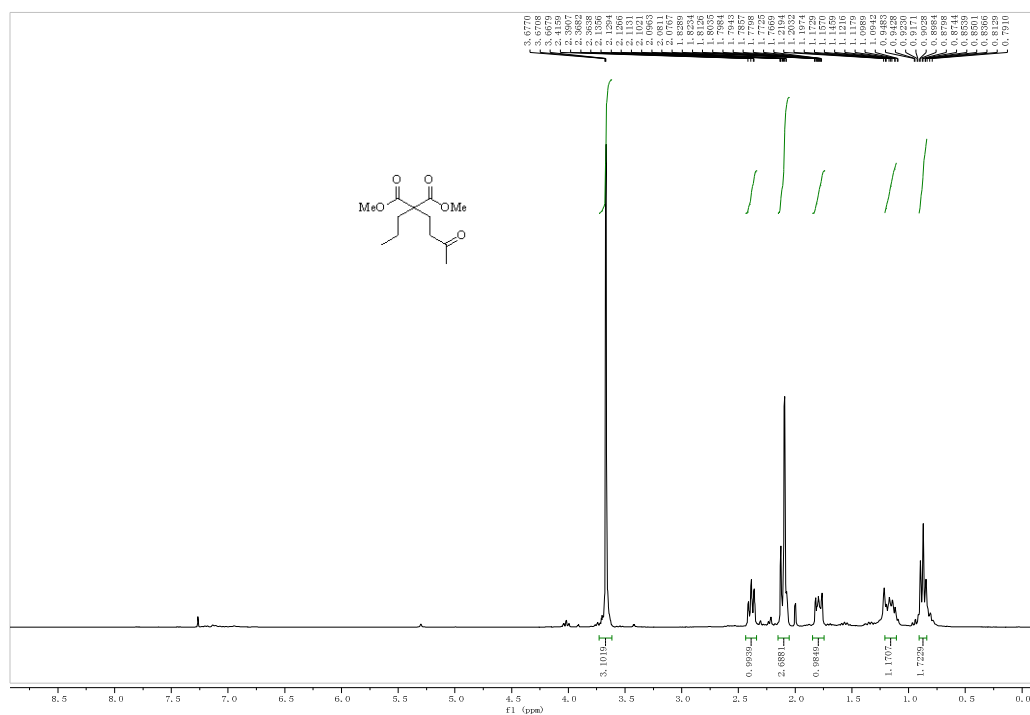
5-Oxonon-8-en-1-yl acetate (23e)



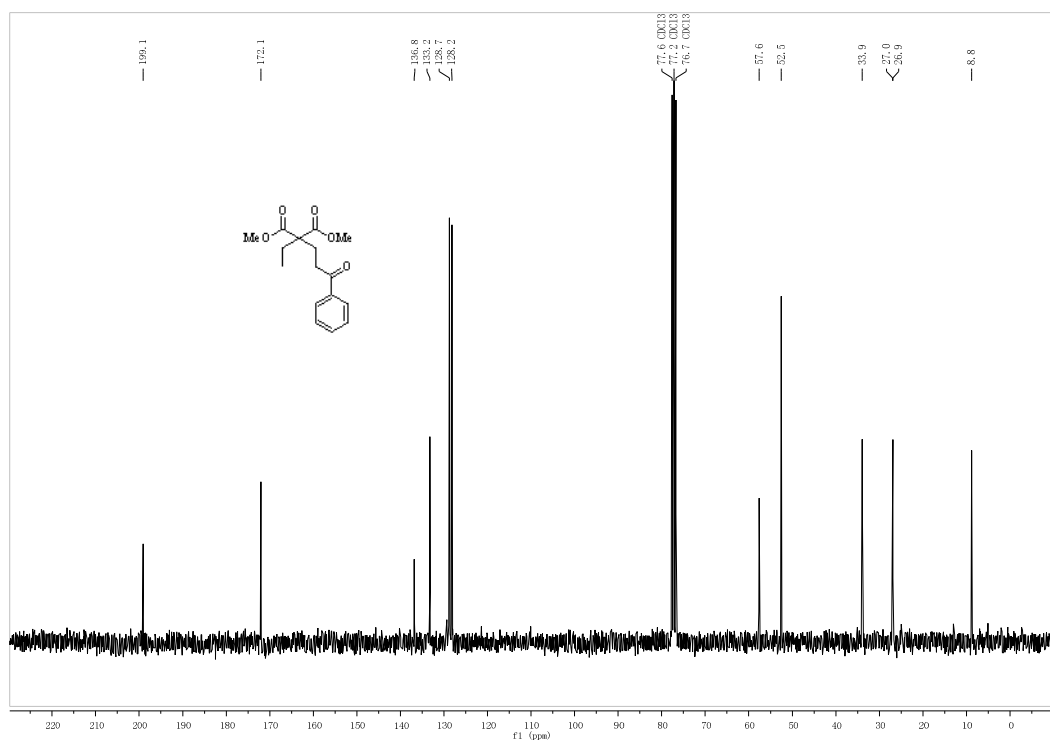
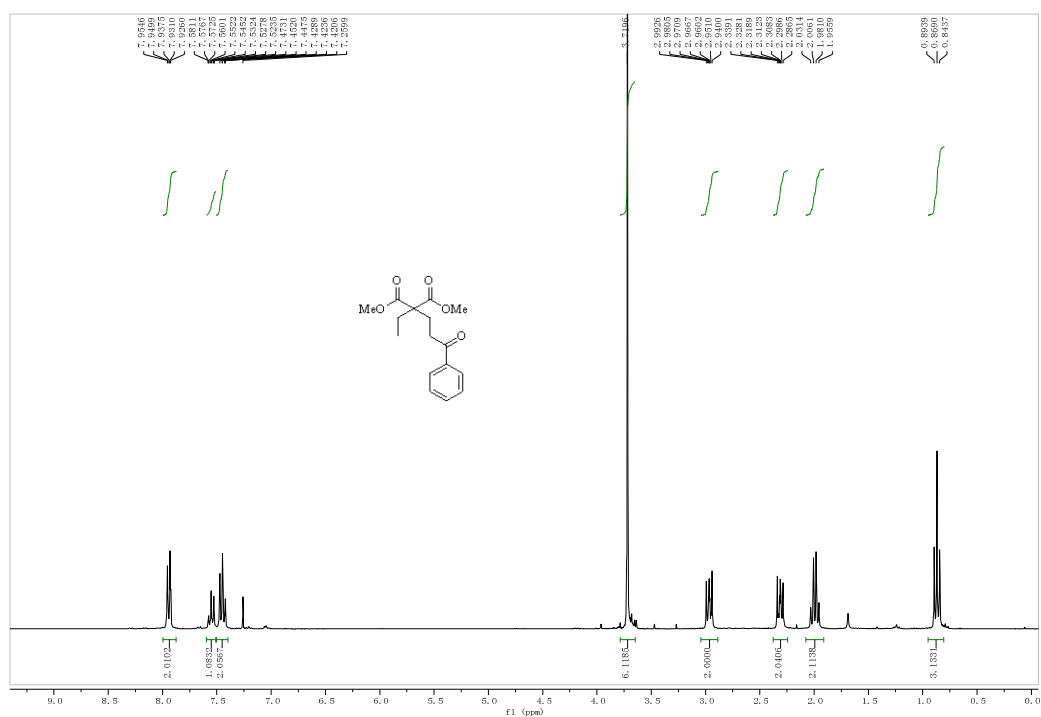
Dimethyl 2-butyl-2-(3-oxobutyl)malonate (Precursor for 24a)



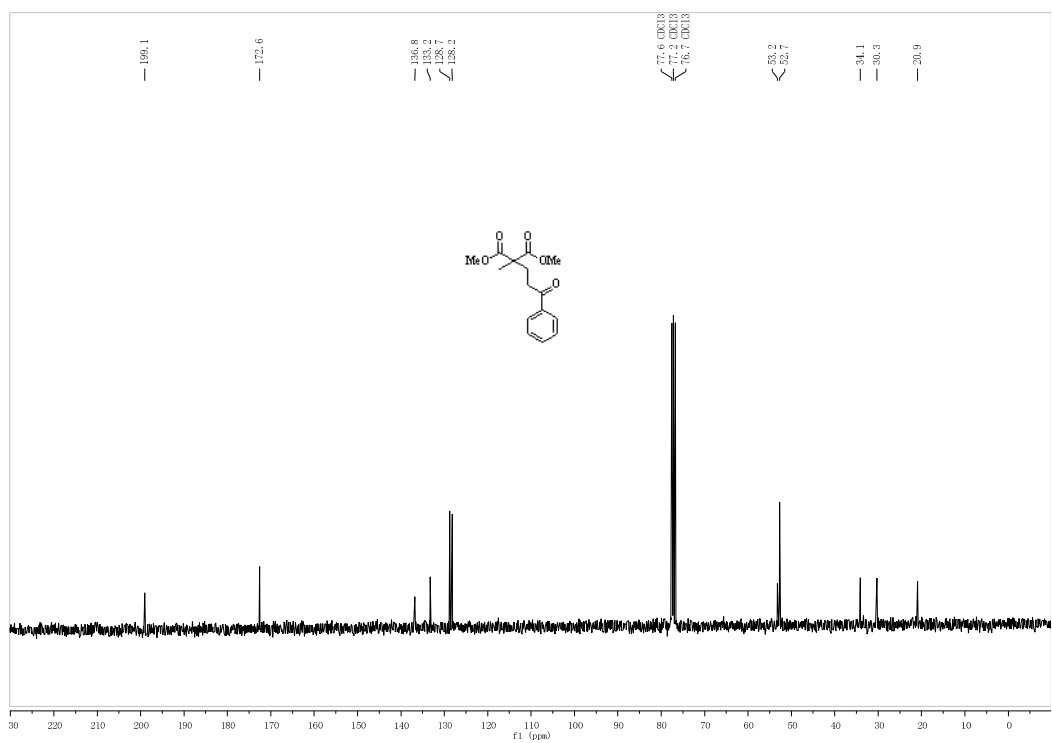
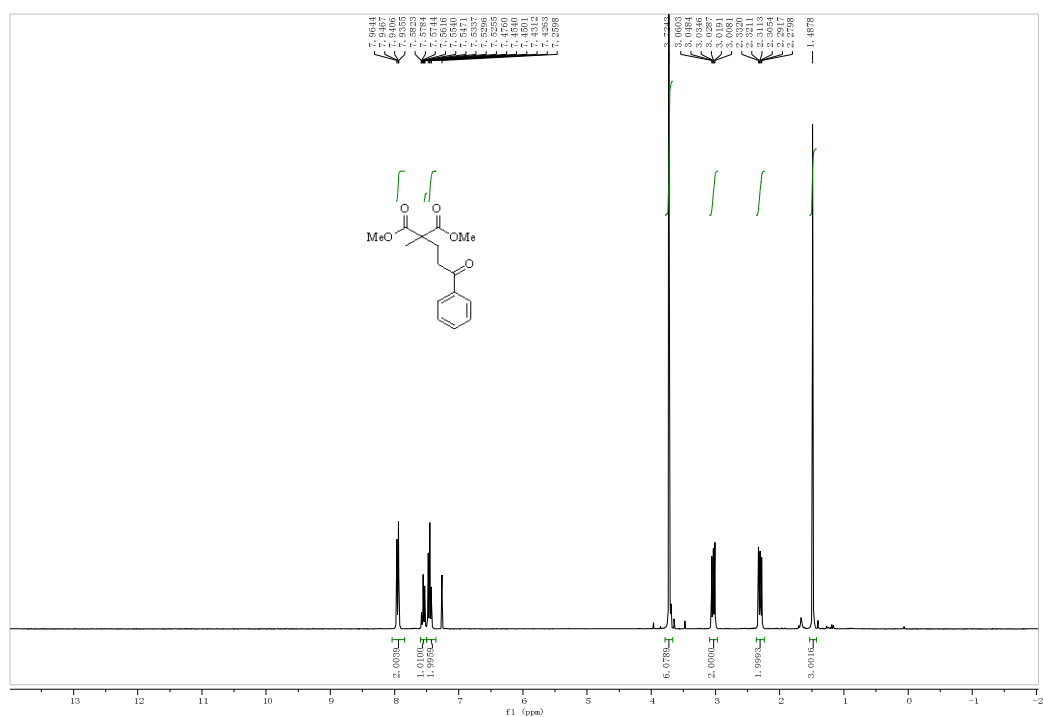
Dimethyl 2-(3-oxobutyl)-2-propylmalonate (Precursor for 24c)



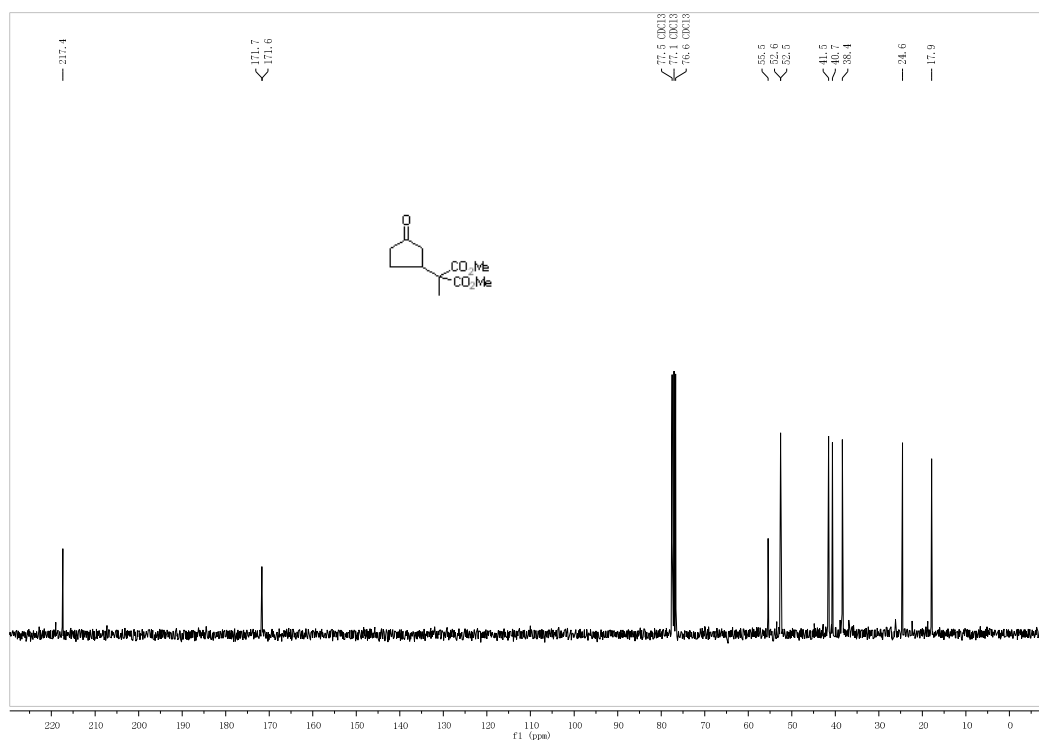
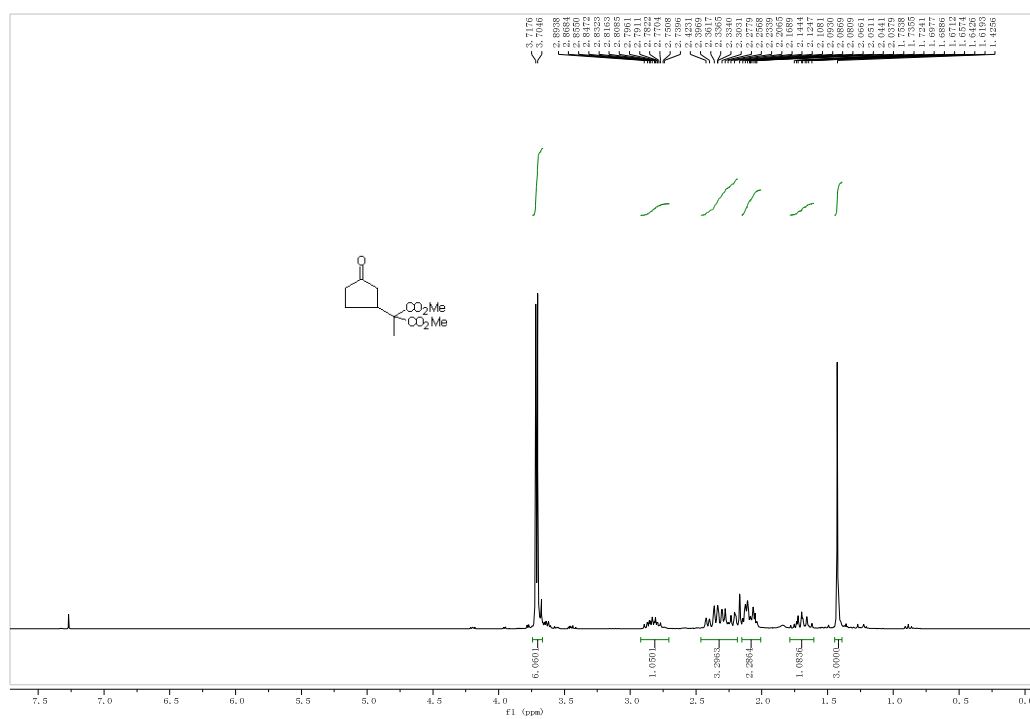
Dimethyl 2-ethyl-2-(3-oxo-3-phenylpropyl)malonate (Precursor for 24e)



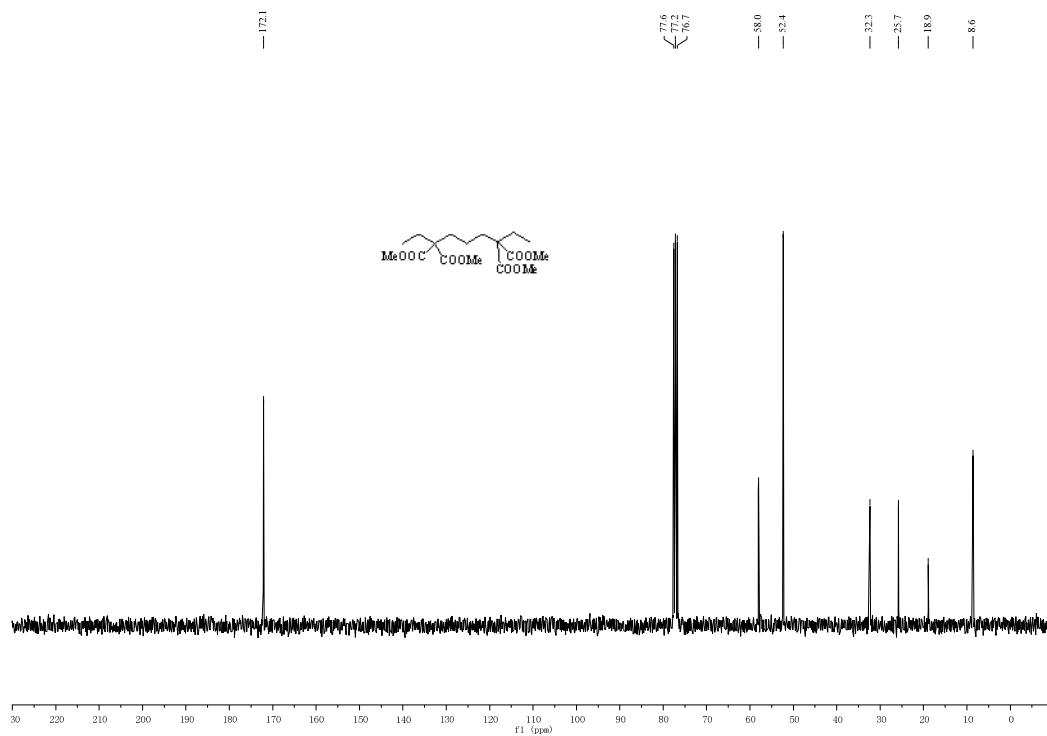
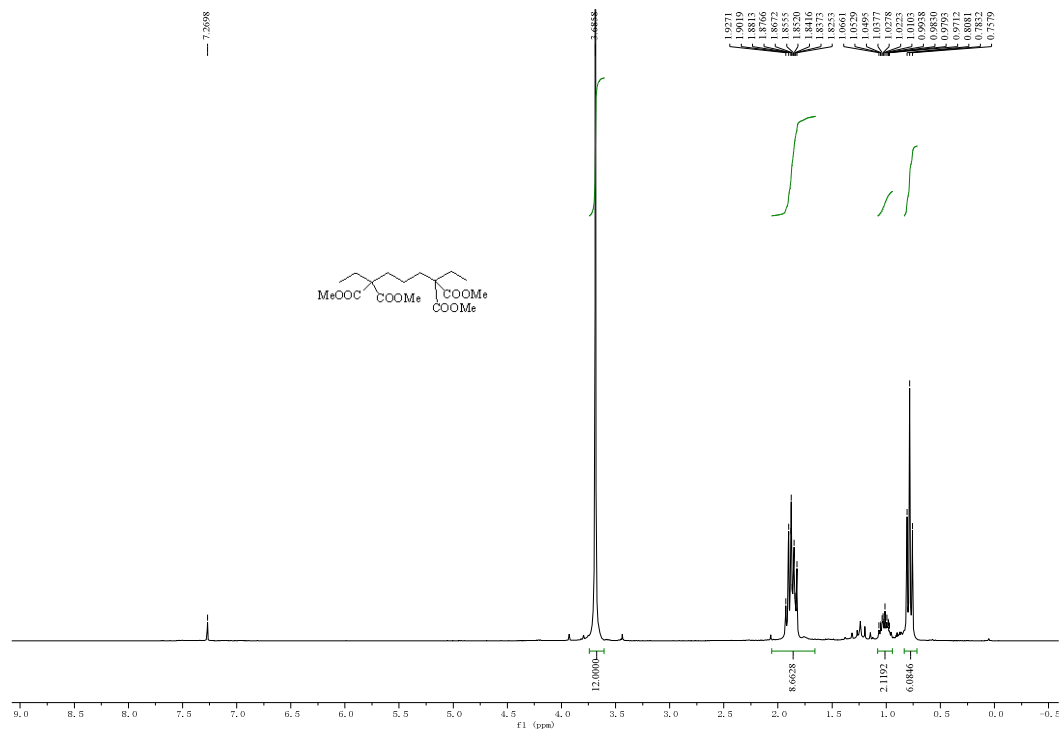
Dimethyl 2-methyl-2-(3-oxo-3-phenylpropyl)malonate (Precursor for 24f)



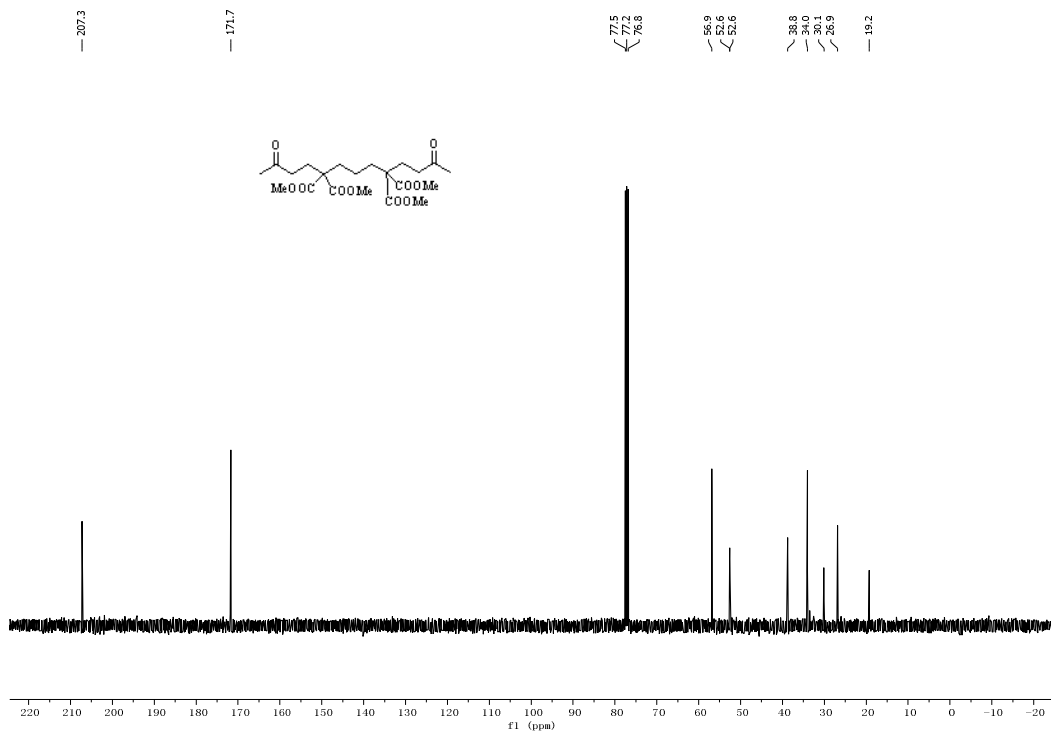
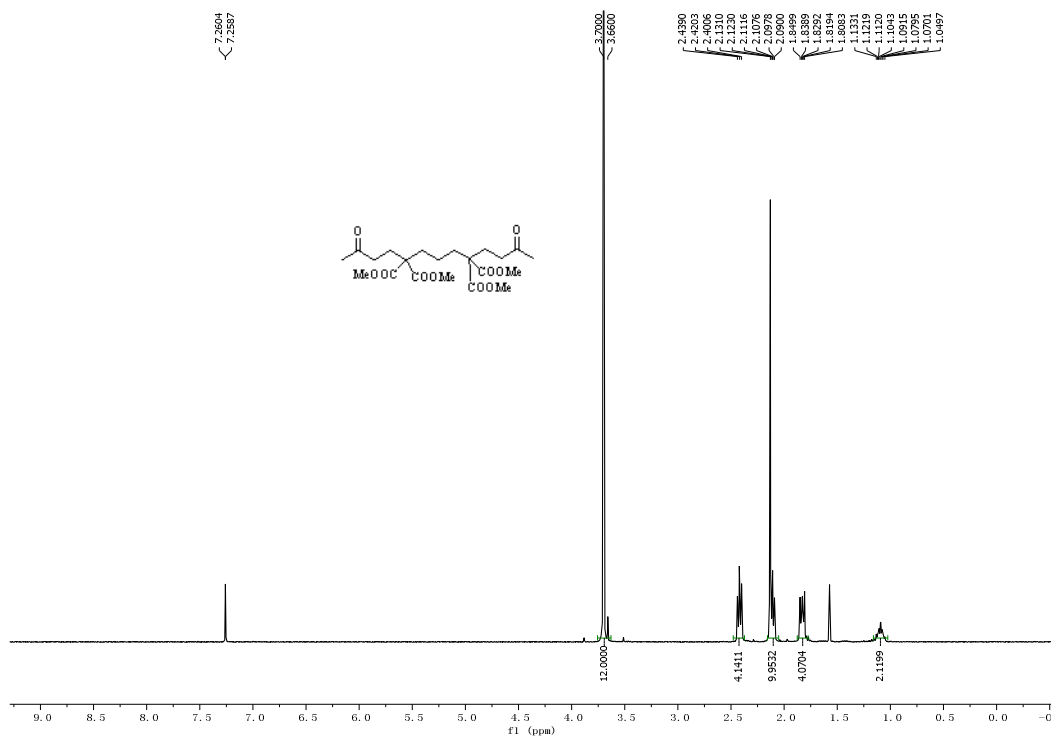
Dimethyl 2-methyl-2-(3-oxocyclopentyl)malonate (Precursor for 24h)



Tetramethyl nonane-3,3,7,7-tetracarboxylate (S1)

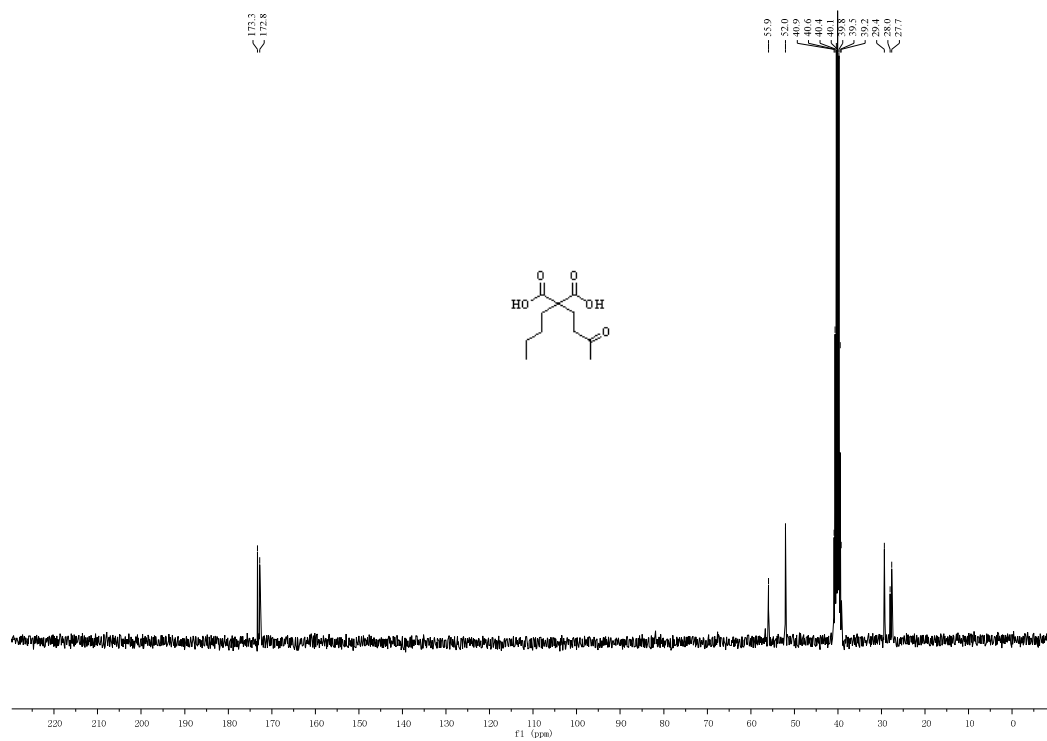
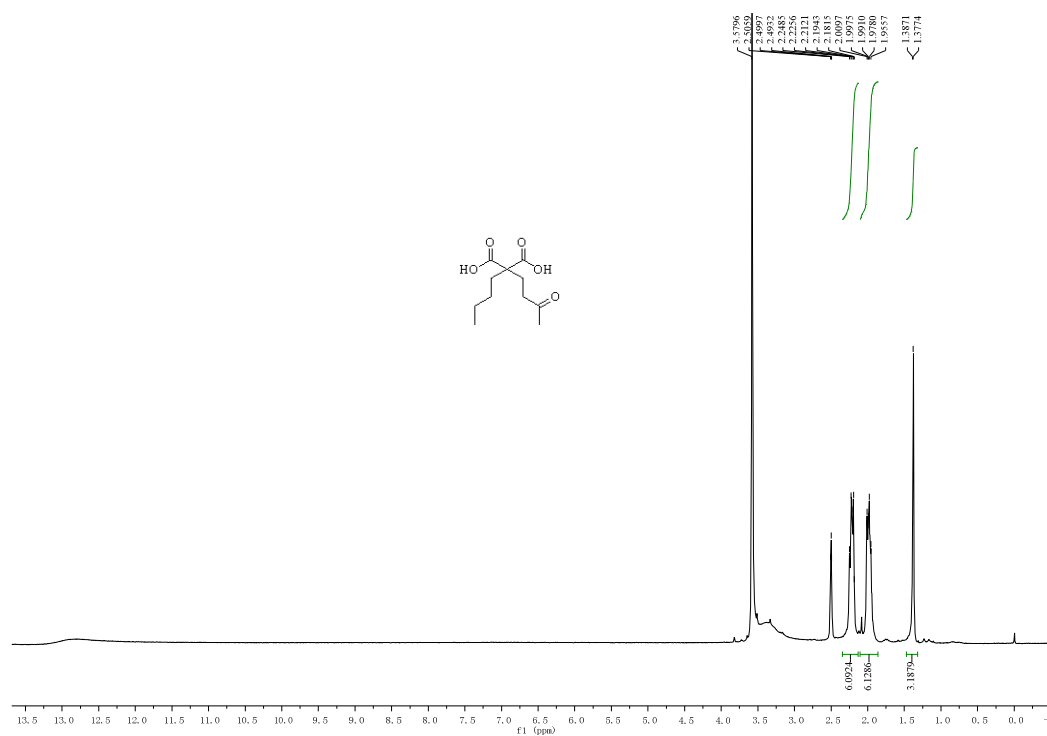


Tetramethyl 2,12-dioxotridecane-5,5,9,9-tetracarboxylate (S2)

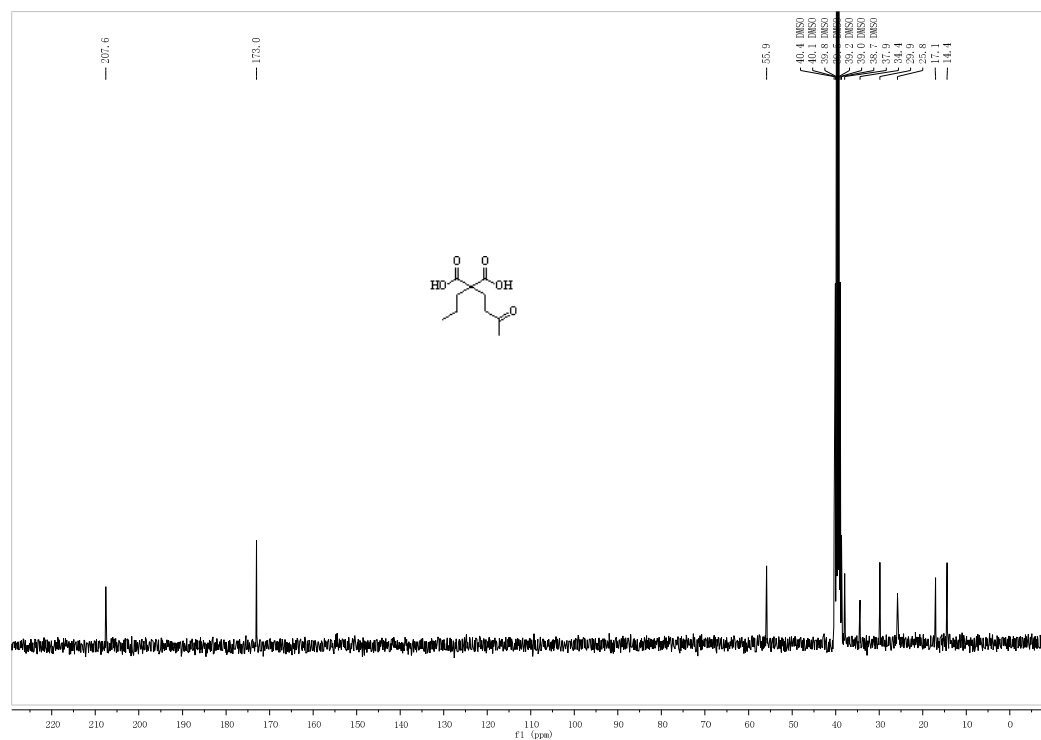
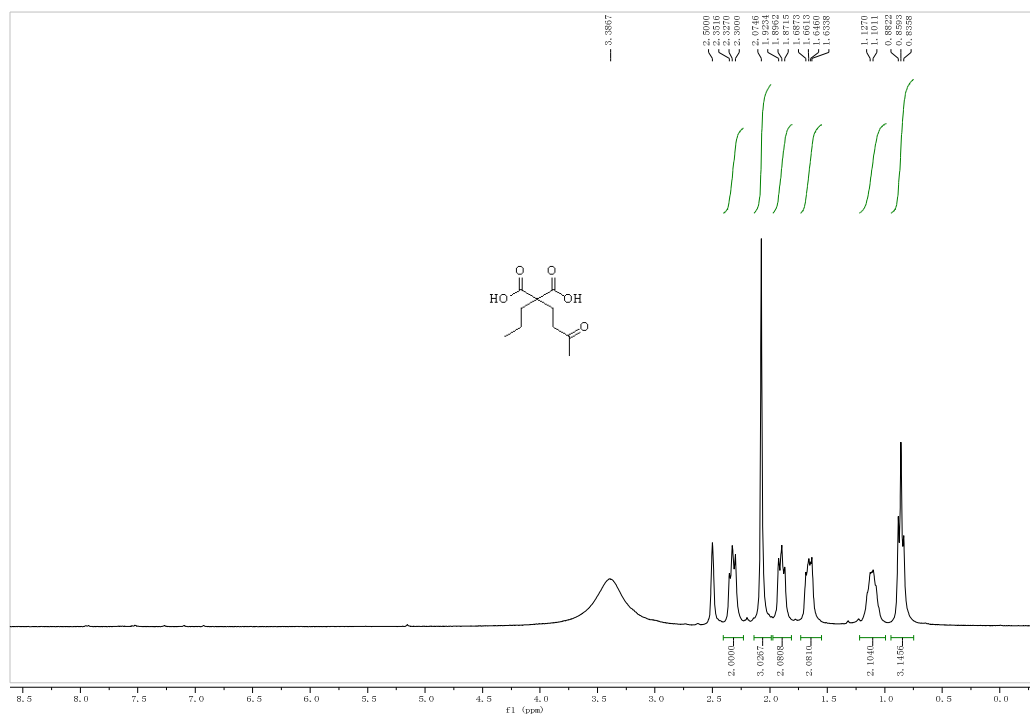


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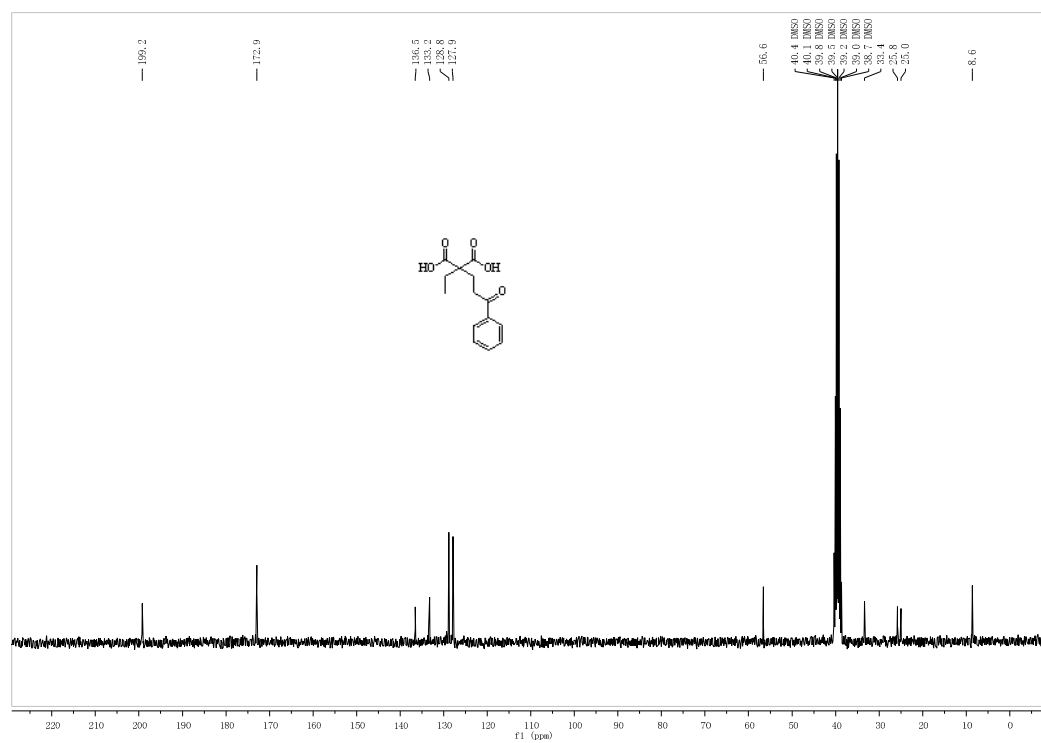
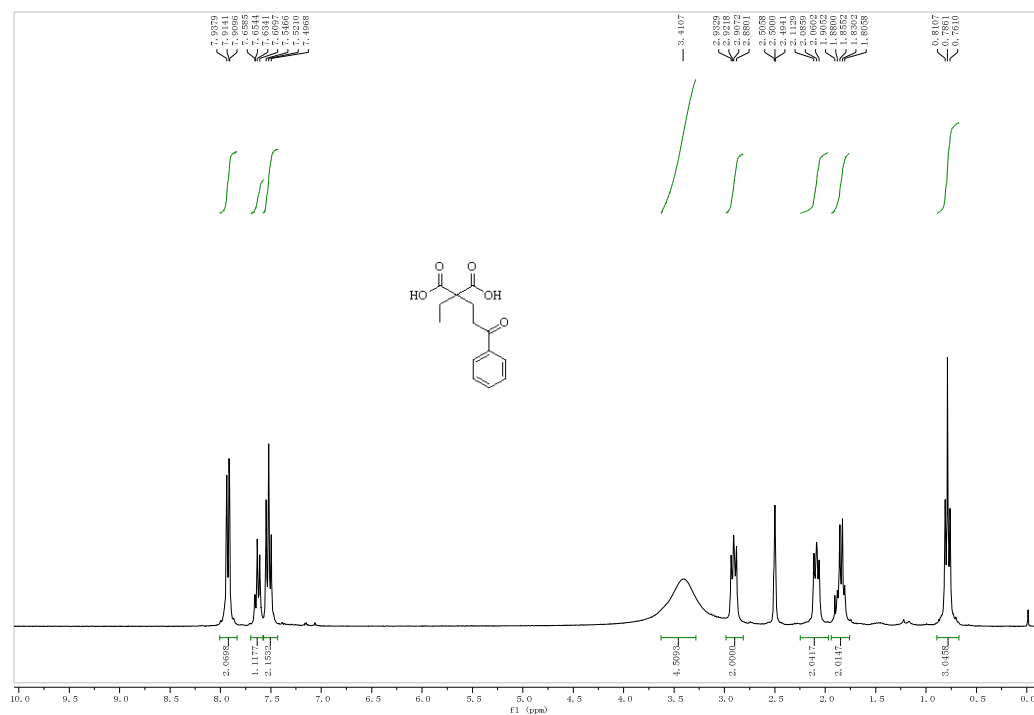
2-Butyl-2-(3-oxobutyl)malonic acid (24a)



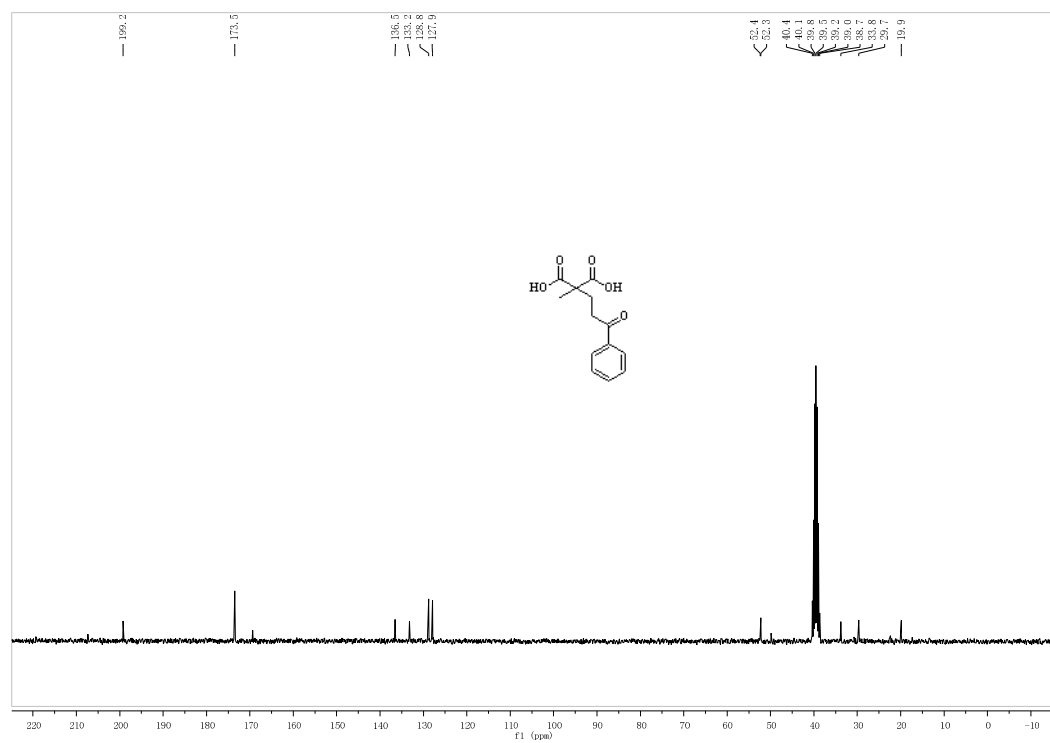
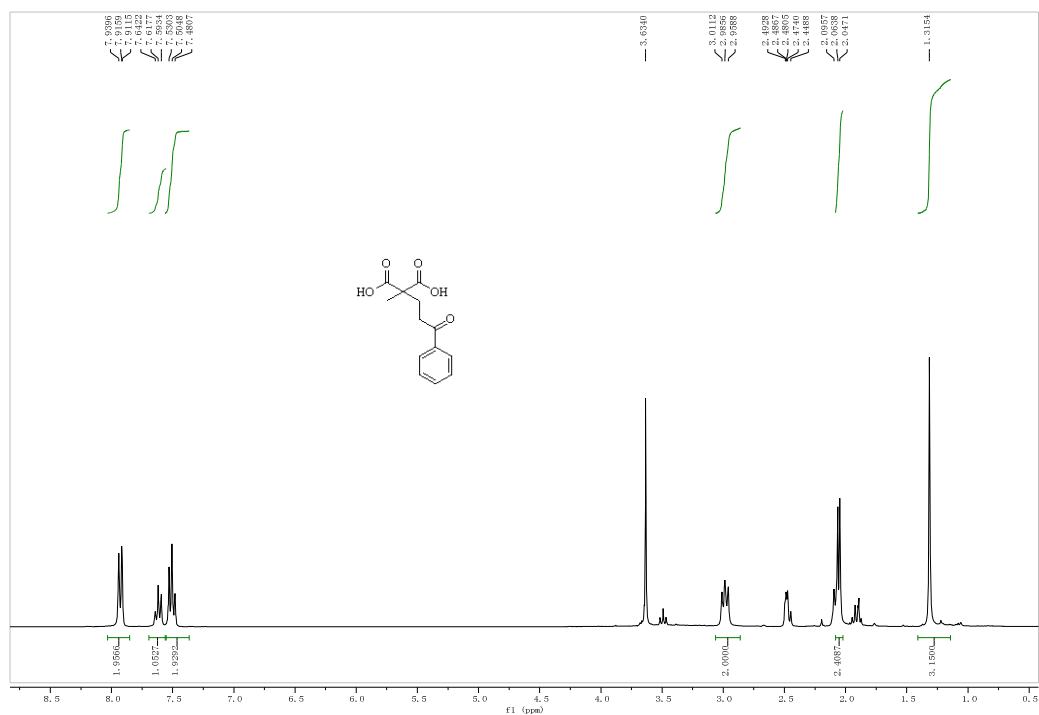
2-(3-Oxobutyl)-2-propylmalonic acid (24c)



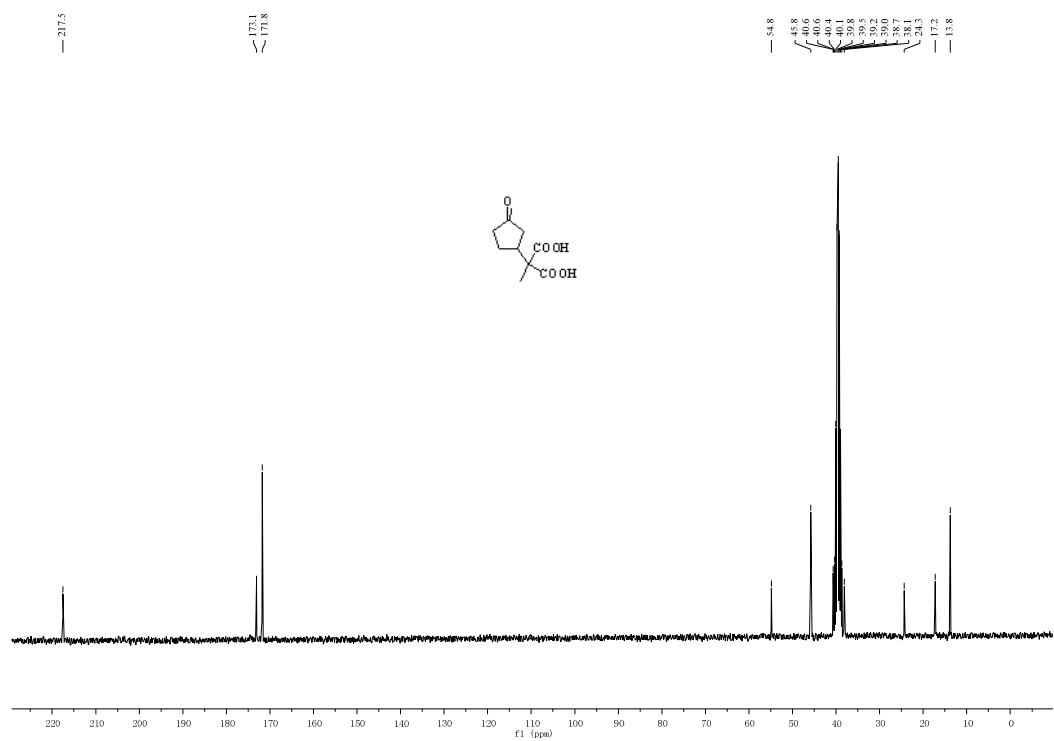
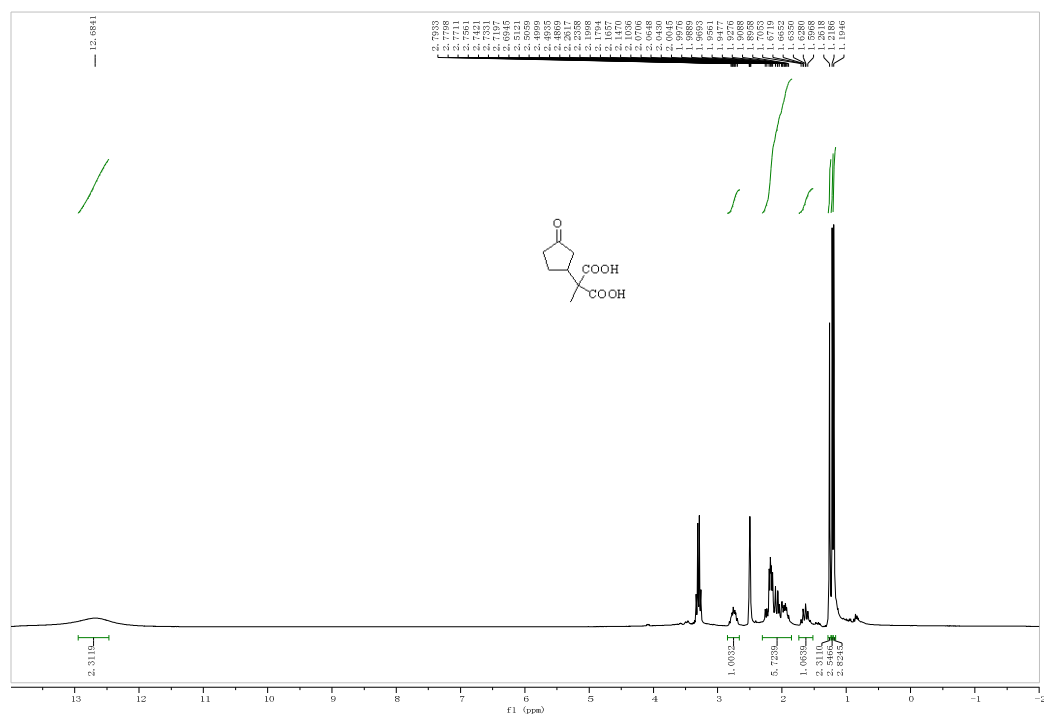
2-Ethyl-2-(3-oxo-3-phenylpropyl)malonic acid (24e)



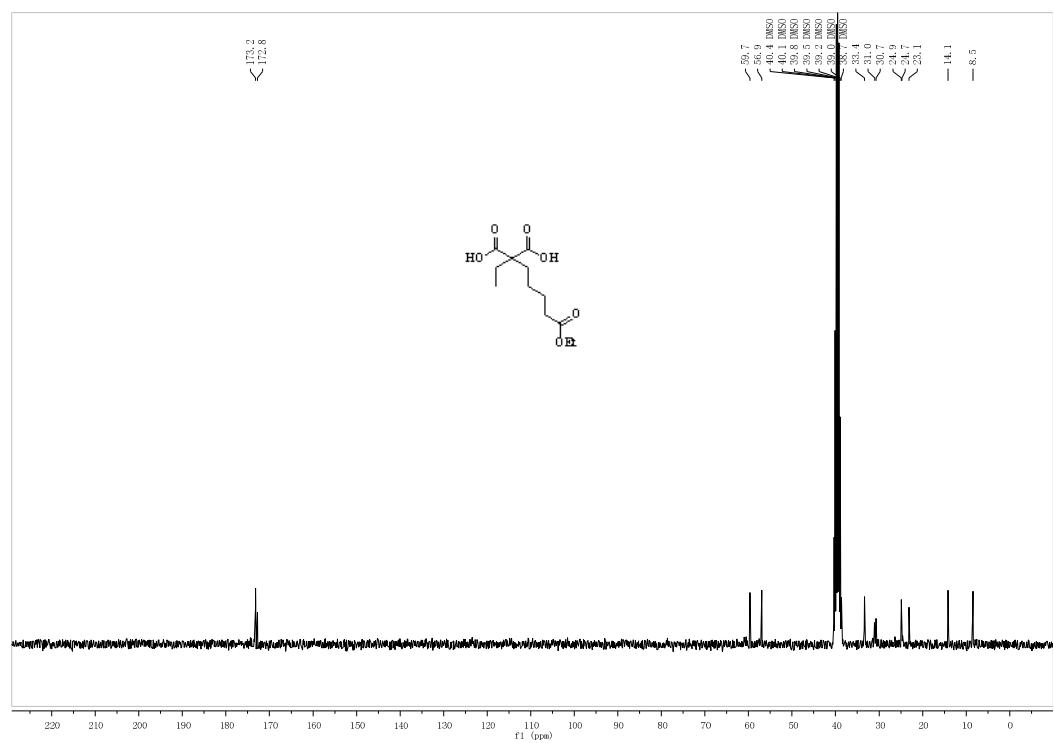
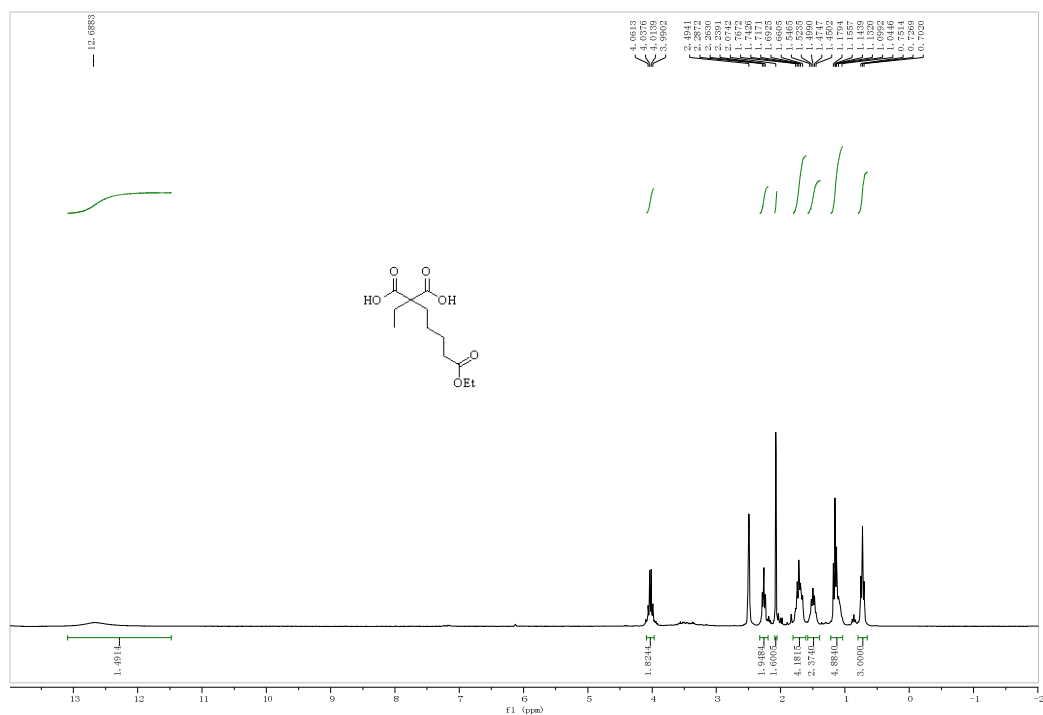
2-Methyl-2-(3-oxo-3-phenylpropyl)malonic acid (24f)



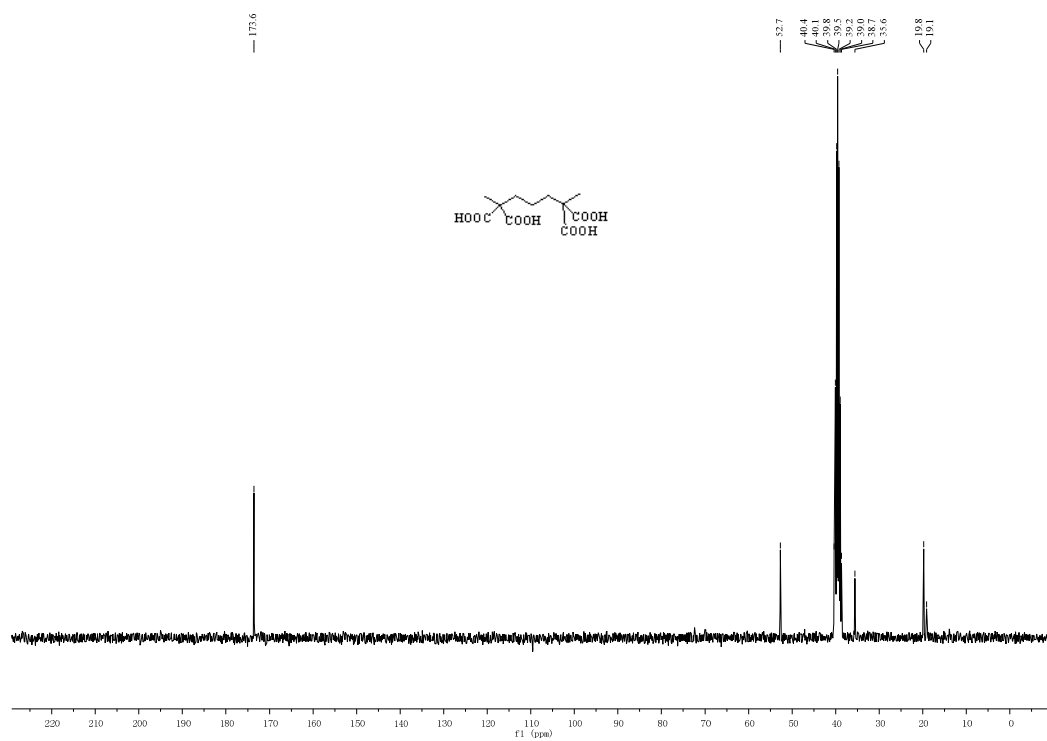
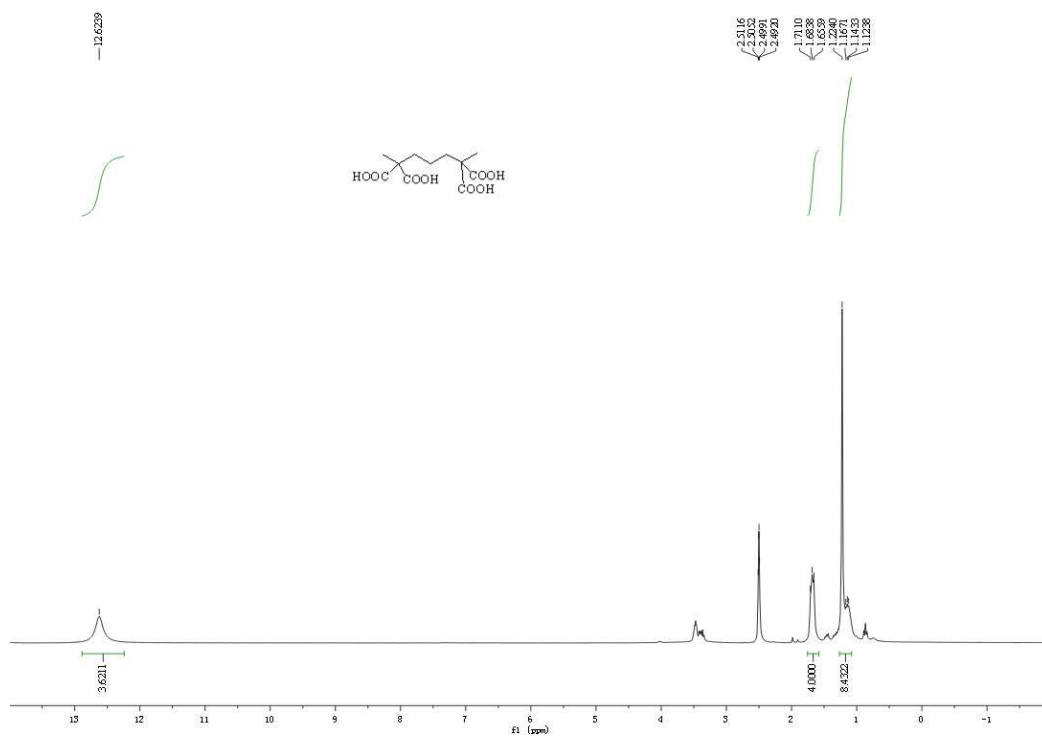
2-Methyl-2-(3-oxocyclopentyl)malonic acid (24h)



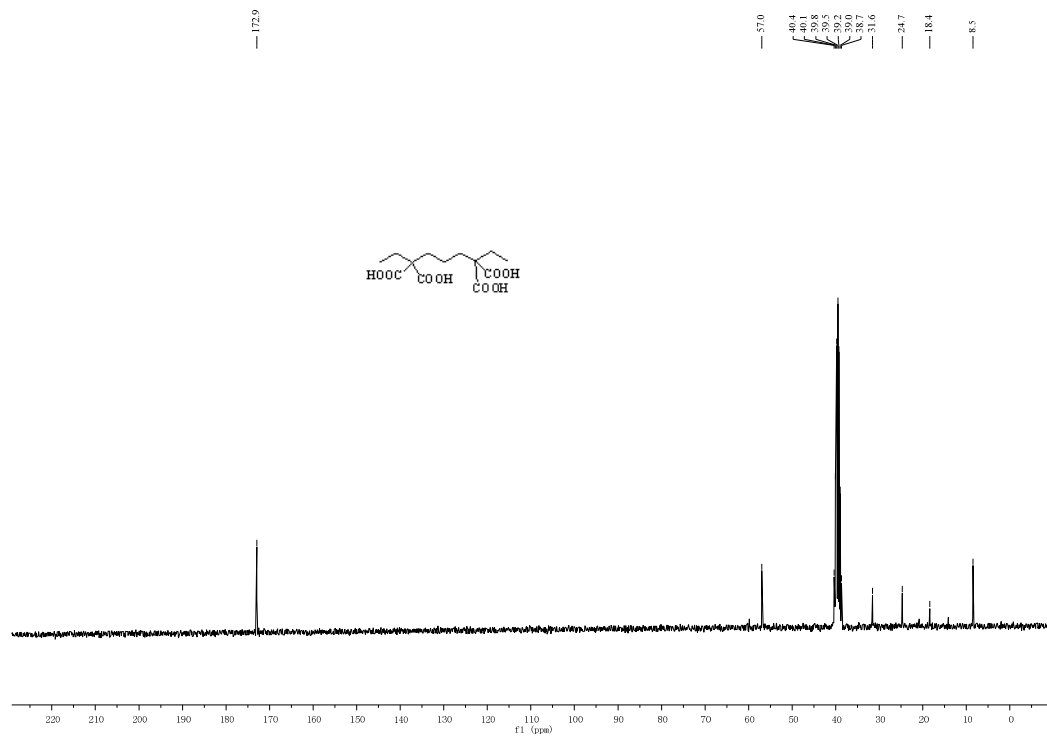
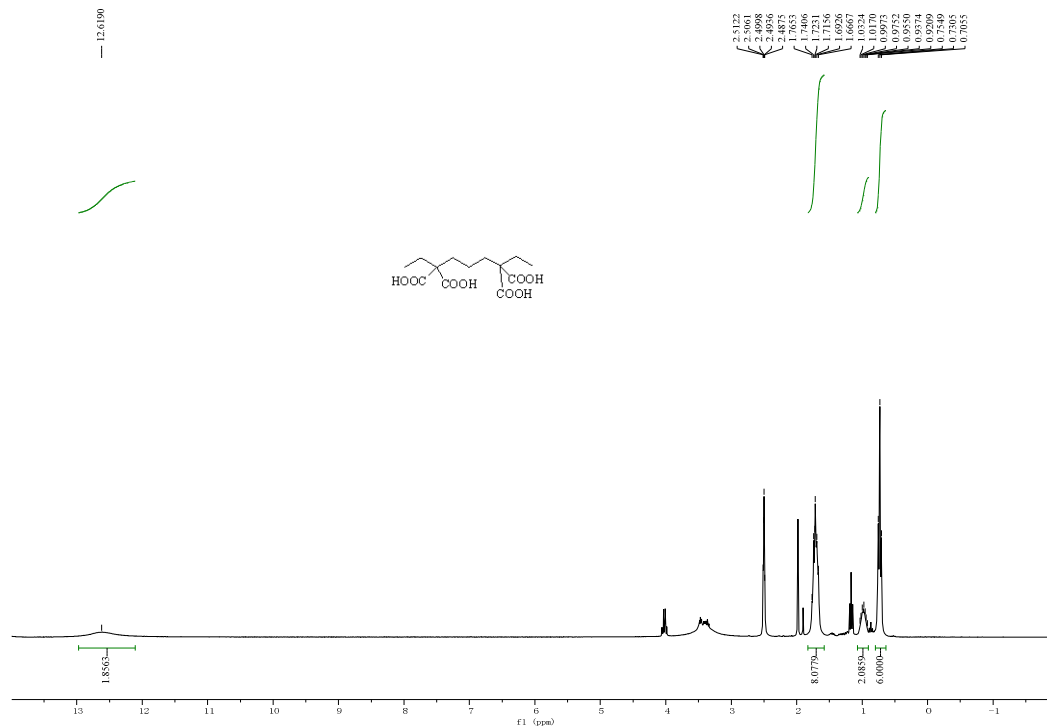
2-(5-Ethoxy-5-oxopentyl)-2-ethylmalonic acid (24j)



2,13-Dioxotetradecane-5,5,10,10-tetracarboxylic acid (27a)



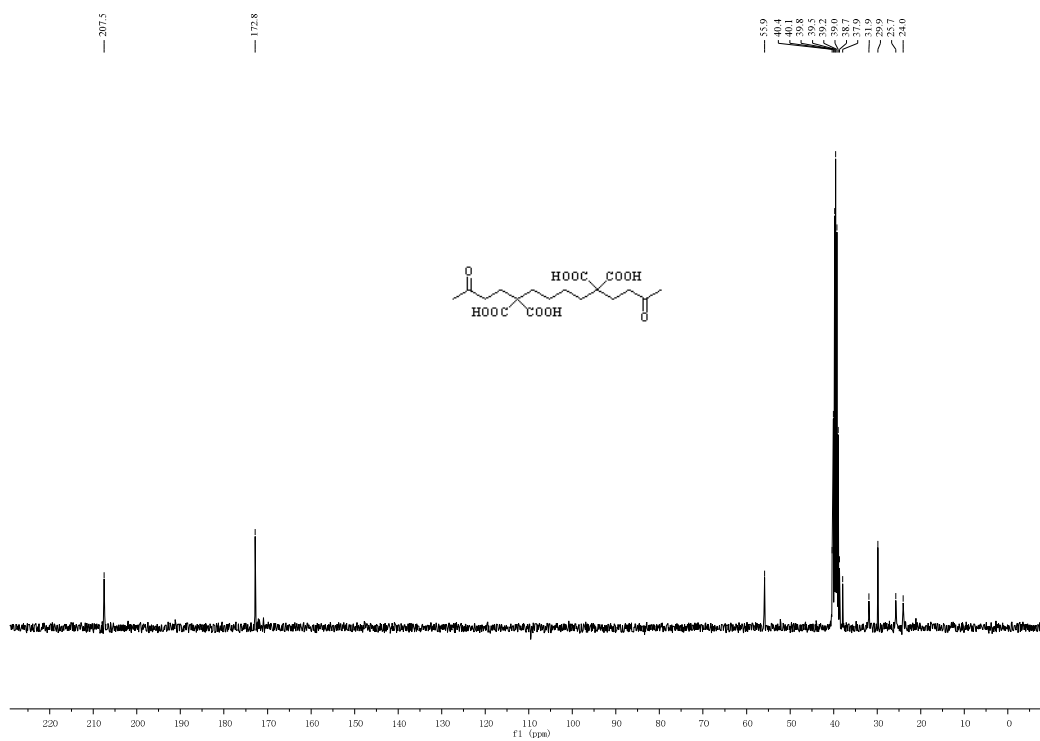
2,13-dioxotetradecane-5,5,10,10-tetracarboxylic acid (27b)



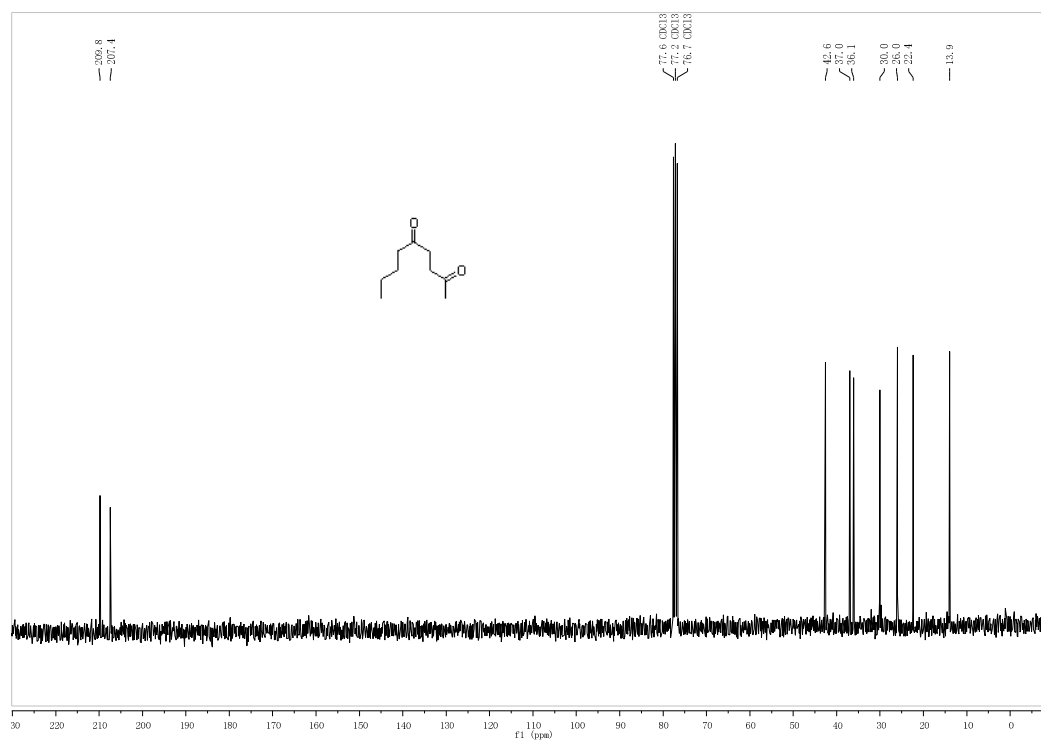
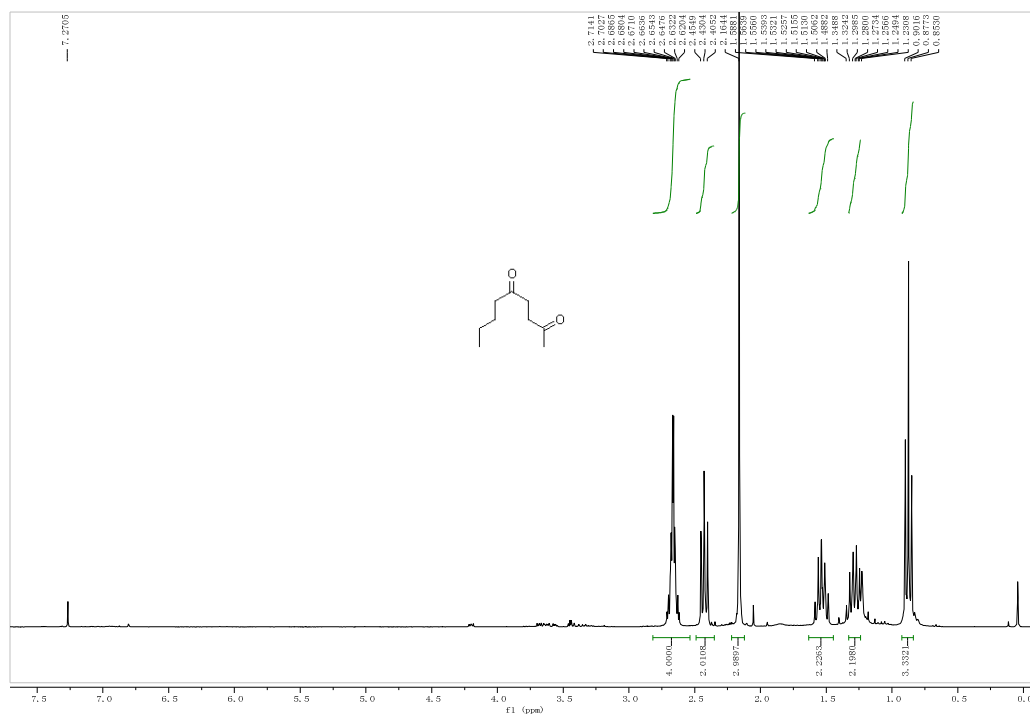
Chemical structure of 2,2,4,4-tetraoxo-2,4,6,8-octanedioic acid (fumaric acid derivative) is shown above the spectrum.

¹H NMR spectrum (ppm) with integration values:

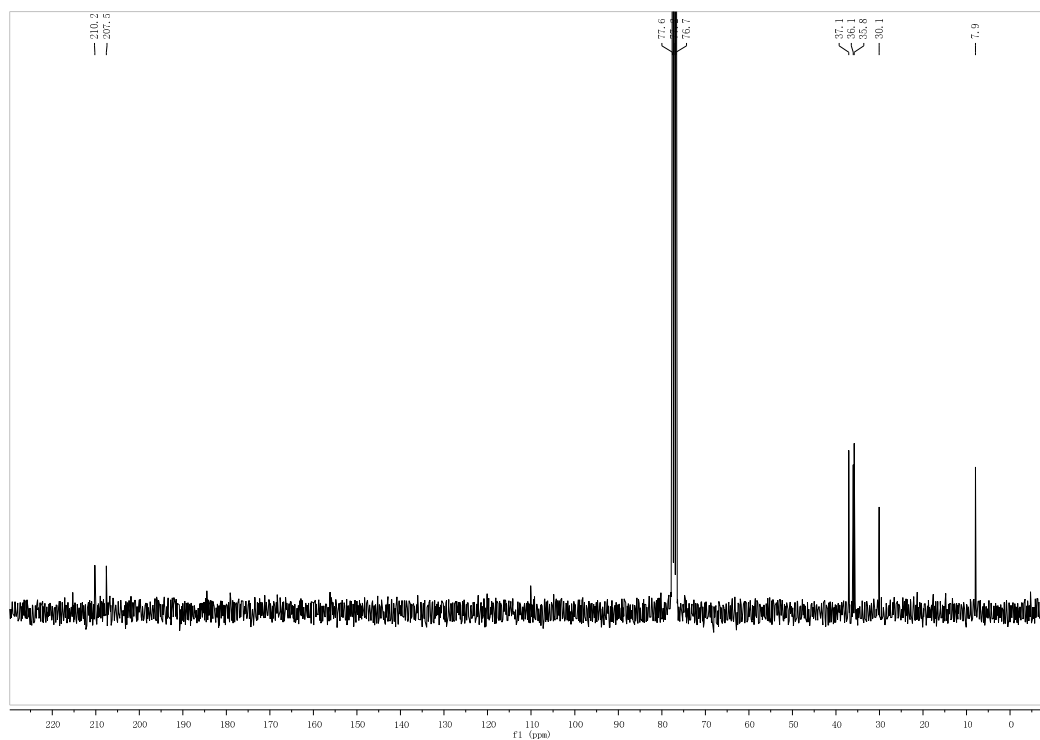
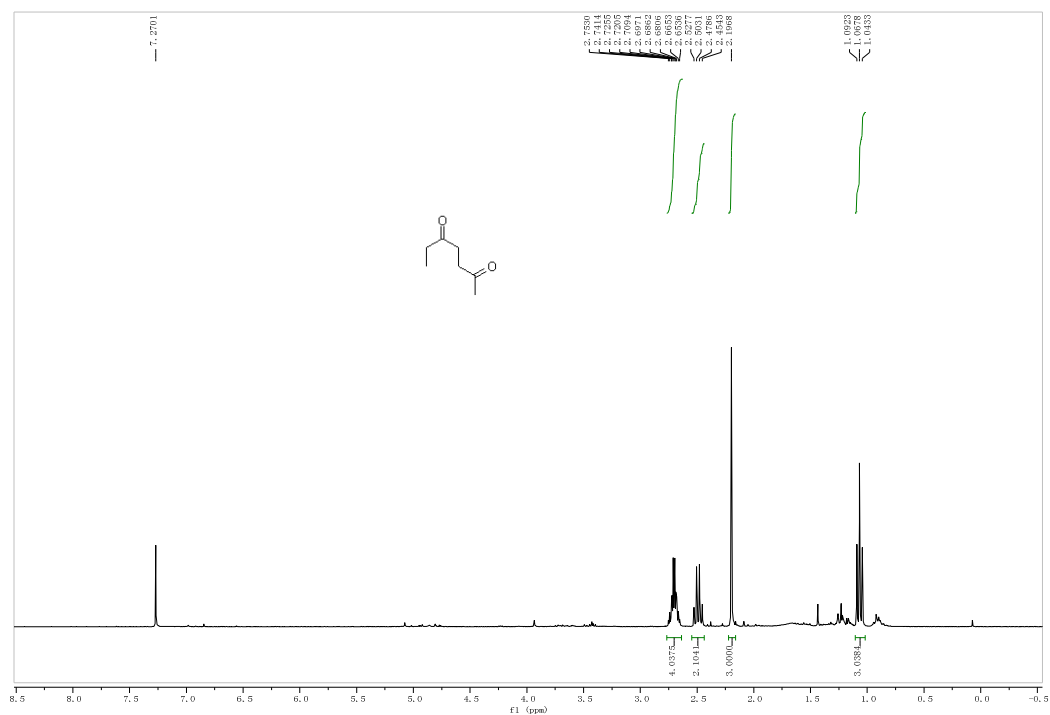
Chemical Shift (ppm)	Integration
1.0877	4.3944
1.6915	4.1937
1.8907	4.1165
1.9122	6.4105
2.0222	4.0906
2.0682	
2.3533	
2.3533	
2.4496	
2.4496	
2.4893	
2.4893	
3.4109	
3.4109	



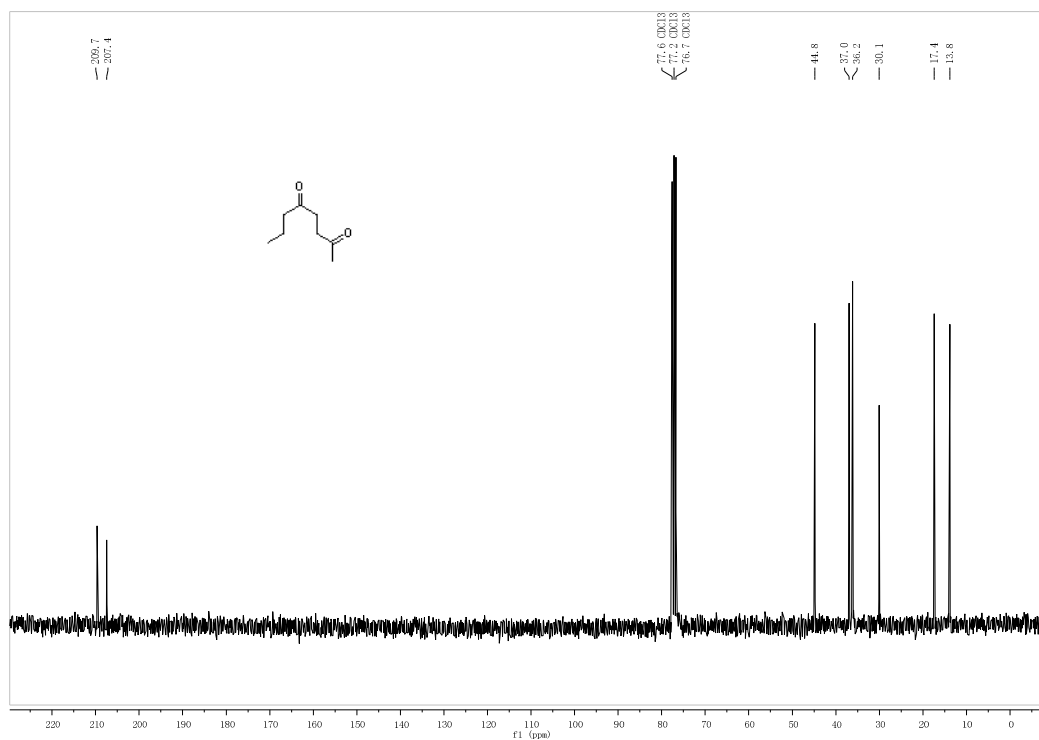
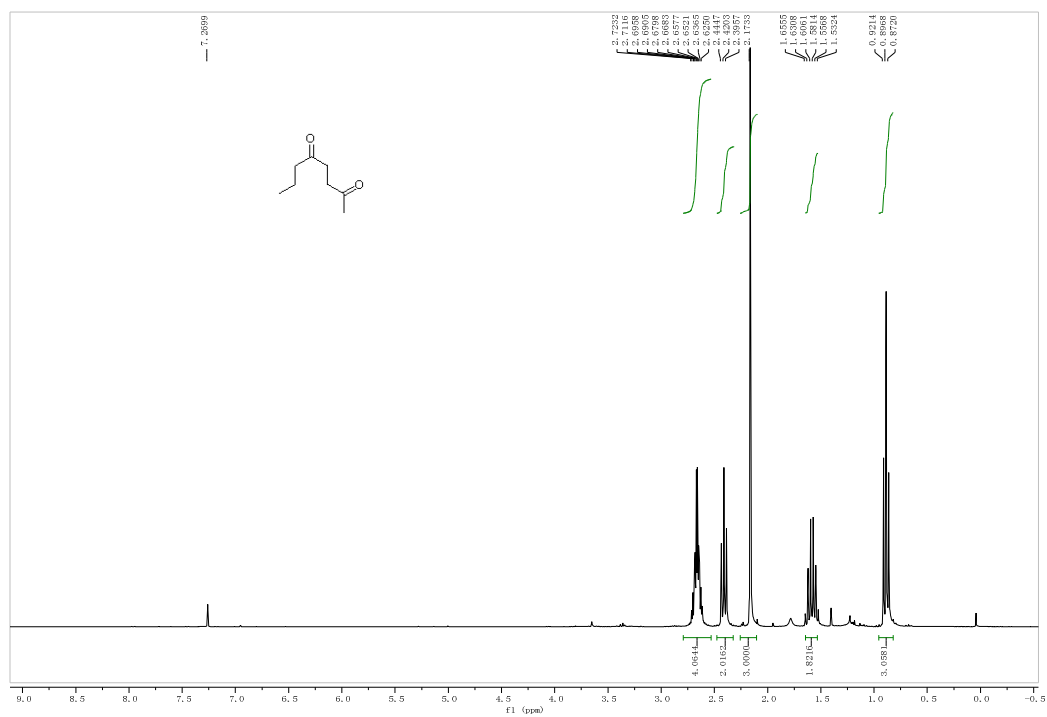
Nonane-2,5-dione (26a)



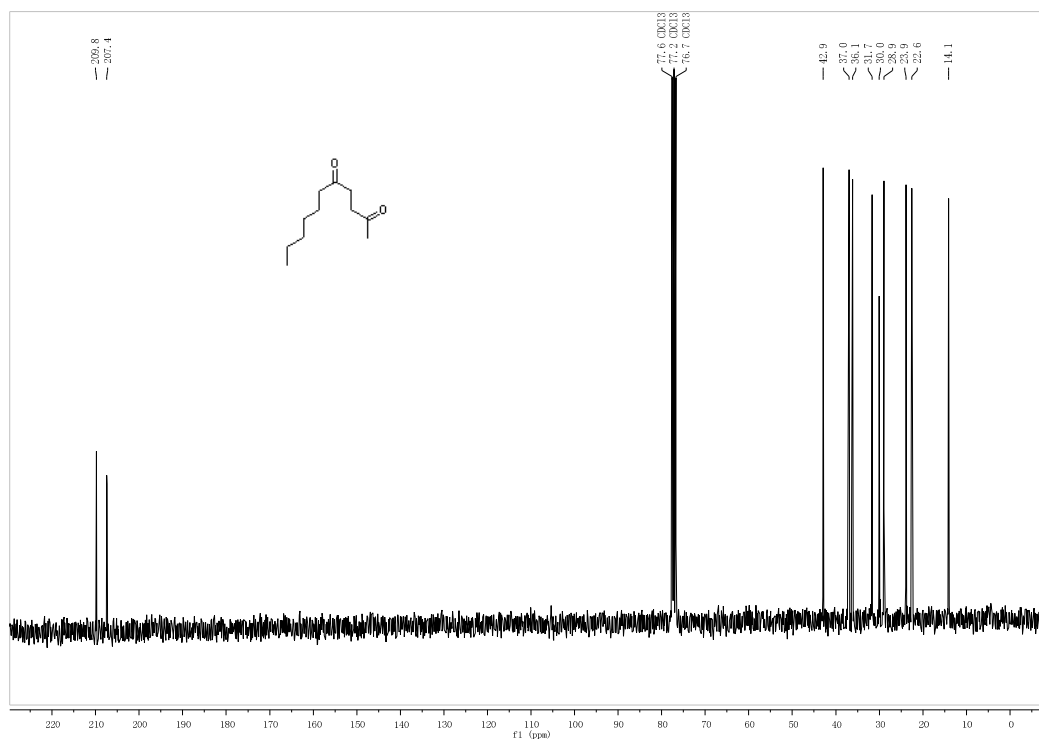
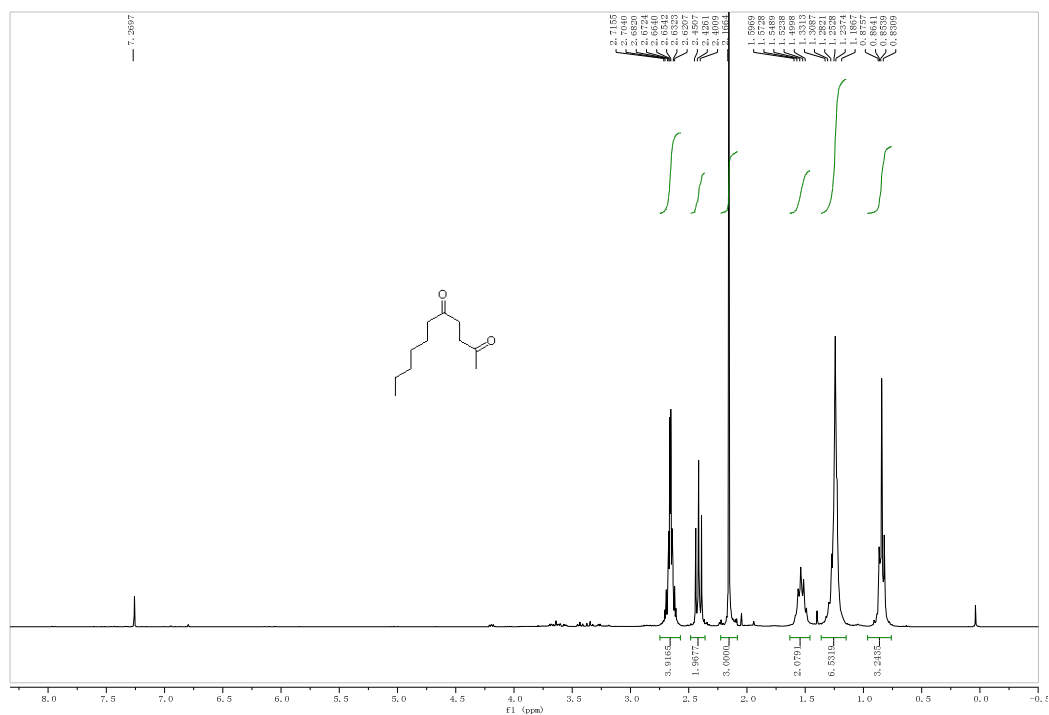
Heptane-2,5-dione (26b)



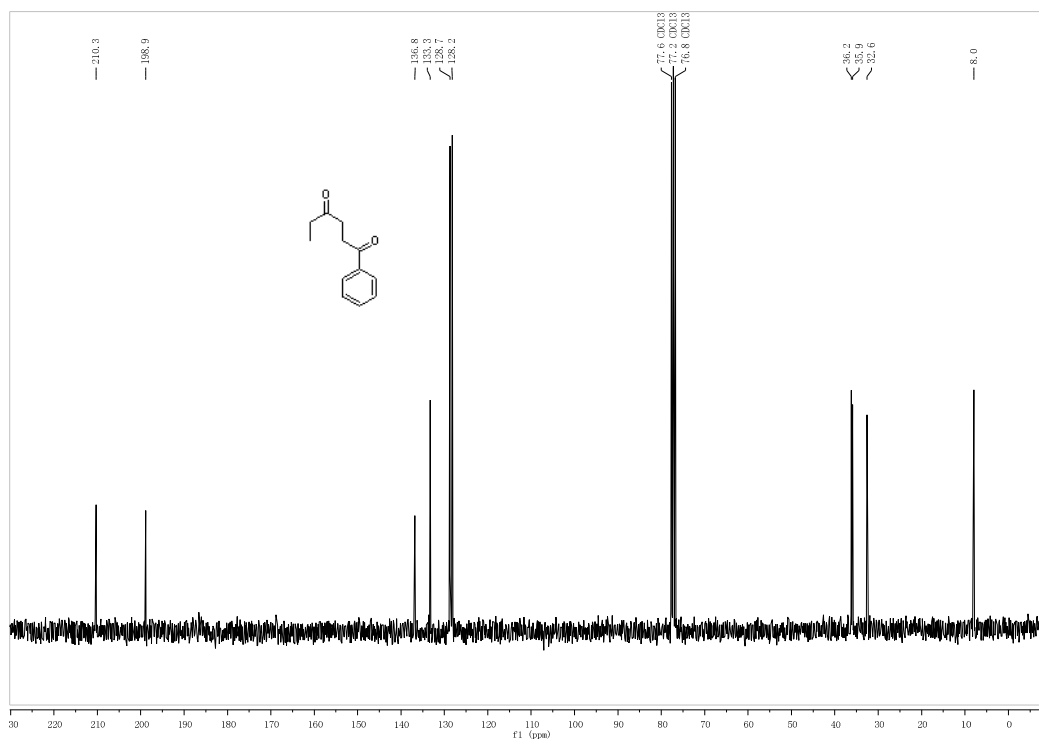
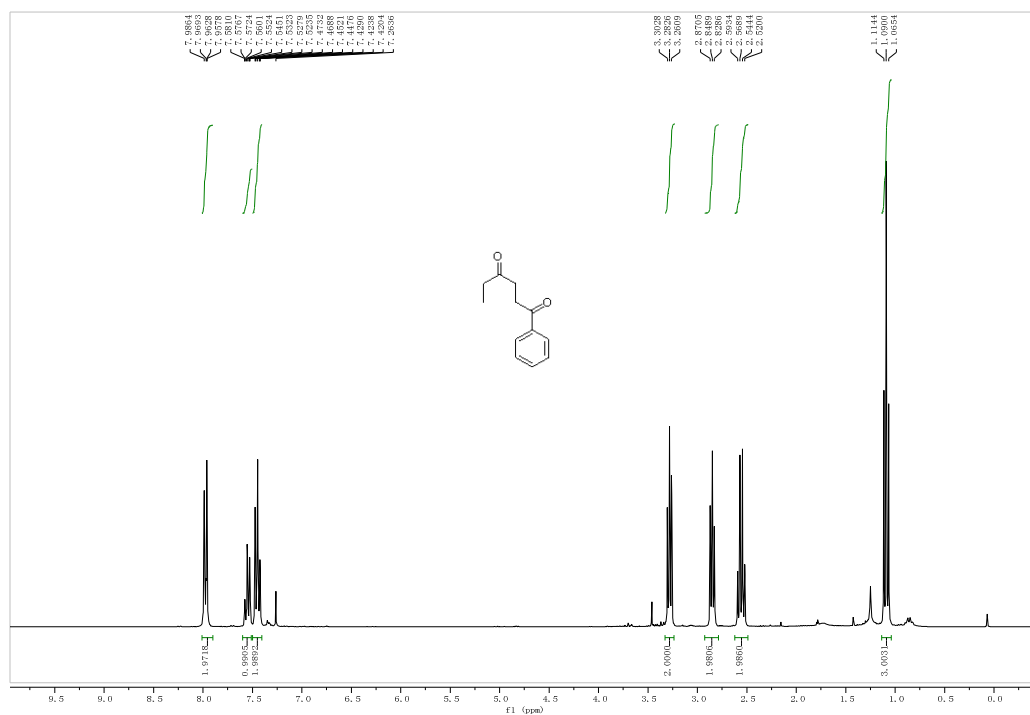
Octane-2,5-dione (26c)

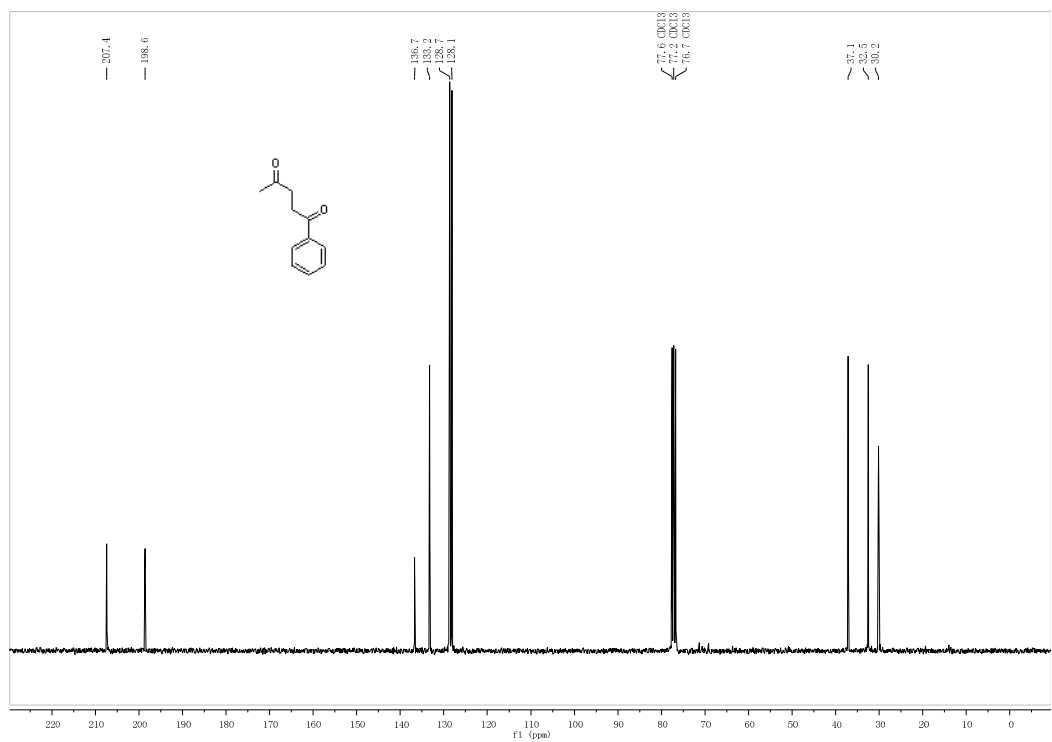
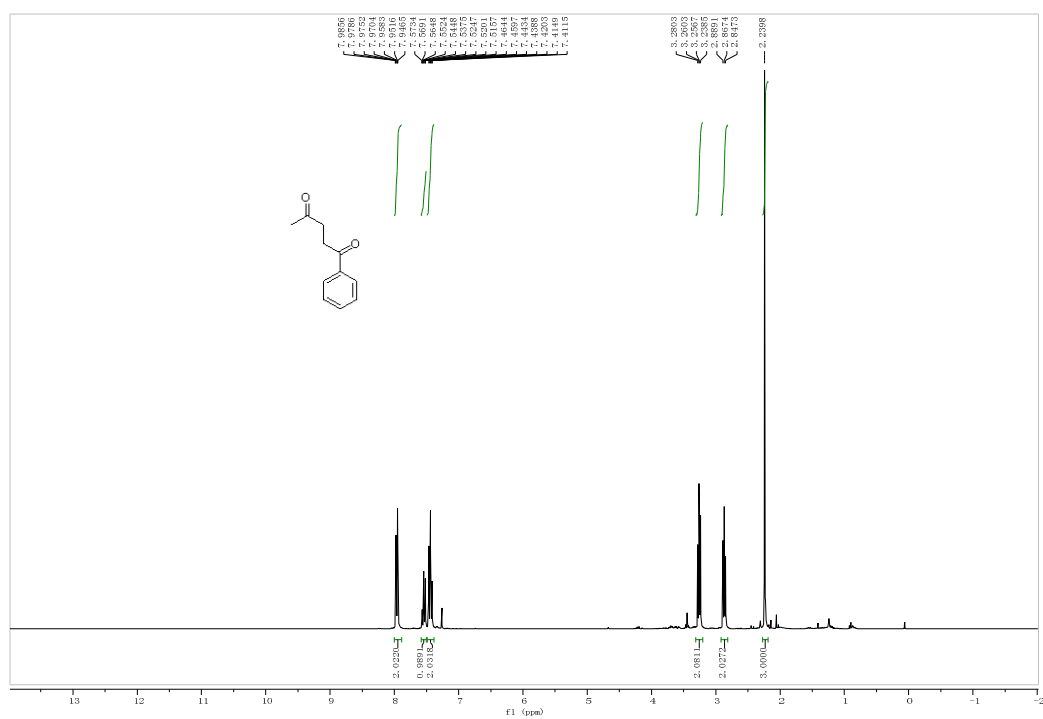


Undecane-2,5-dione (26d)

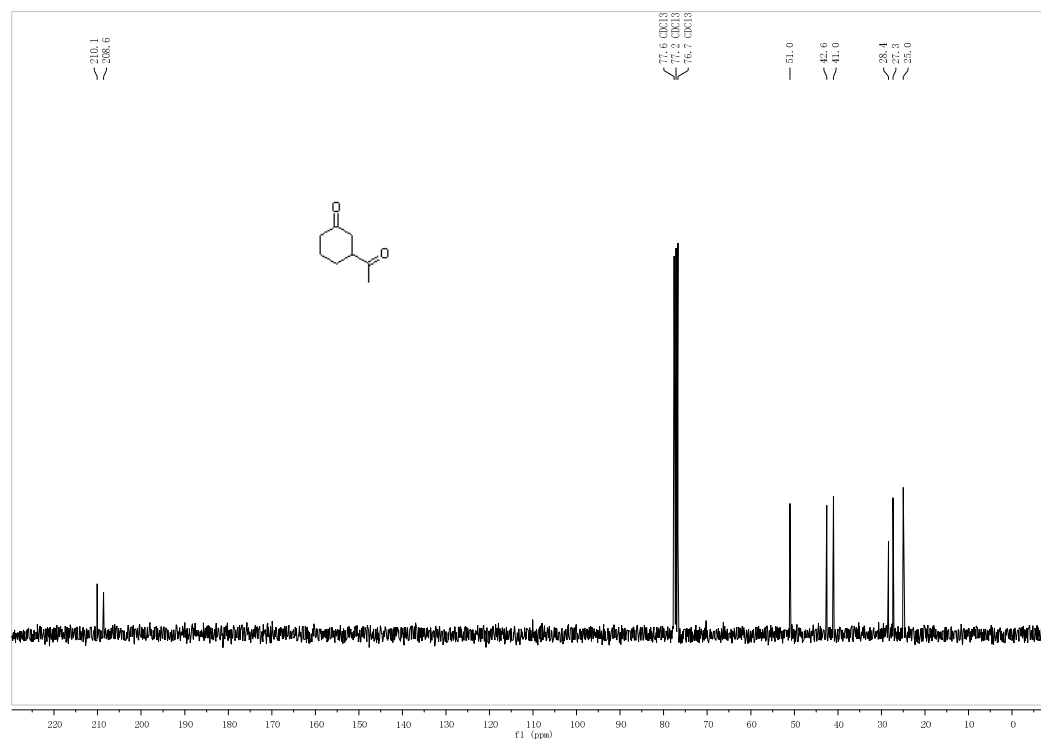
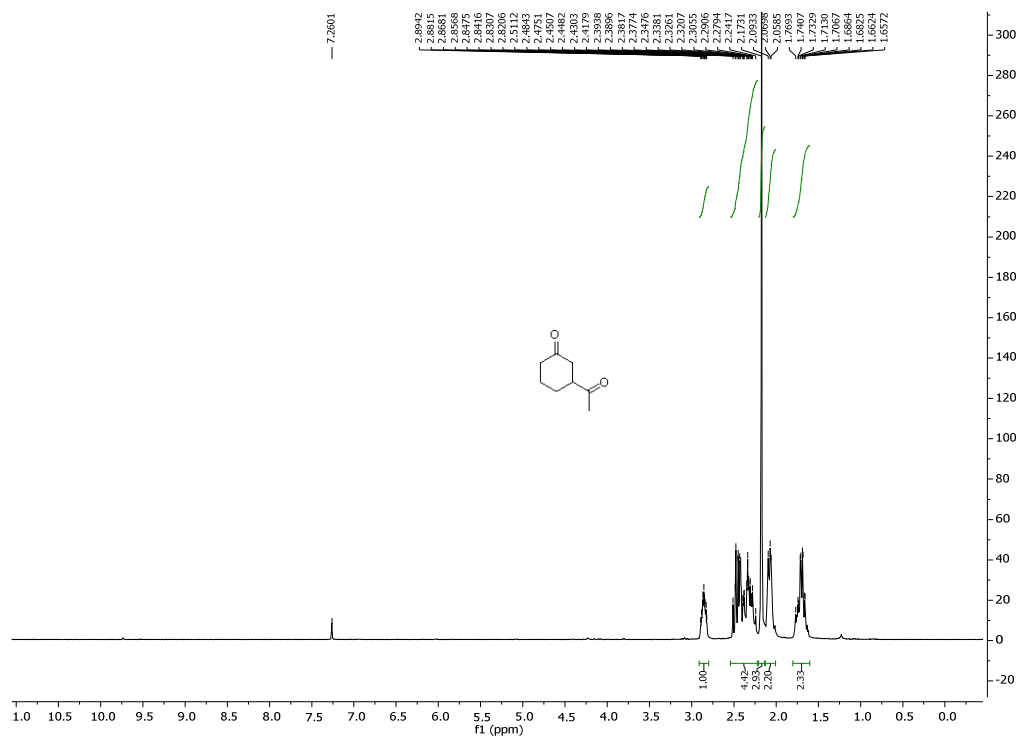


1-Phenylpentane-1,4-dione (26e)

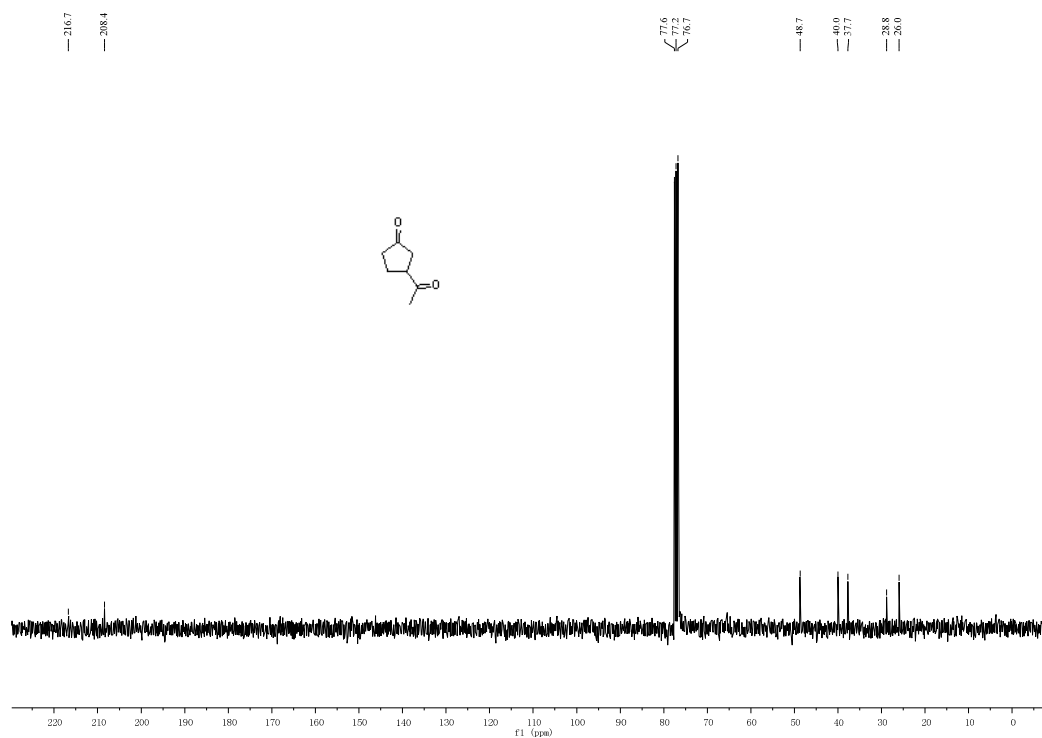
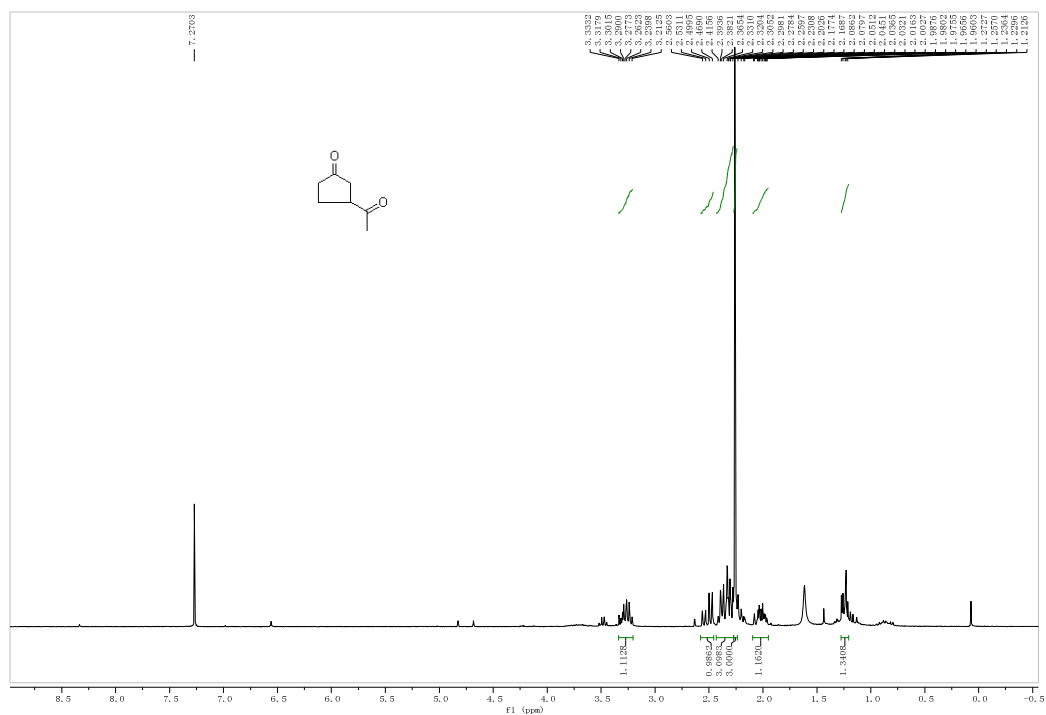


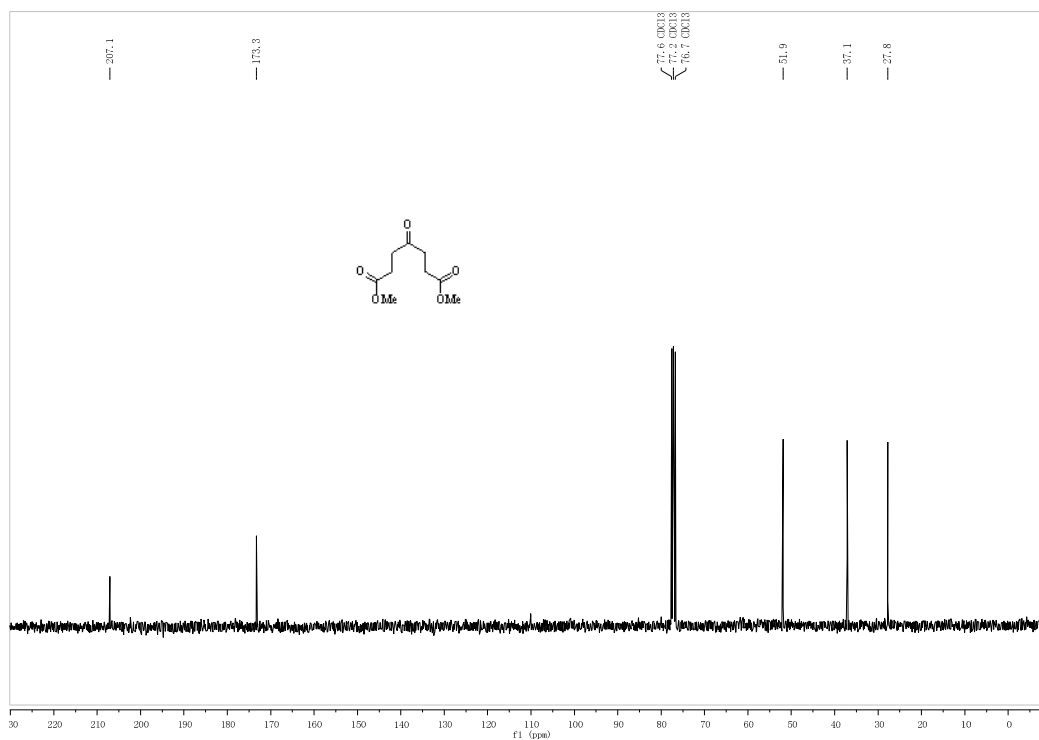
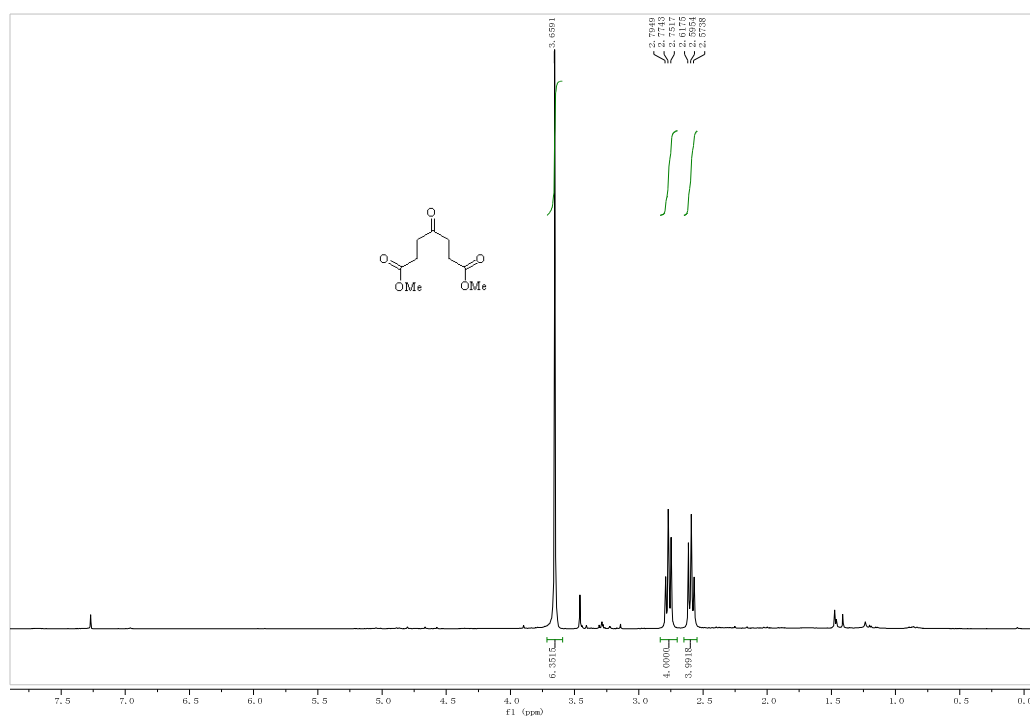


3-Acetylcyclohexanone (26g)

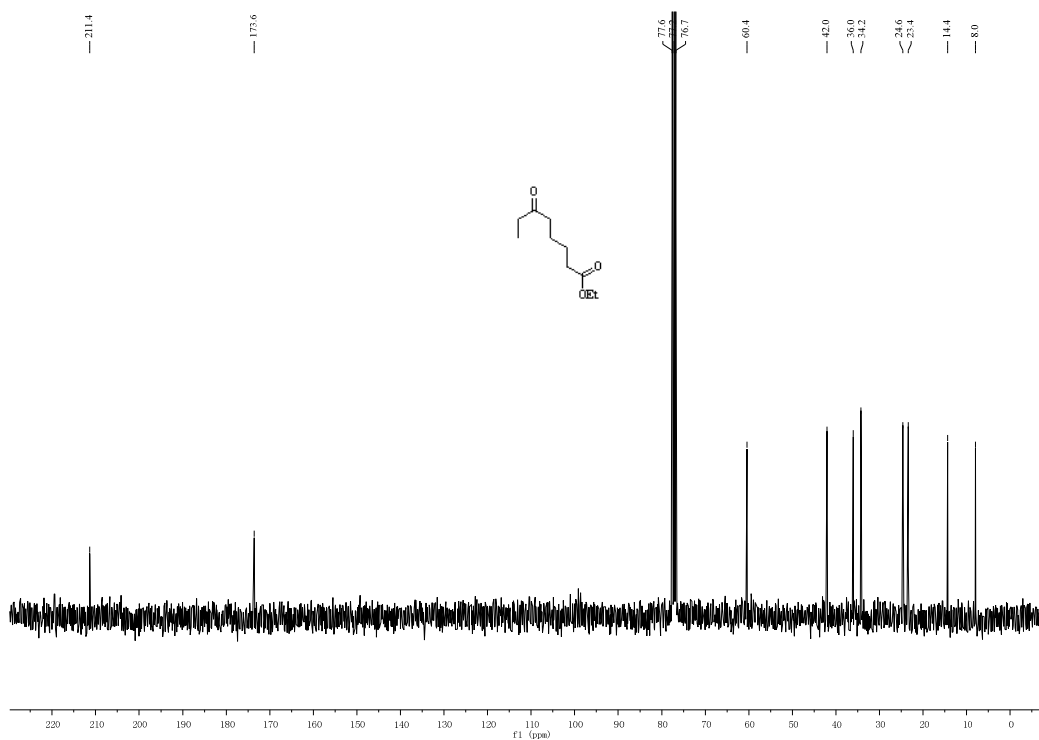
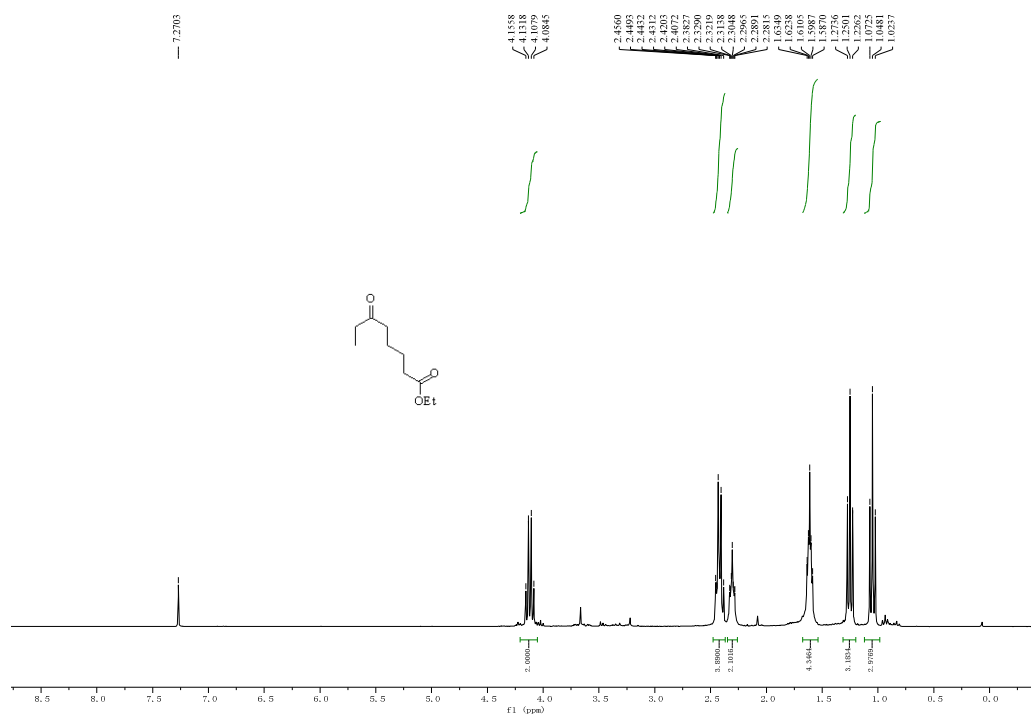


3-Acetylcyclopentanone (26h)

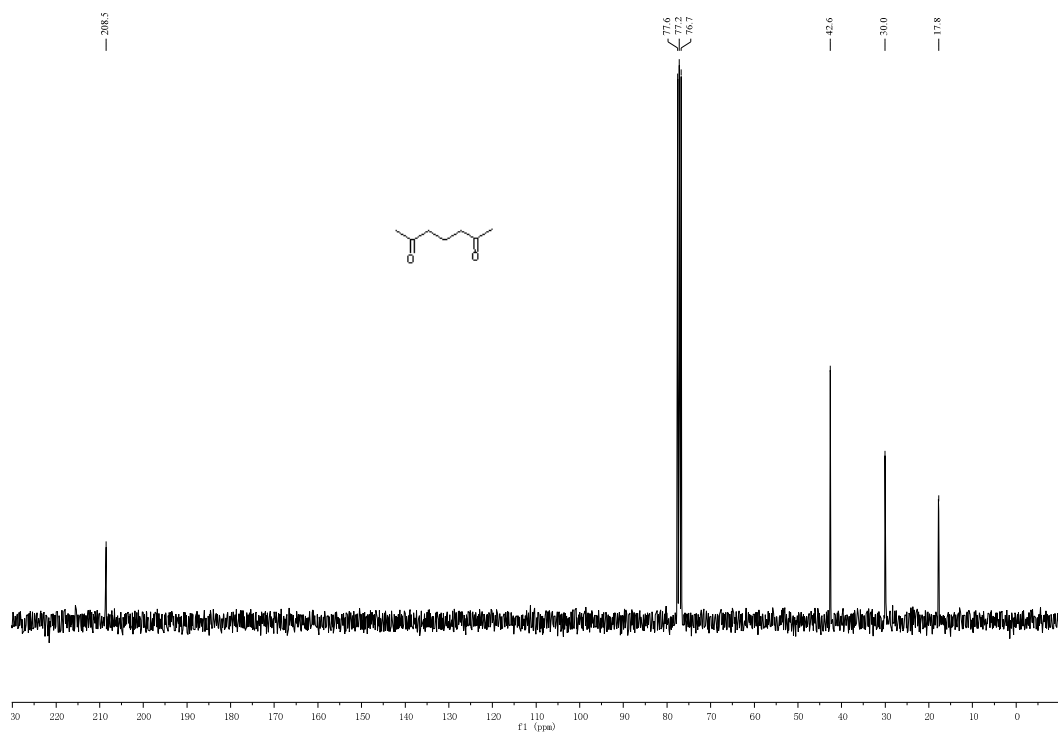
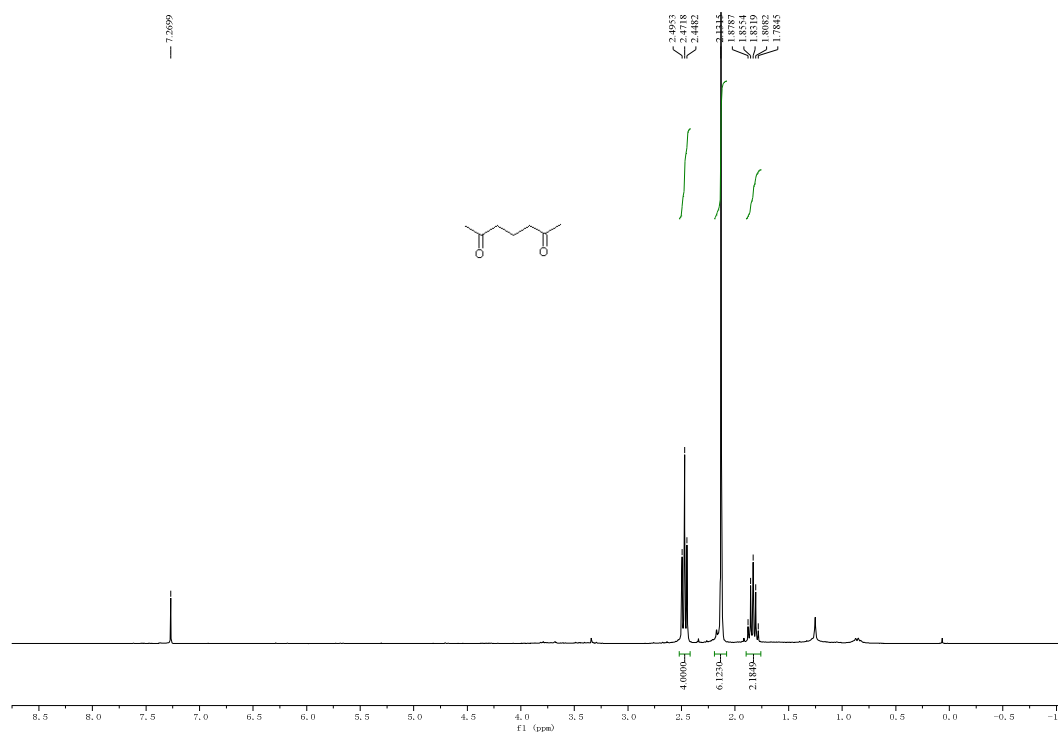




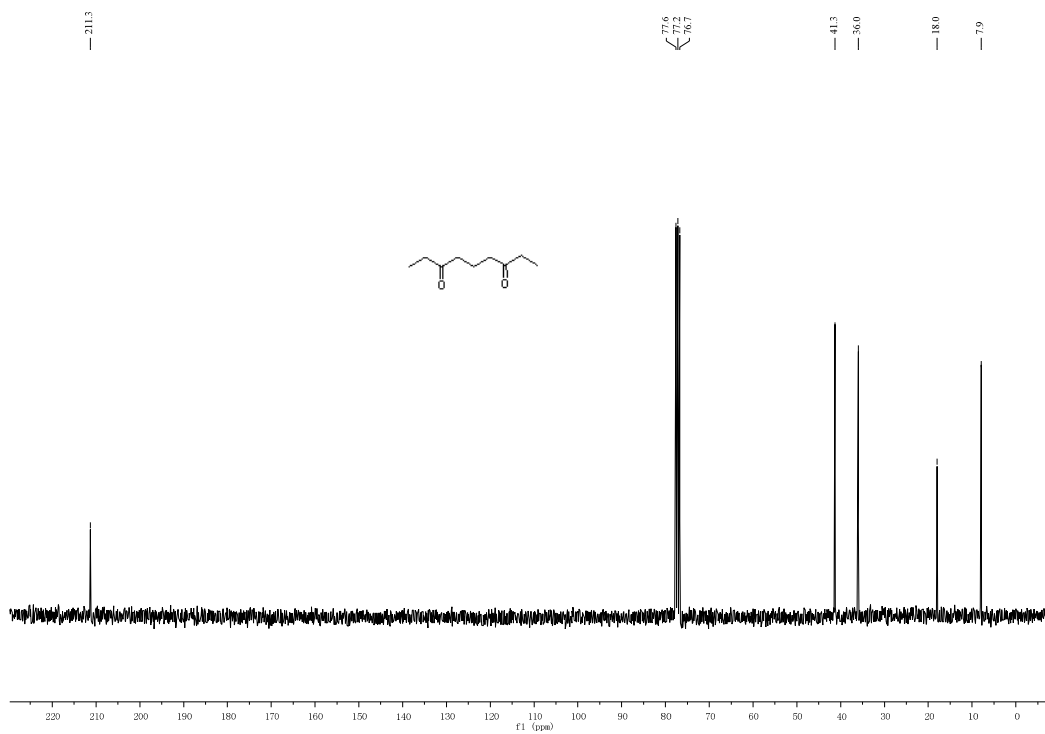
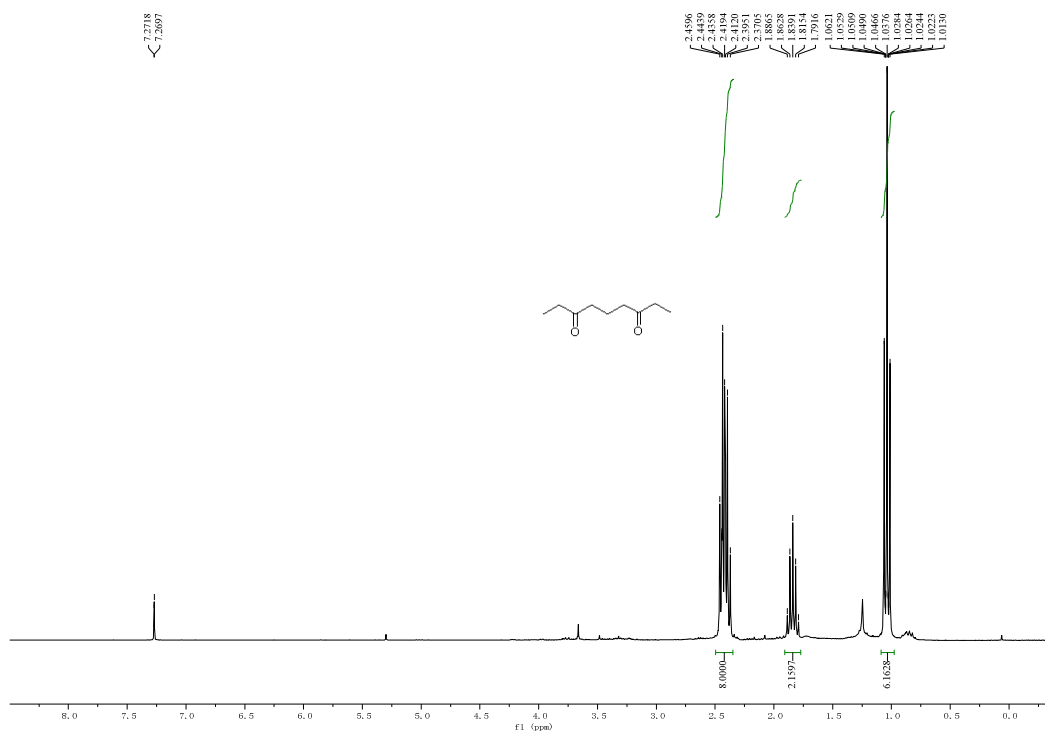
Ethyl 6-oxooctanoate (26j)



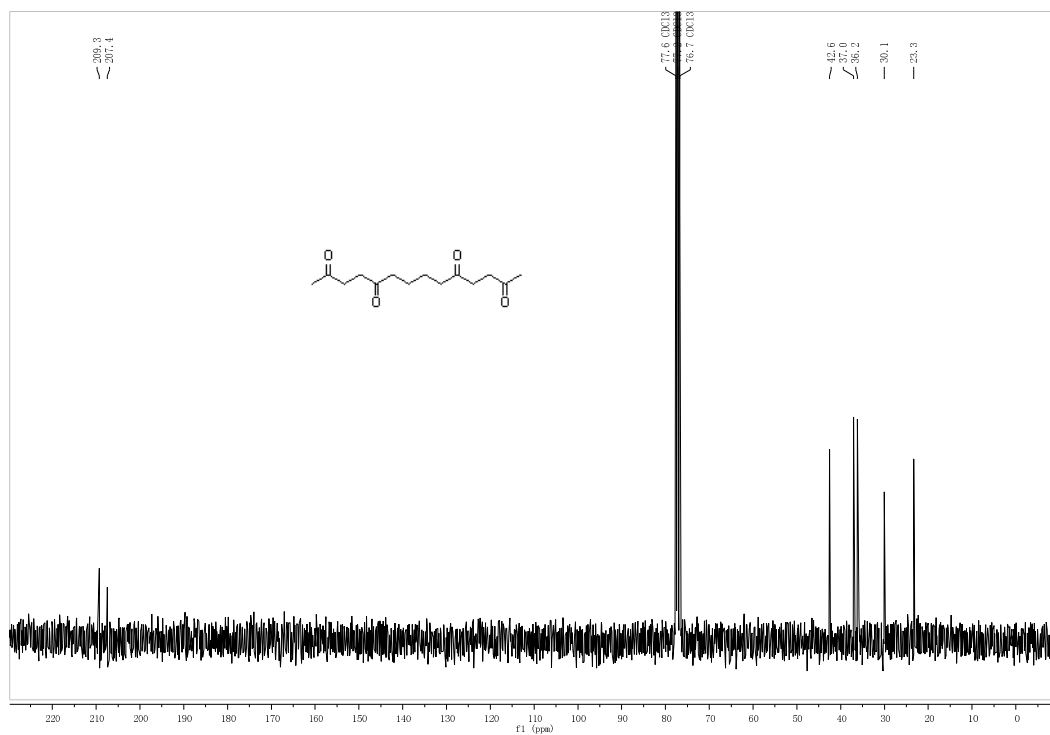
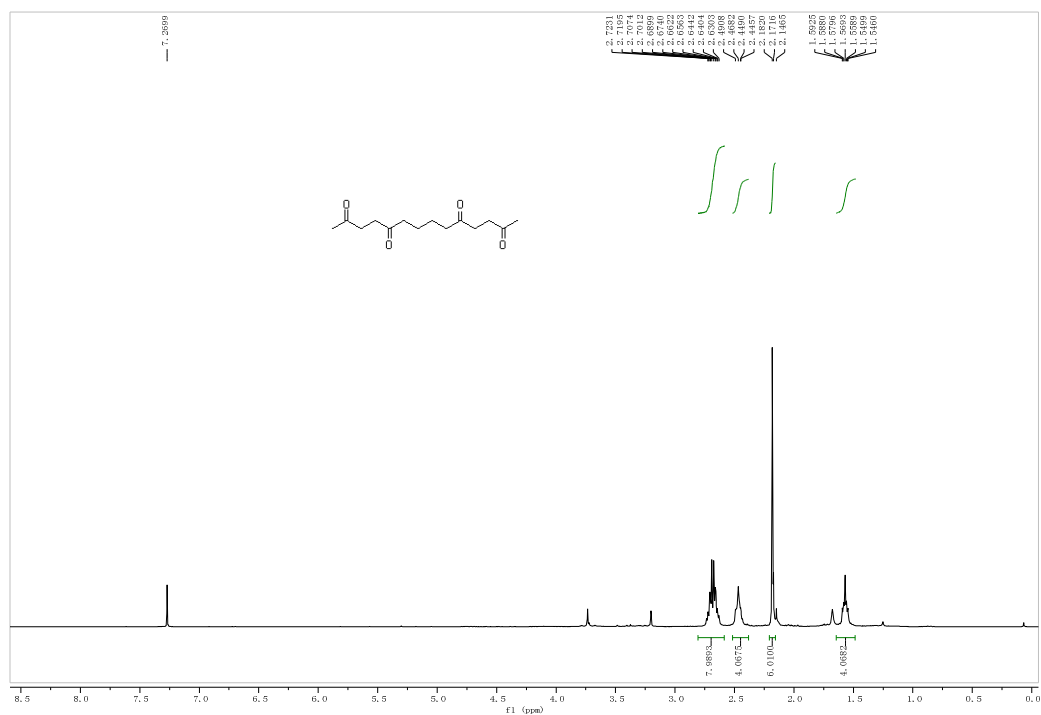
Heptane-2,6-dione (28a)



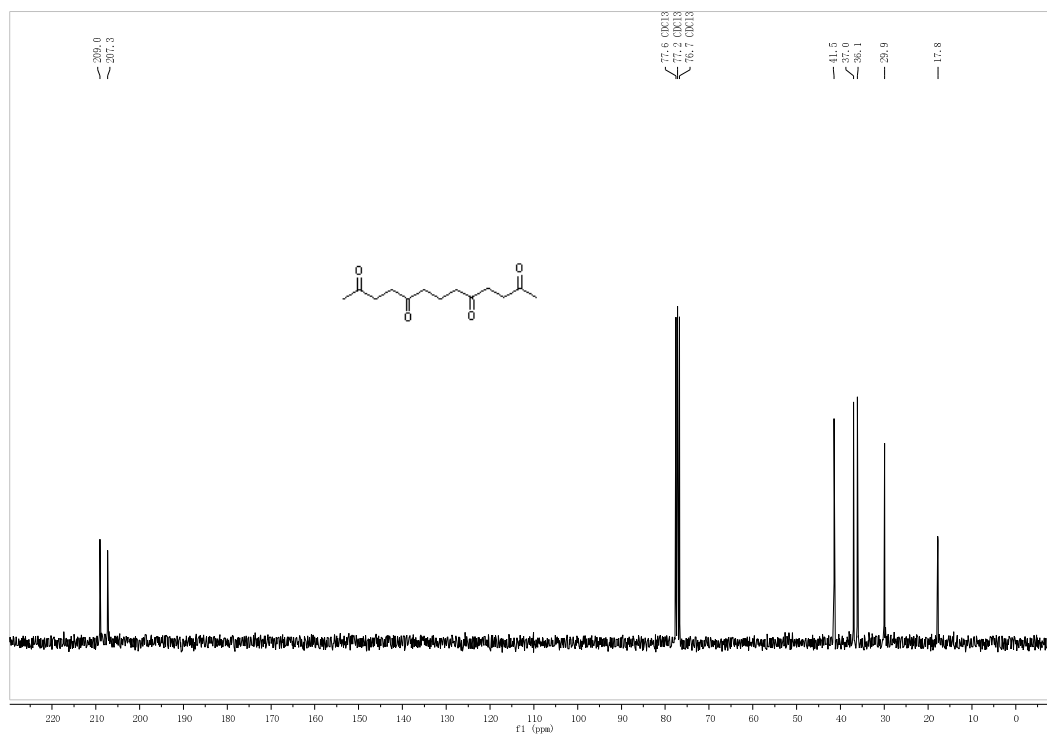
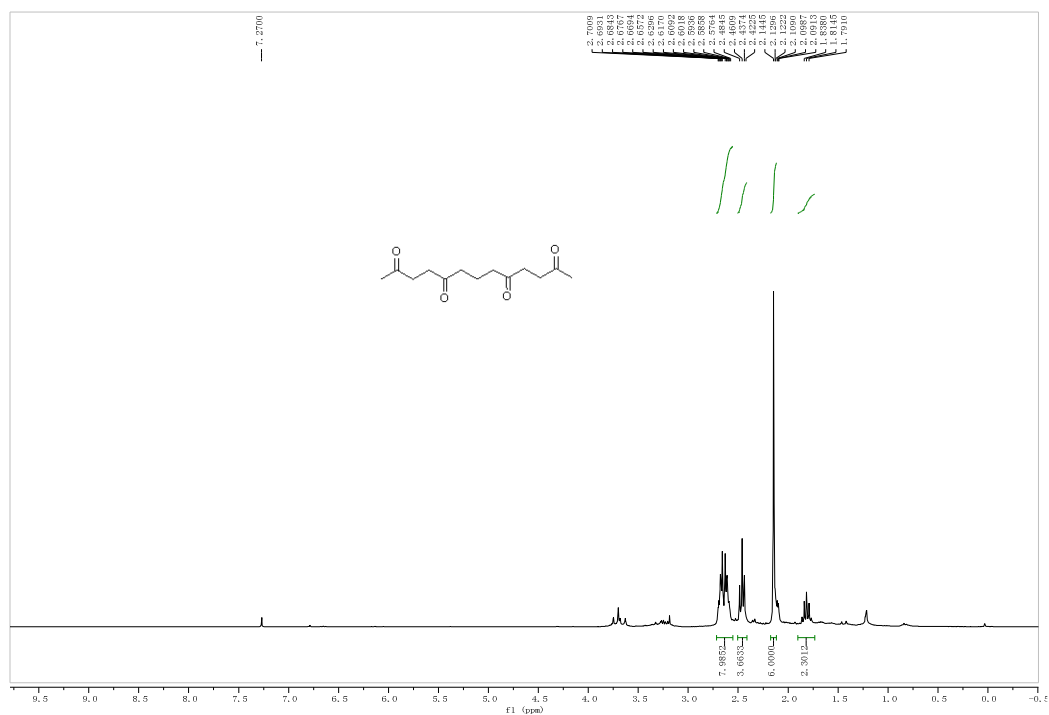
Nonane-3,7-dione(28b)



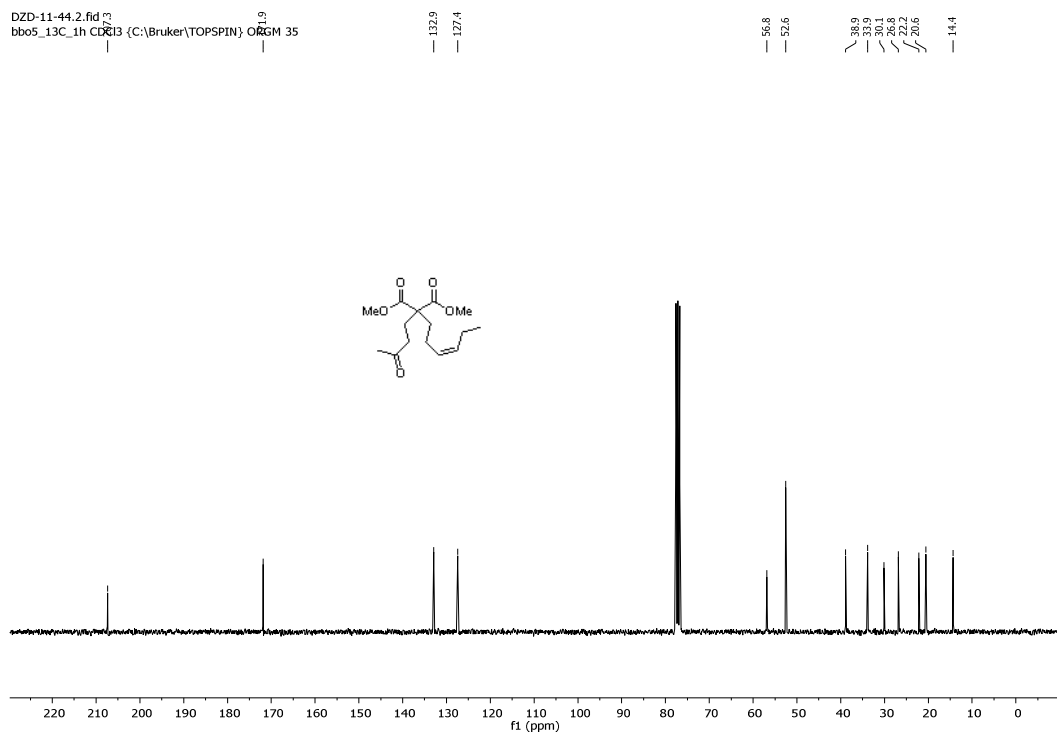
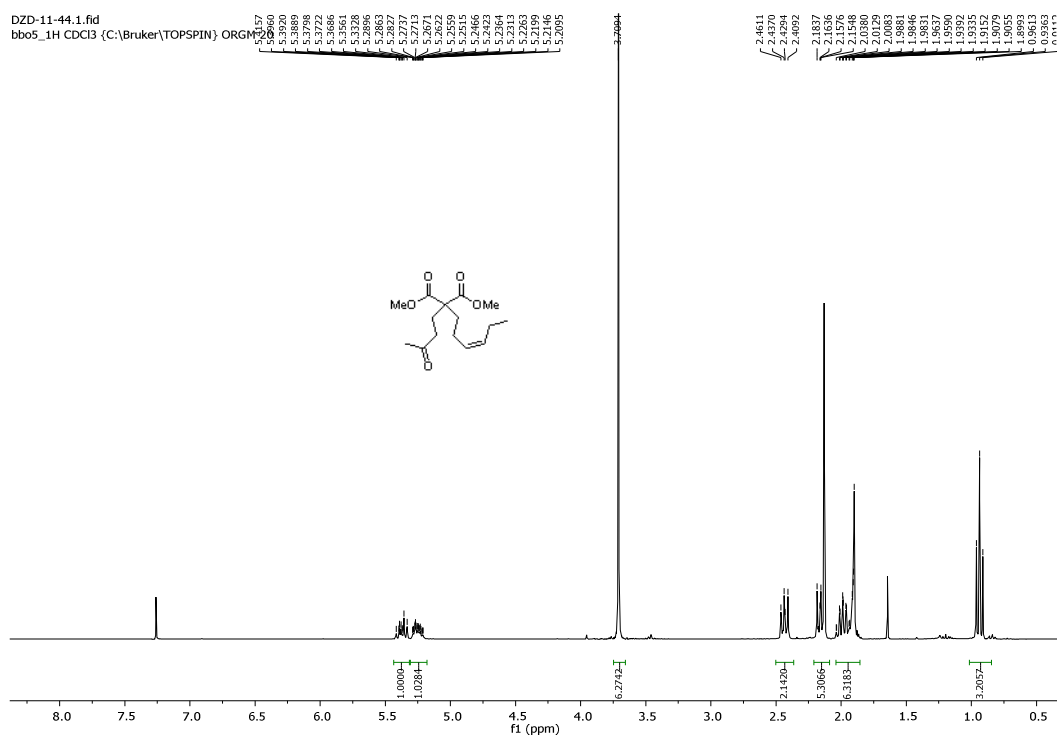
Tridecane-2,5,9,12-tetraone (28c)



Tetradecane-2,5,10,13-tetraone (28d)

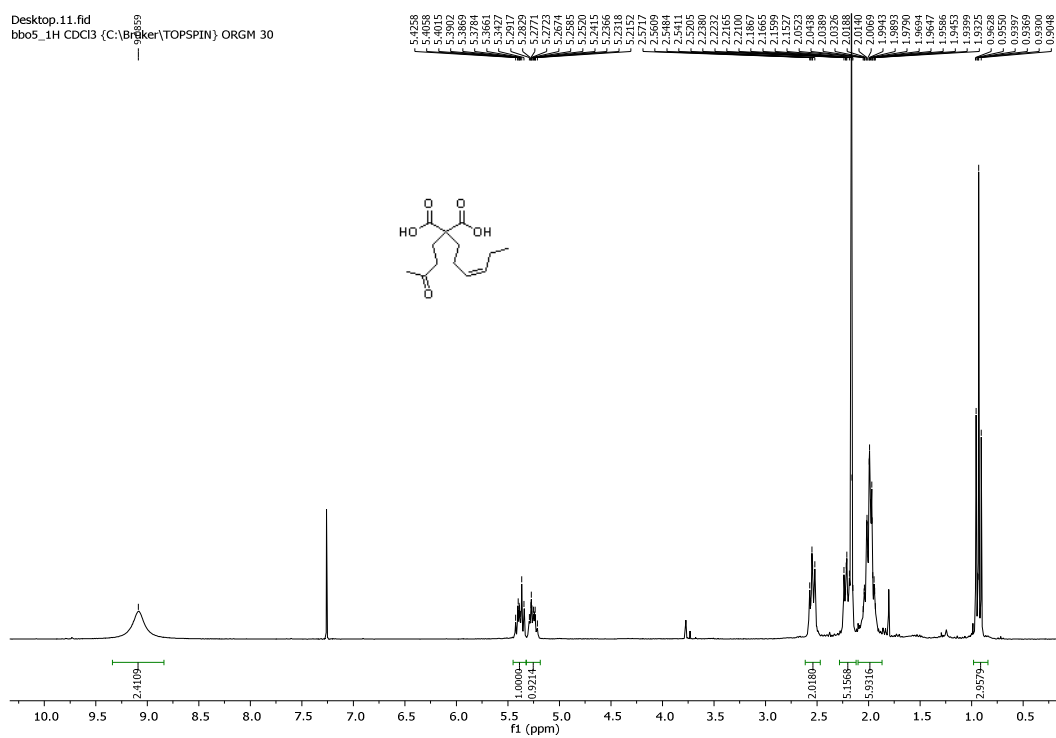


Dimethyl (Z)-2-(hex-3-en-1-yl)-2-(3-oxobutyl)malonate

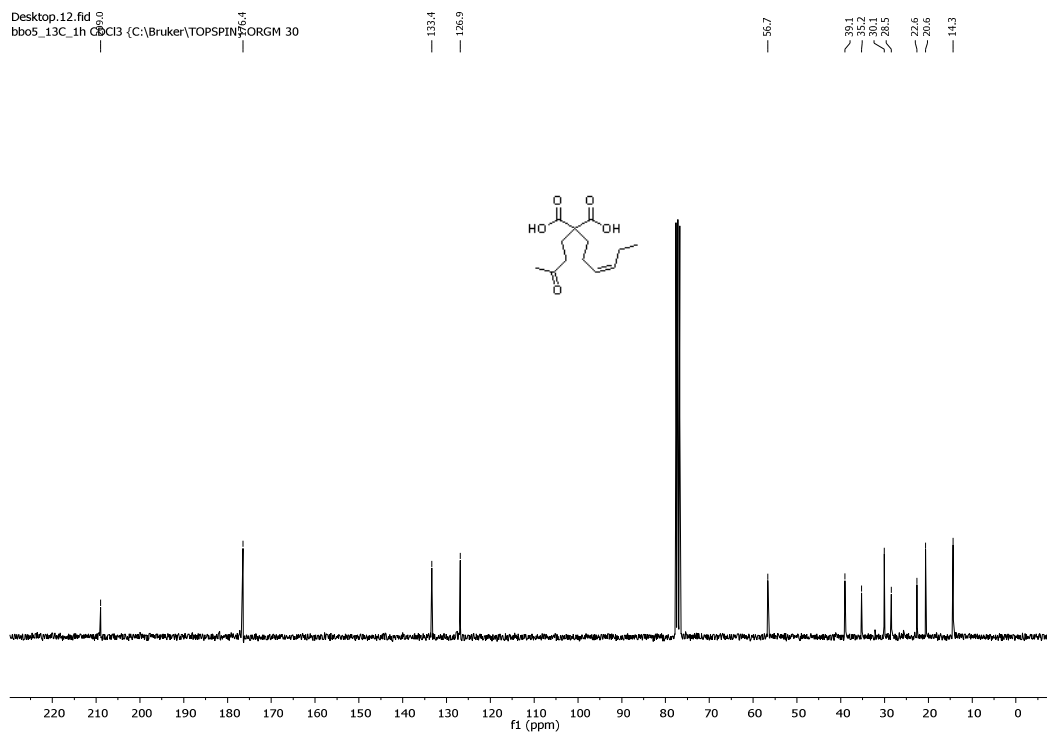


(Z)-2-(Hex-3-en-1-yl)-2-(3-oxobutyl)malonic acid (31)

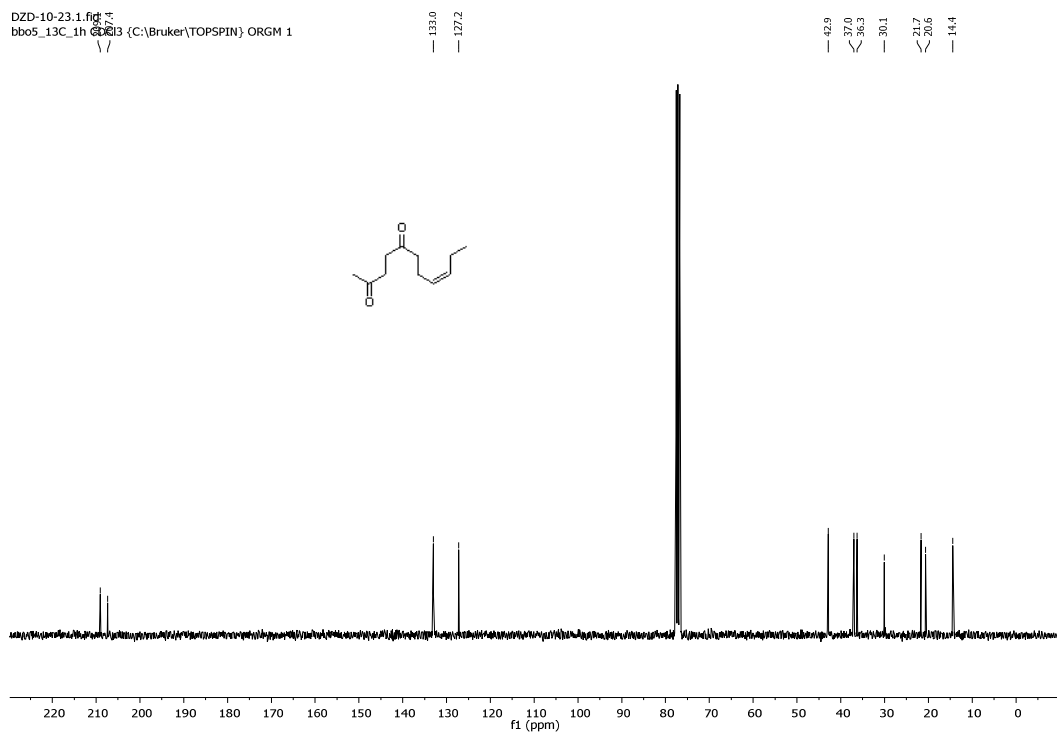
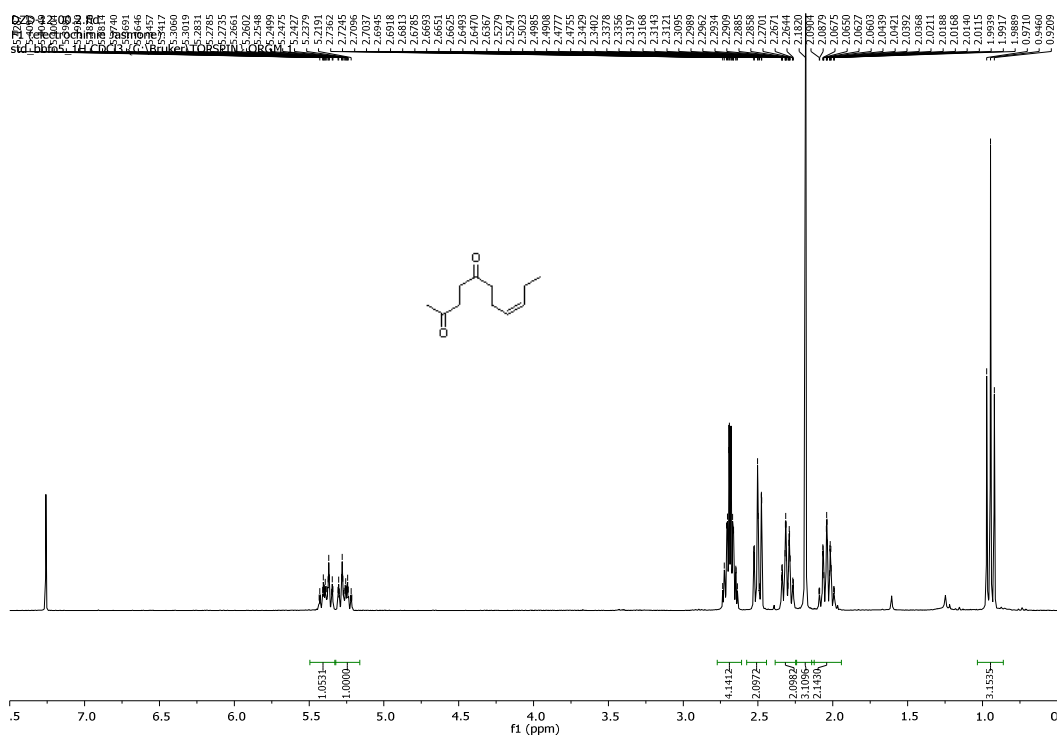
Desktop.11.fid
bbo5_1h CDCl3 (C:\Bruker\TOPSPIN) ORGM 30



Desktop.12.fid
bbo5_13C_1h CDCl3 (C:\Bruker\TOPSPIN) ORGM 30



(Z)-Undec-8-ene-2,5-dione (32)



DZD-12-25.2.fid
std_bbfo5_1H CDCl3 {C:\Bruker\TOPSPIN\ORIGIN}

