Supporting Information

Green and Highly Efficient Strategies for the Straightforward Reduction of Carboxylic Acids to Alcohols Using Four Different and Affordable Types of Hydrogen Donors

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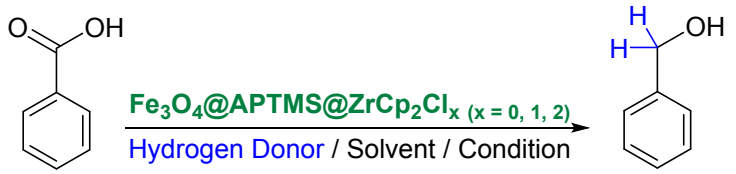
Table S1. Optimization of the reaction conditions using HCO_2NH_4, glycerol and also *i*-PrOH as other types of hydrogen donors.



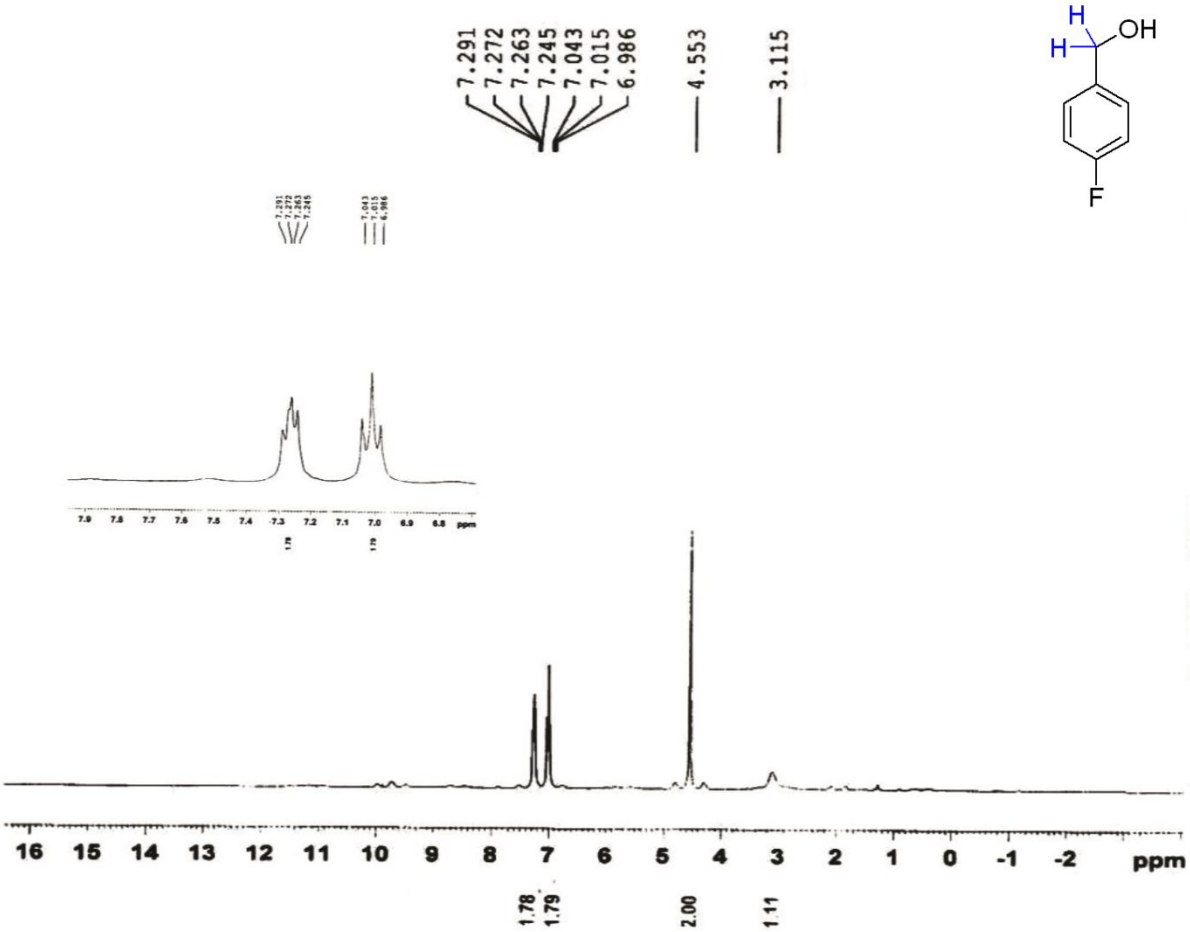
Entry	Hydrogen Donor (mmol)	Catalyst (mg)	Solvent	Condition	Time (min)	Yield (%)
1	HCO_2NH_4 (2)	6	H_2O	r.t.	70	79
2	HCO_2NH_4 (2)	6	THF	r.t.	100	74
3	HCO_2NH_4 (2)	6	PEG-400	r.t.	80	75
4	HCO_2NH_4 (2)	6	DMF	r.t.	100	81
5	HCO_2NH_4 (2)	6	DMSO	r.t.	100	83
6	HCO_2NH_4 (2)	6	$CHCl_3$	r.t.	120	75
7	HCO_2NH_4 (2)	6	CH_2Cl_2	r.t.	110	79
8	HCO_2NH_4 (2)	6	H_2O:PEG-400 (1:1)	r.t.	60	97
9	HCO_2NH_4 (2)	4	H_2O:PEG-400 (1:1)	r.t.	90	81
10	HCO_2NH_4 (2)	8	H_2O:PEG-400 (1:1)	r.t.	60	98
11	HCO_2NH_4 (2)	6	H_2O:PEG-400 (1:1)	50 °C	60	98
12	HCO_2NH_4 (1)	6	H_2O:PEG-400 (1:1)	r.t.	140	81
13	HCO_2NH_4 (2)	-	H_2O:PEG-400 (1:1)	r.t.	1440	-
14	Glycerol (2)	10	H_2O	r.t.	20	97
15	Glycerol (2)	10	THF	r.t.	90	78
16	Glycerol (2)	10	PEG-400	r.t.	85	86
17	Glycerol (2)	10	DMF	r.t.	100	83
18	Glycerol (2)	10	$CHCl_3$	r.t.	100	75
19	Glycerol (2)	10	CH_2Cl_2	r.t.	90	65
20	Glycerol (2)	7	H_2O	r.t.	40	85
21	Glycerol (2)	12	H_2O	r.t.	20	98
22	Glycerol (2)	10	H_2O	50 °C	20	97
23	Glycerol (1)	10	H_2O	r.t.	120	81
24	Glycerol (2)	-	H_2O	r.t.	1440	-
25	*i*-PrOH (2)	10	H_2O	r.t.	60	96
26	*i*-PrOH (2)	10	THF	r.t.	90	78
27	*i*-PrOH (2)	10	PEG-400	r.t.	85	86
28	*i*-PrOH (2)	10	DMF	r.t.	100	83
29	*i*-PrOH (2)	10	$CHCl_3$	r.t.	100	75
30	*i*-PrOH (2)	10	CH_2Cl_2	r.t.	90	65
31	*i*-PrOH (2)	7	H_2O	r.t.	100	80
32	*i*-PrOH (2)	12	H_2O	r.t.	60	98
33	*i*-PrOH (2)	10	H_2O	50 °C	50	97
34	*i*-PrOH (1)	10	H_2O	r.t.	120	81
35	*i*-PrOH (2)	-	H_2O	r.t.	1440	-

Table S2. Surface area (S_{BET}) and total pore volumes (V_{total}) of the Fe_3O_4 and Fe_3O_4@APTMS@$ZrCp_2Cl_{x\ (x = 0, 1, 2)}$ MNPs.

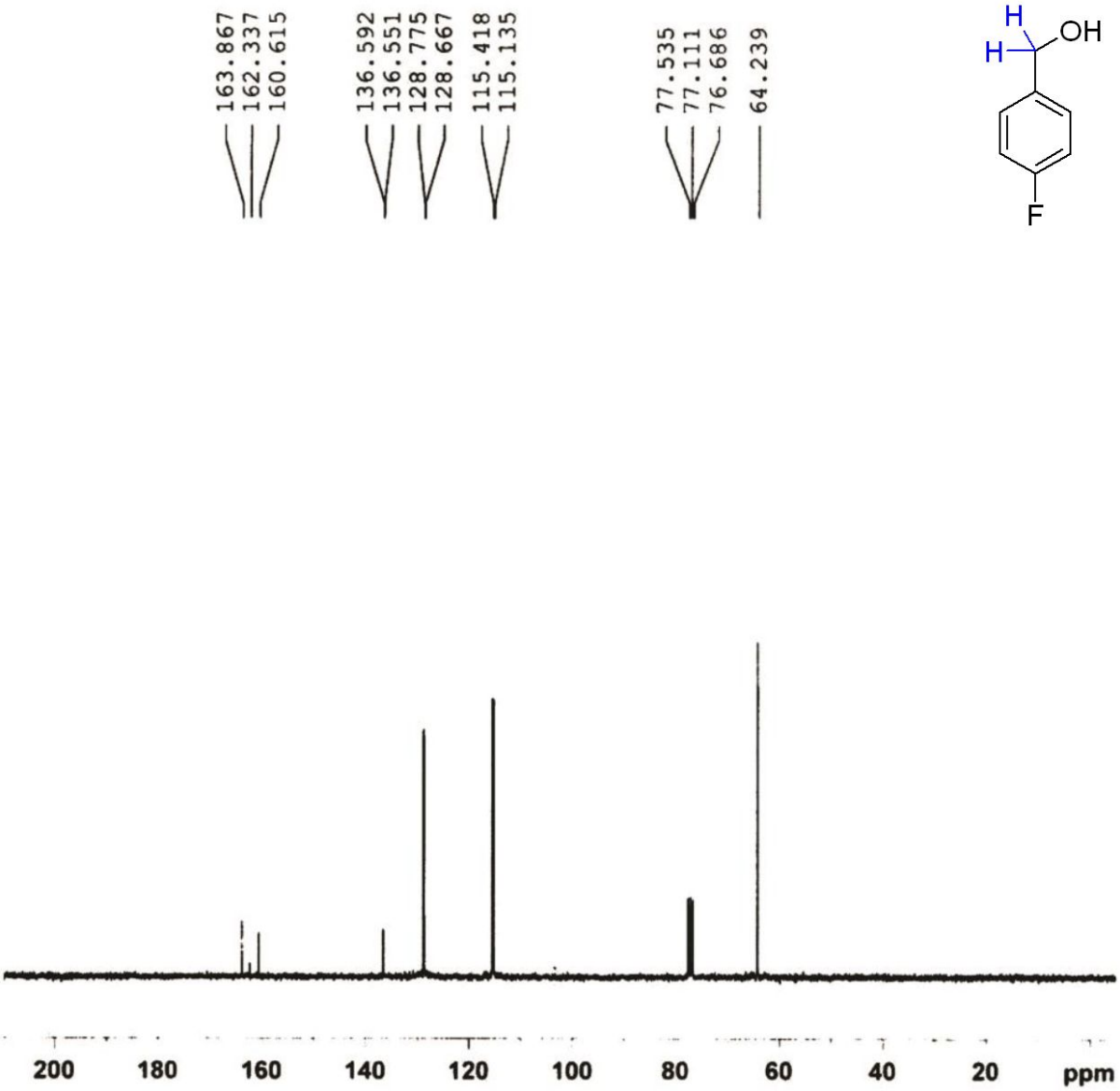
Sample	S_{BET} (m^2/g)	V_{total} (cm^3/g)
Fe_3O_4	88.65	0.3
Fe_3O_4@APTMS@$ZrCp_2Cl_{x\ (x = 0, 1, 2)}$	81.32	0.26

Selected NMR spectra of products

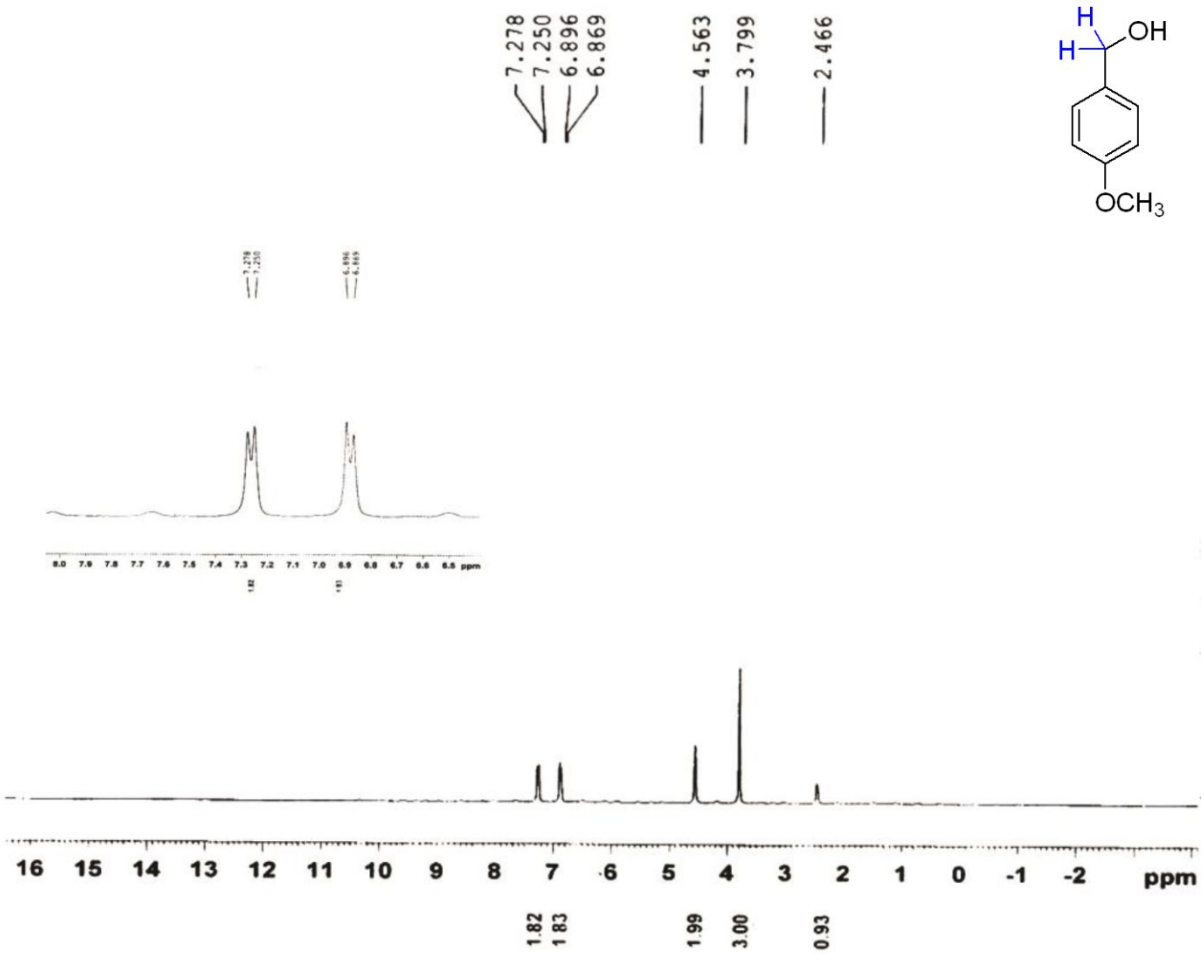
^{1}H NMR: (4-Fluorophenyl)methanol



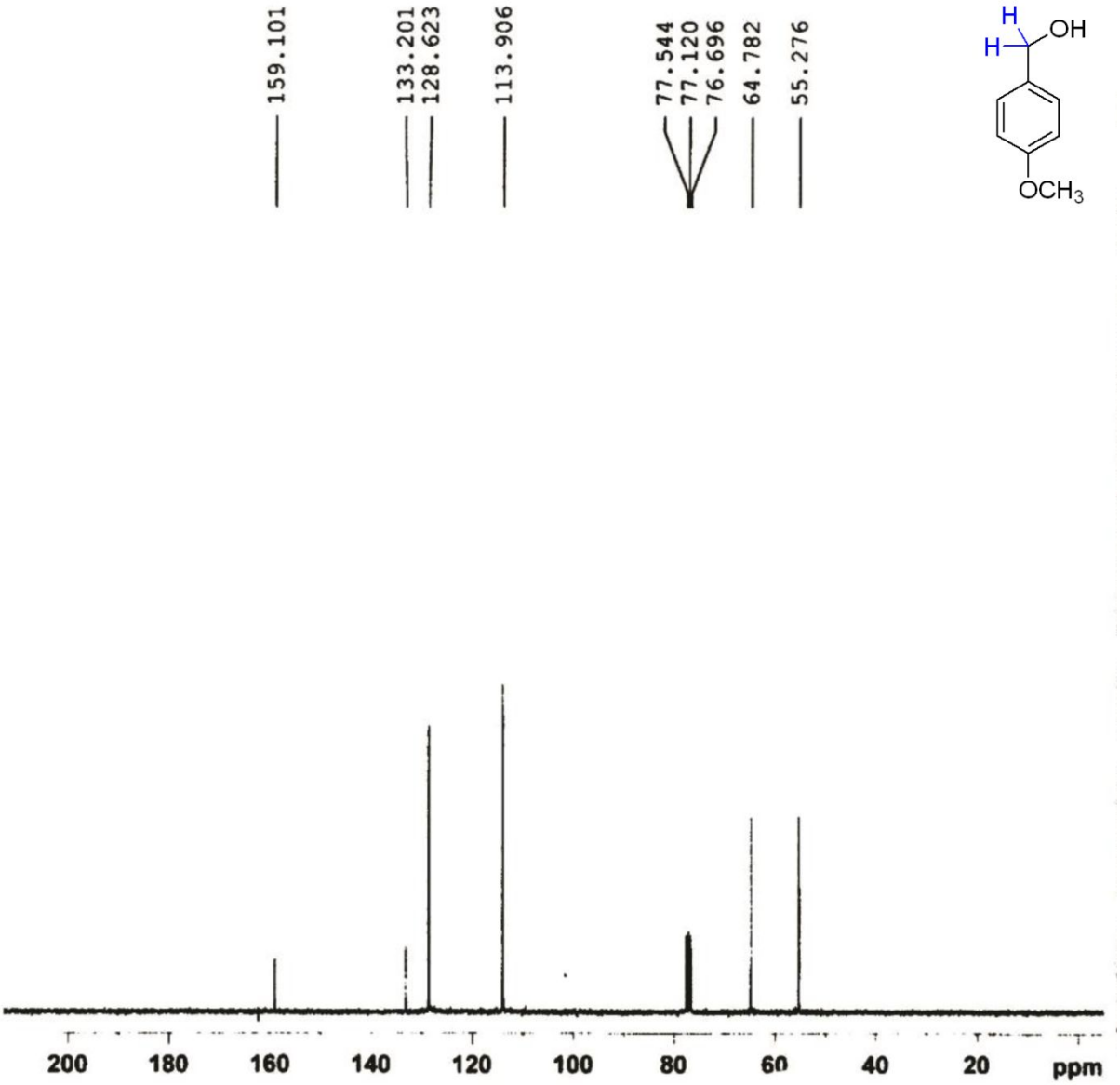
^{13}C NMR: (4-Fluorophenyl)methanol



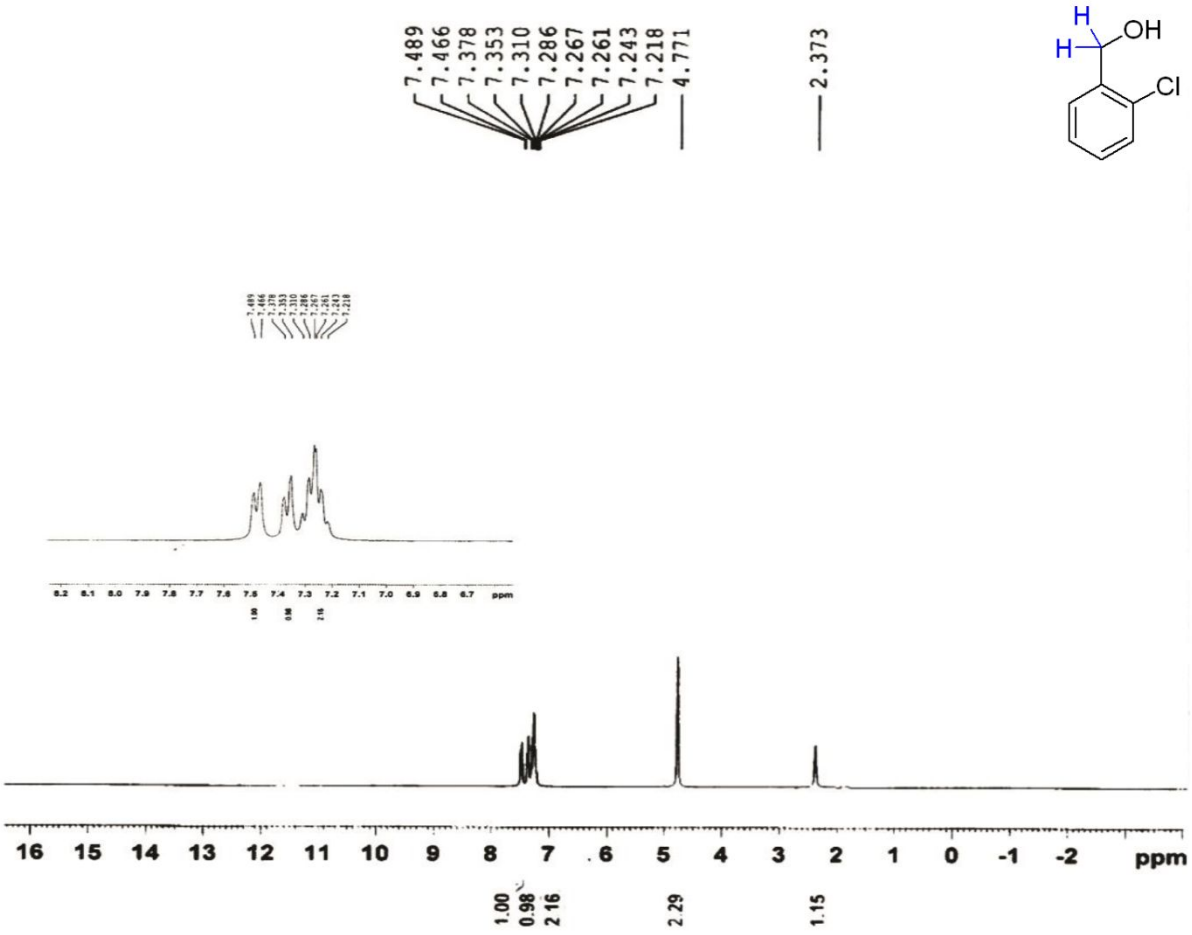
^{1}H NMR: (4-Methoxyphenyl)methanol



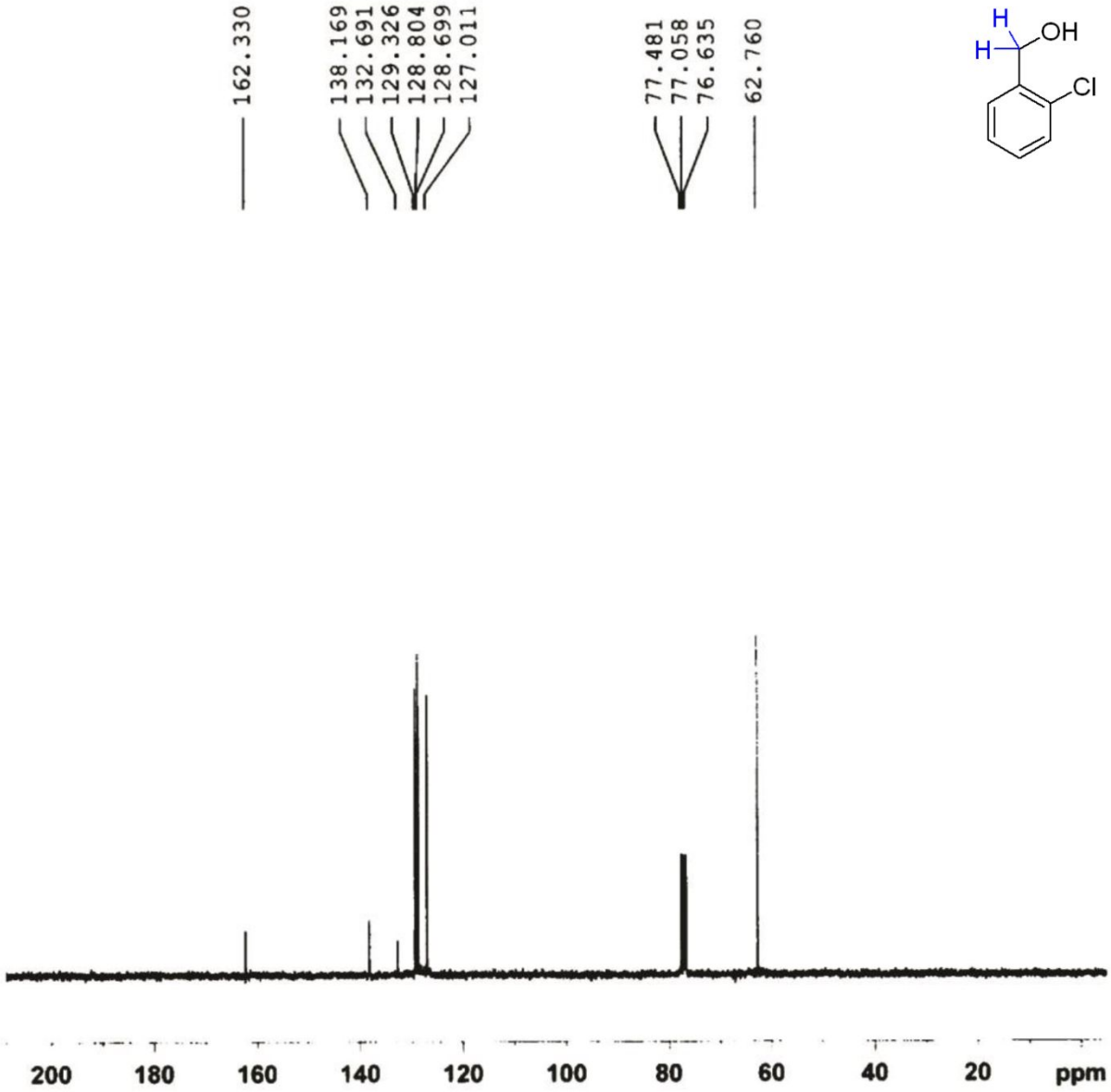
^{13}C NMR: (4-Methoxyphenyl)methanol



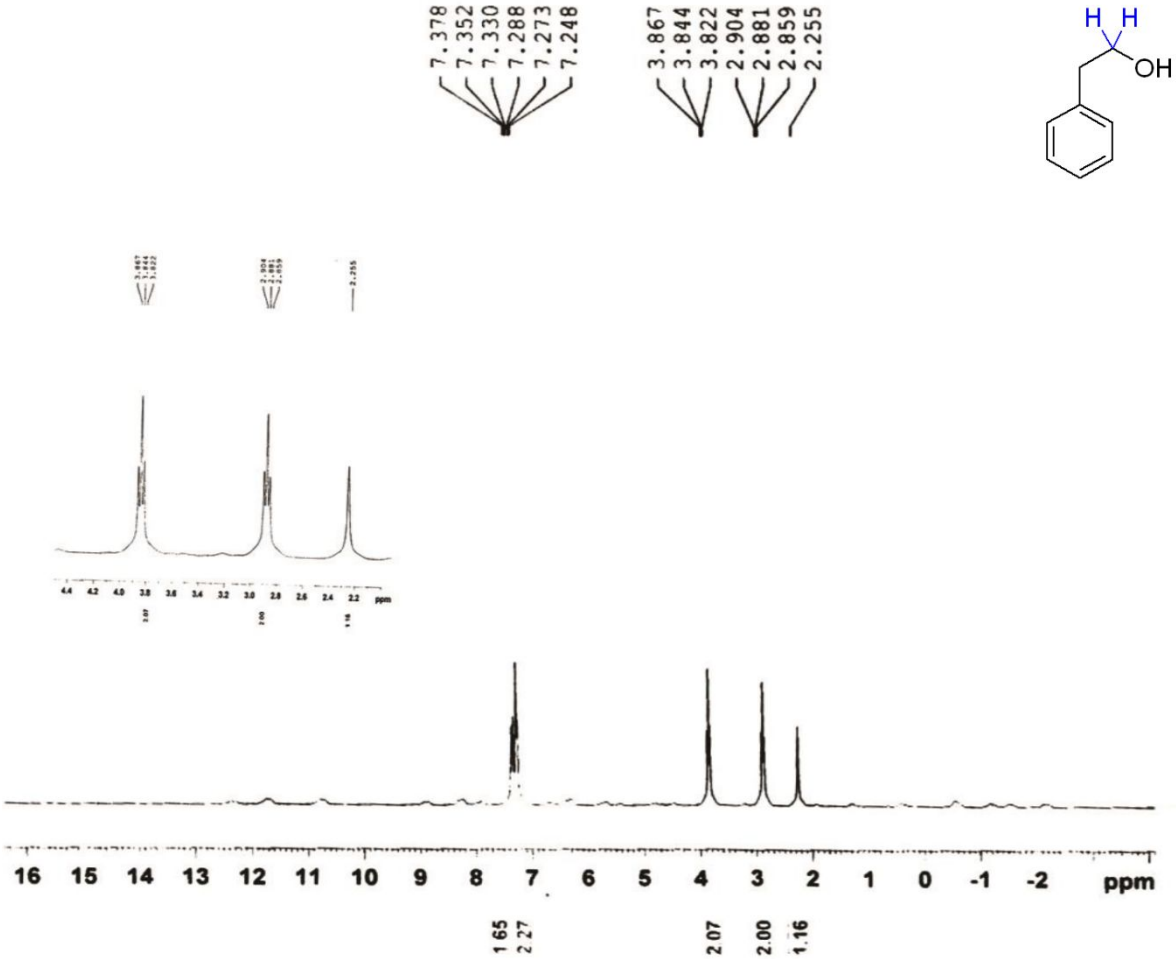
^{1}H NMR: (2-Chlorophenyl)methanol



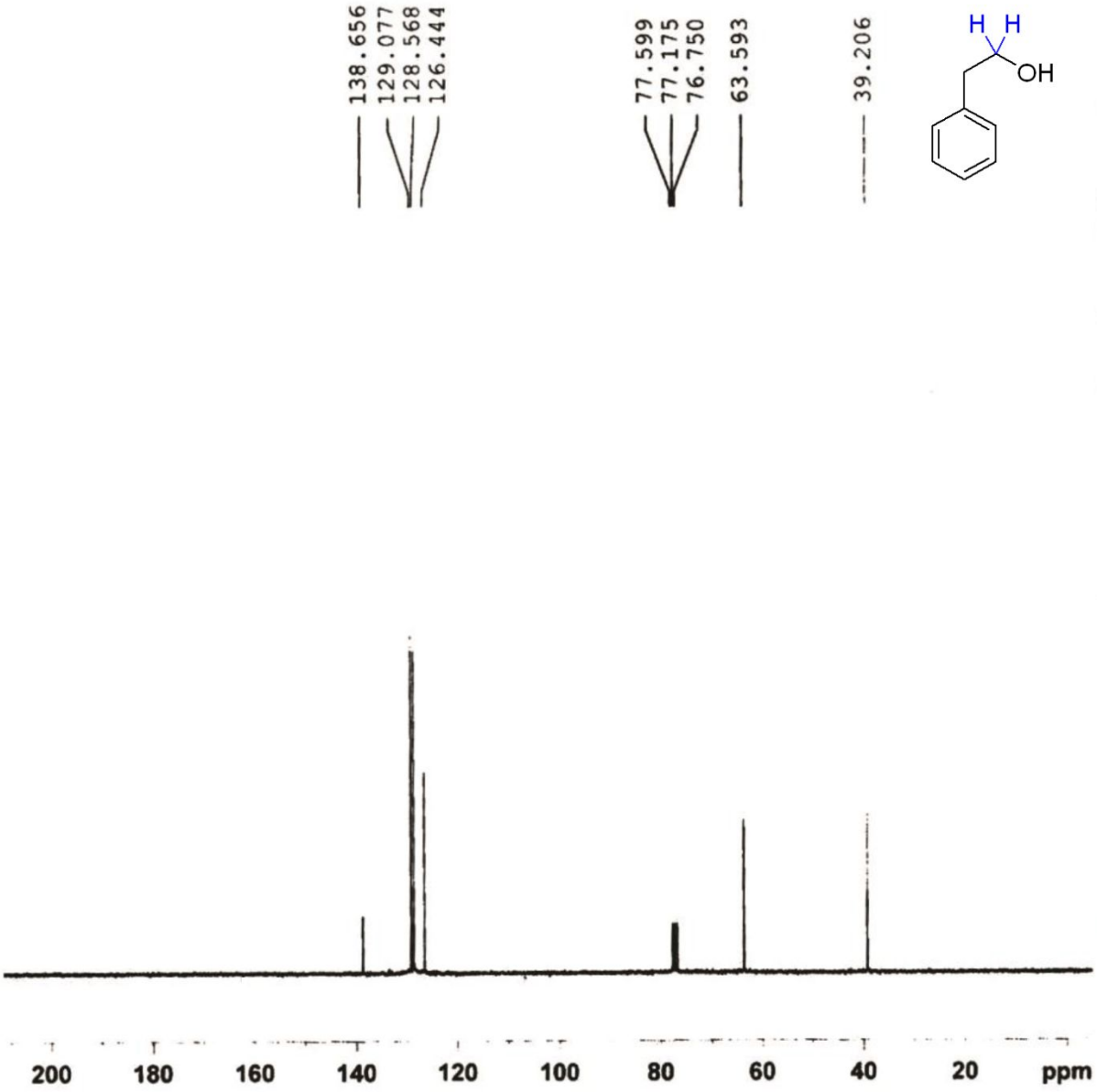
^{13}C NMR: (2-Chlorophenyl)methanol



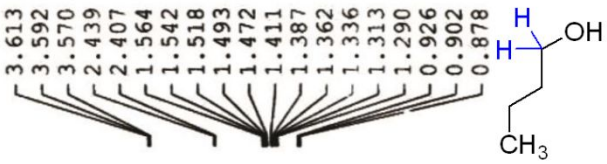
^{1}H NMR: 2-Phenylethan-1-ol

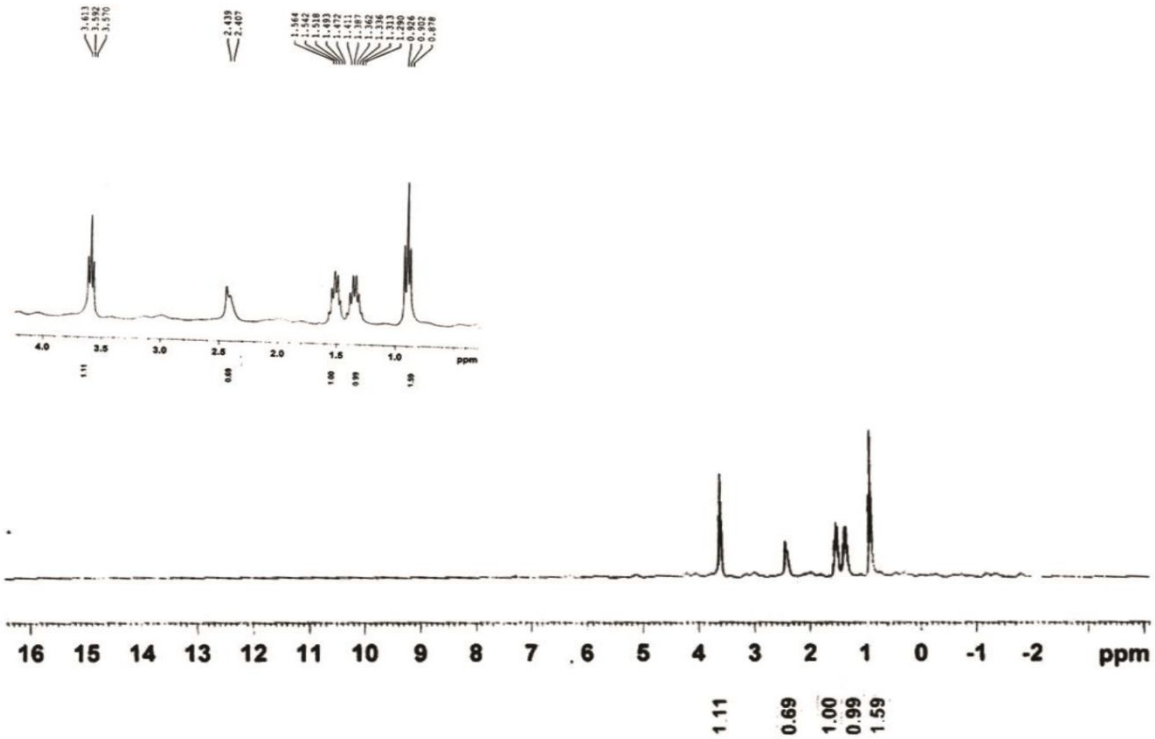
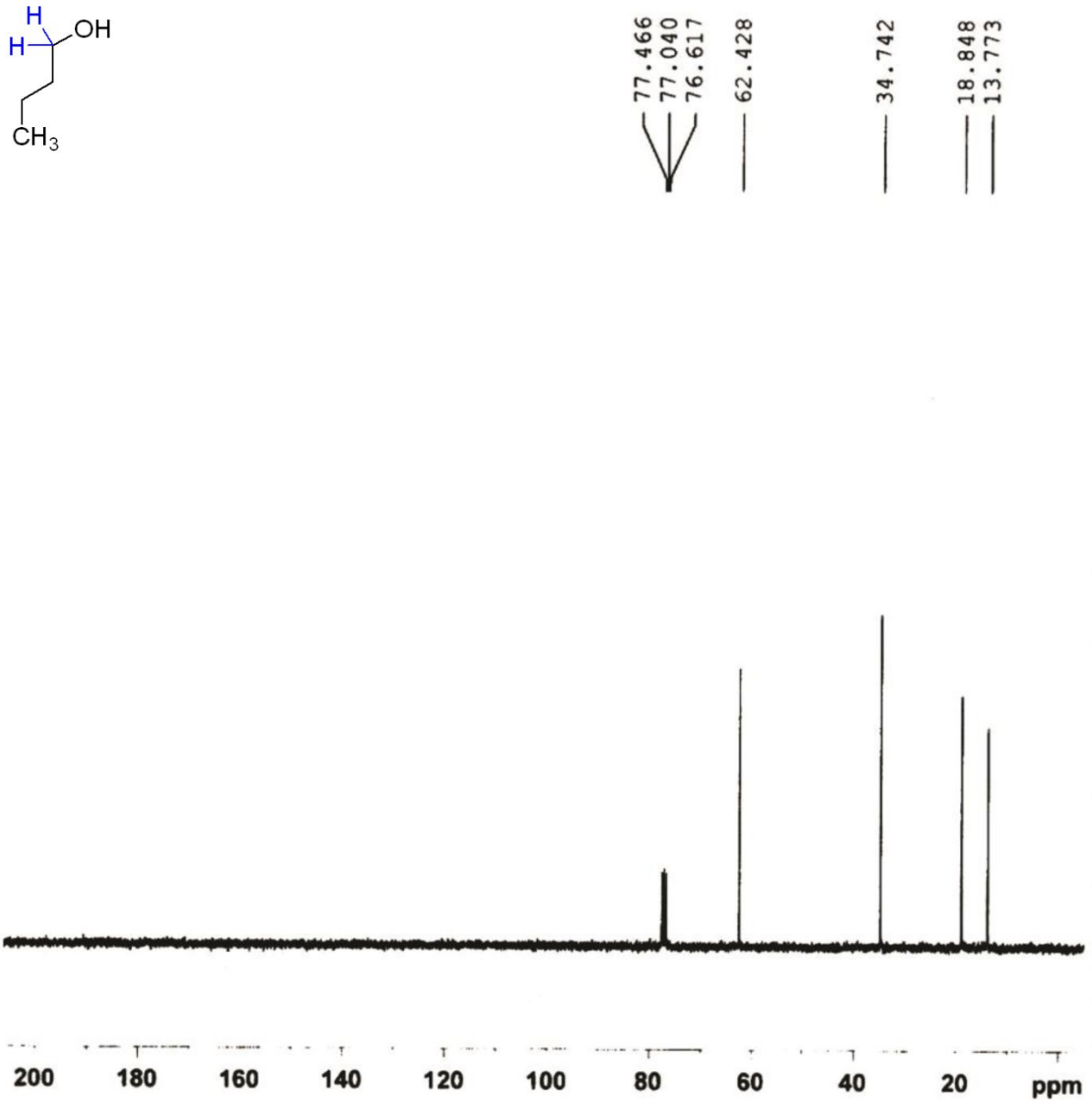


^{13}C NMR: 2-Phenylethan-1-ol



^{1}H NMR: Butan-1-ol





^{13}C NMR: Butan-1-ol