Supporting Information

Investigating the Potent Antibacterial, Antibioflim, Antidiabetic, and Antioxidant Activities of Biosynthesized Iron Oxide Nanoparticles: Recyclable Catalyst for Ammoxidation of Aromatic Aldehydes

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Table S1 MIC and MBC values of Fe_3O_4@PPE nanoparticles

Bacterial strains	MIC (µg/ml)	MBC (µg/ml)
***Staphylococcus aureus* (MRSA1)**	150	300.00
***Staphylococcus aureus* (MRSA2)**	125	250.00
Escherichia coli	250	500.00

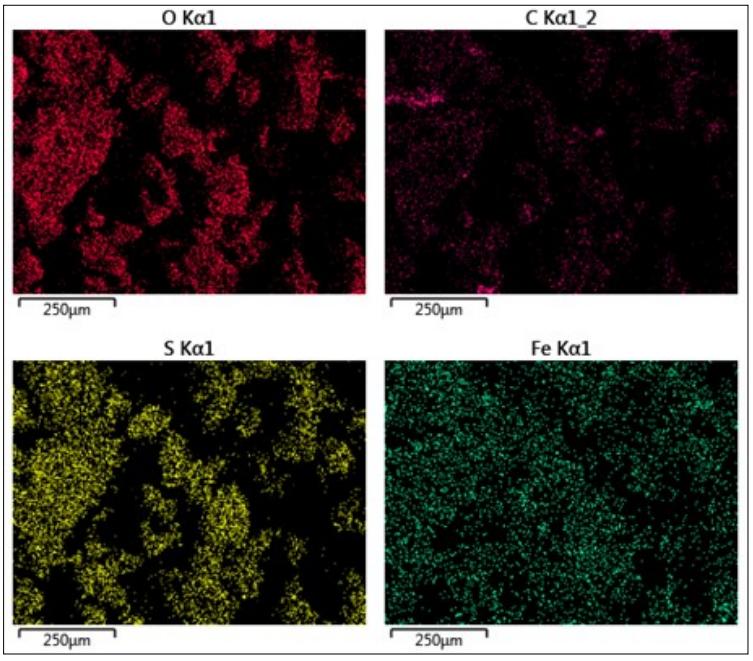


Fig. S1. Elemental mapping images of Fe_3O_4@PPE NPs

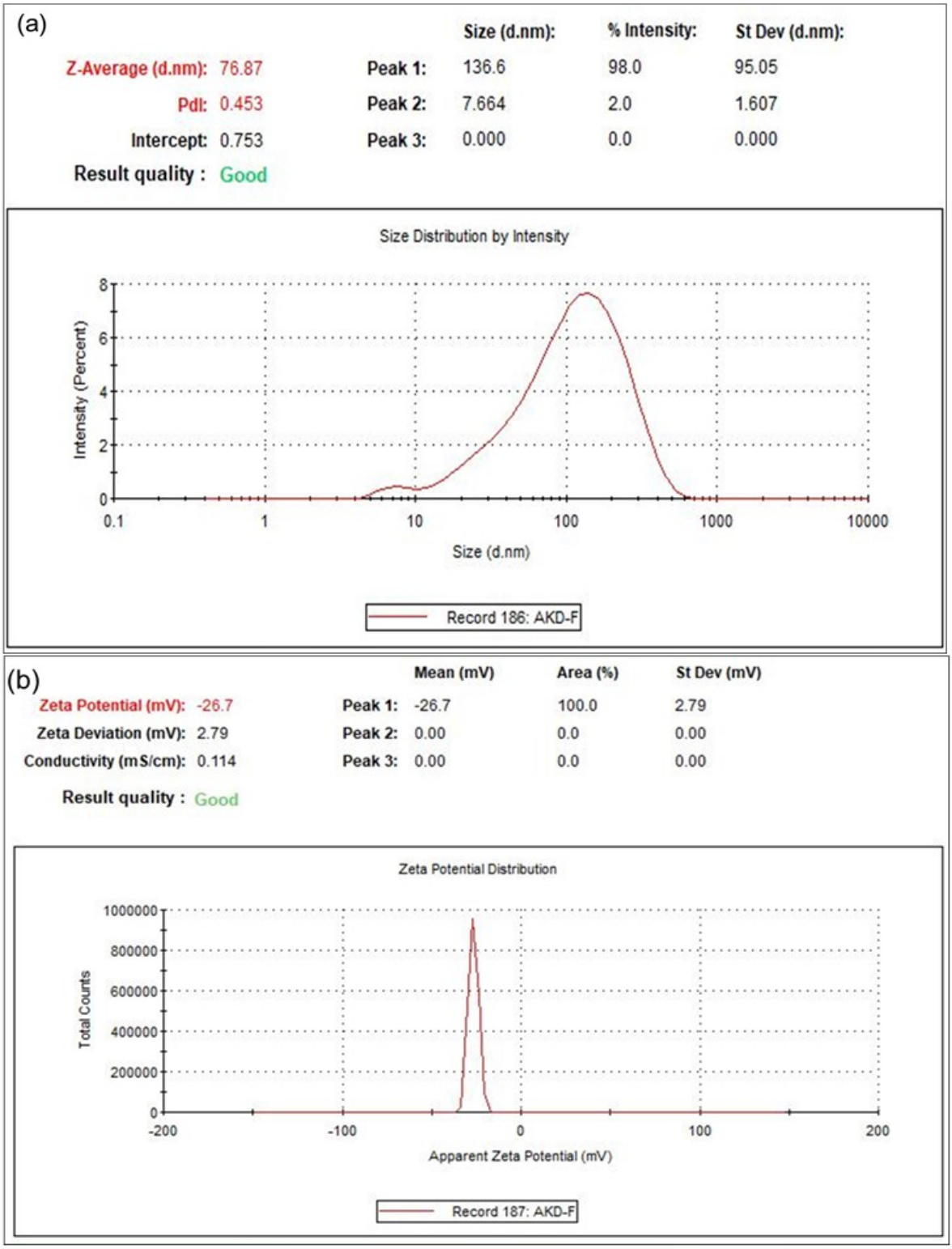


Fig. S2. The particle size (a) and zeta potential (b) analysis of biosynthesized Fe_3O_4@PPE NPs from *Punica Granatum L.* fruit peel extract.

Novelty and Comparisons:

A comparative analysis of the present study from previously reported antibacterial agents and its MIC, MBC and ZOI (Zone of Inhibition) values for some bacteria with the agents are presented in Table S2.

Table S2 Comparative analysis of the present study with available literature reports

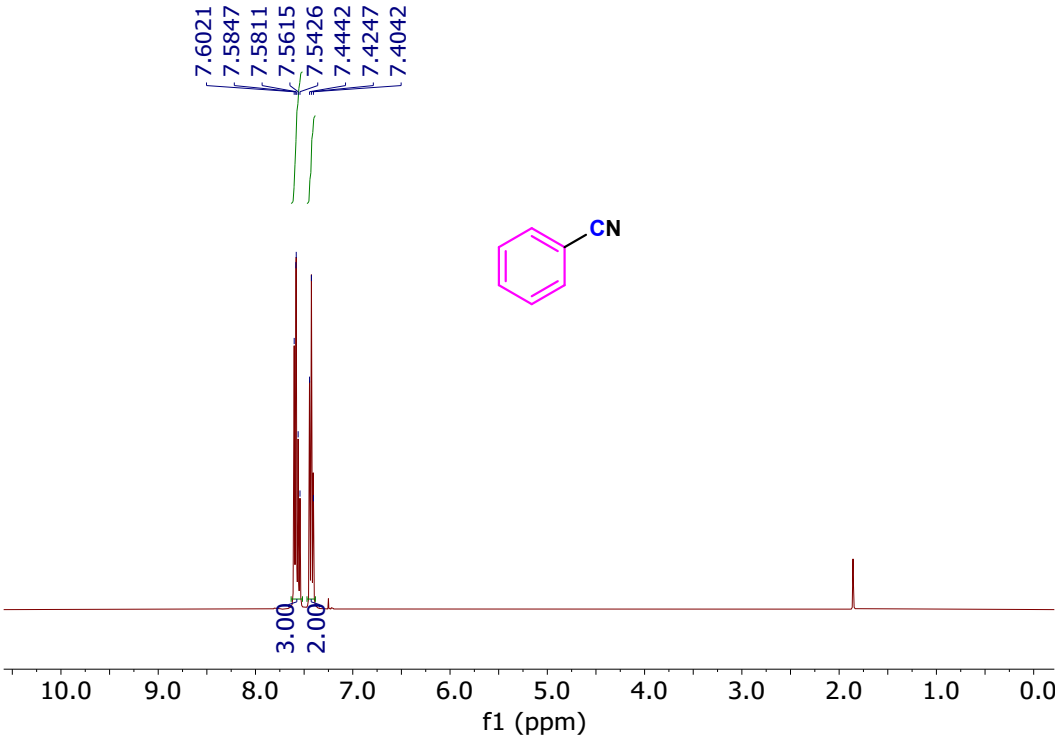
Sl No	Antibacterial	Bacteria	MIC (µg/mL)	MBC (µg/mL)	Zone of inhibition	Ref.
1	Fe_3O_4 NPs	*S.aureus*	150		29	1
2	Fe_3O_4 NPs	*E. coli*	250	500		2
3	Fe_3O_4 NPs	*Pseudomonas aeruginosa*	-	-	22	3
4	Fe_3O_4 coated by chitosan	*A. niger, B. subtilis, C. albicans, E. coli, F. solani*	30-40	-	-	4
5	Fe_2O_3 NPs	*B. subtilis, E. coli, K. pneumoniae, S. aureus*	50	-	-	5
6	Fe_3O_4 NPs	*S.aureus,*	250	250	-	6
		Pseudomonas aeruginosa	250	500	-	
		Klebsiellapneumoniae	500	500	-	
7	Fe_3O_4 NPs	PAO1	6.25	25	8.5	7
8	Fe_3O_4 NPs	MSRT	25	50	6	7
9	Fe_3O_4@CNTs	PM	6.25	25	11	7
10	Fe_3O_4@CNTs	MSRT	12.5	25	8	7
11	PVA/3 wt% Fe_3O_4	*E. Coli*	50	100		7
12	PVA/3 wt% CNTs	*E. Coli*	50	100		7
13	PVA/3 wt% Fe_3O_4@CNTs	*E. Coli*	25	50		7
14	PVA/3 wt% Fe3O4	PAO1	50	100		7
15	PVA/3 wt% Fe_3O_4@CNTs	PAO1	25	50		7
16	Ag NPs	PAO1	3.0	-	-	8
17	ZnO (BE1)	*S.aureus*	-	-	0	9
		E.coli	-	-	10	

		C.albanicans	-	-	0	
18	ZnO (VA1)	*S.aureus*	-	-	8	9
		E.coli	-	-	8	
		C.albanicans	-	-	8	
19	ZnO (PA1)	*S.aureus*	-	-	8	9
		E.coli	-	-	8	
		C.albanicans	-	-	0	
20	ZnO (BR1)	*S.aureus*	-	-	8	9
		E.coli	-	-	10	
		C.albanicans	-	-	8	
21	Fe_3O_4NPs (chemically synthesized)	*E. coli*	850	-	-	10,11
		Staphylococcus aureus	800	-	-	
22	Iron Oxide, Polyethylene Glycol, and Gentamicin Conjugated Nanoparticles (Fe_3O_4NPs+PEG, Fe_3O_4+Gen)	*A. baumannii*	25	-	26.33	11
		P. mirabilis	50	-	25.66	
		S. epidermidis	50	-	23.66	
		E. coli	-	-	21:6	
		Bacillus subtilis	-	-	22	
		Candida albicans	-	-	24	
23	Fe_3O_4 @PPE NPs	*Staphylococcus aureus* (MRSA1)	150	300.00	17.5±0.48	This study
		Staphylococcus aureus (MRSA2)	125	250.00	21.5±0.62	This study
		Escherichia coli	250	500.00	13.5 ±0.49	This study
		Candida albicans	-	-	0	This study

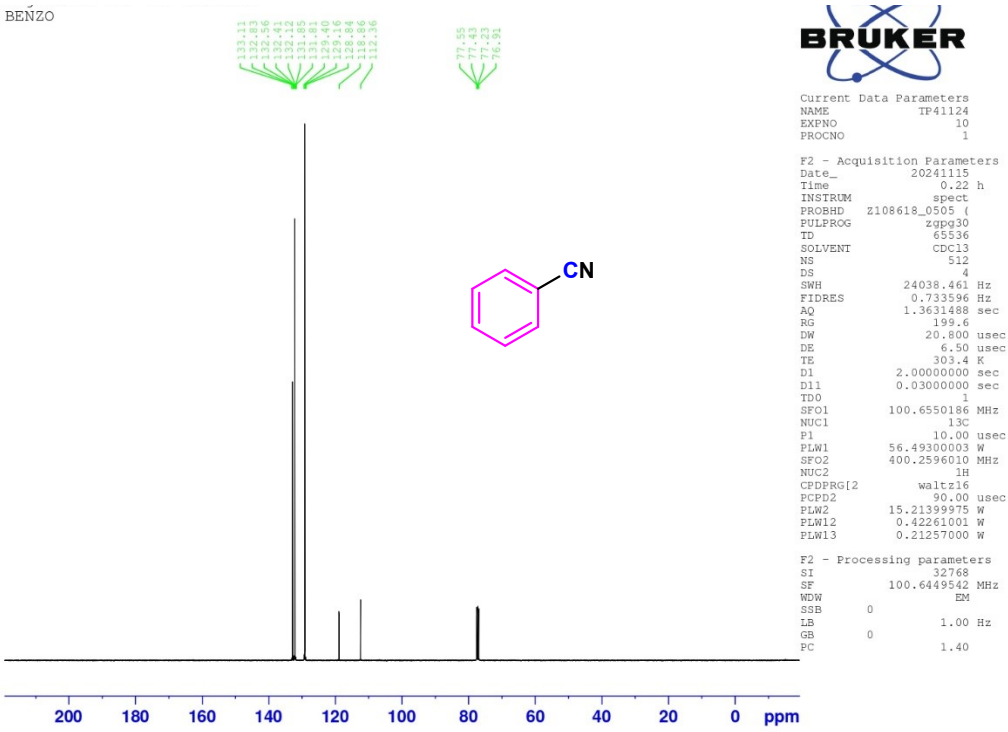
Thukkaramet al.[1] had shown that MIC value of synthesized Fe_3O_4 NPs against *Staphylococcus aureus* was 150µg/mL while Khatami et al.[2] had shown MIC and MBC values of iron oxide nanoparticles against *Escherichia coli* were 250µg/mL and 500µg/mL respectively. There was

another report on antibacterial activity of Fe_3O_4 NPs using *Punica granatum* peel extract synthesized by Irshad et al.[3] against *Pseudomonas aeruginosa*. Nehra et al.[4] had explored the MIC value of Fe_3O_4 coated by chitosan was 30–40 µg/mL against *A. niger, B. subtilis, C.albicans* and *E. coli*. Fe_2O_3-NPs synthesized by Pallela et al.[5] had both antibacterial and antifungal activity (against *C. albicans*). MIC value of Fe_3O_4 nanoparticles using extract of *Malvasylvestris* by Mousavi et al.[6] was 62.5 -125 µg/mL against *Pseudomonas aeruginosa*, *Staphylococcus aureus, Corynebacterium, Klebsiella pneumonia*. Agarwal et al.[7] had shown the MIC and MBC values of their synthesized PVA/3 wt% Fe_3O_4 and PVA/3 wt% Fe_3O_4@CNTs were 50 µg/mL and 100 µg/mL, and 25 µg/mL and 50 µg/mL respectively against *Escherichia coli*. Al-Rawi et al.[10] also had shown antibacterial property of Fe_3O_4 nanoparticles against both Gram-negative and Gram-positive bacteria. Abdulsada et al.[11] reported that MIC values of their synthesized conjugated nanoparticles using Iron Oxide, Polyethylene Glycol and Gentamicin against *Acinetobacterbaumannii* was 25µg/mL and 50 µg/mL against *Proteus mirabilis* and *Staphylococcusepidermidis*.

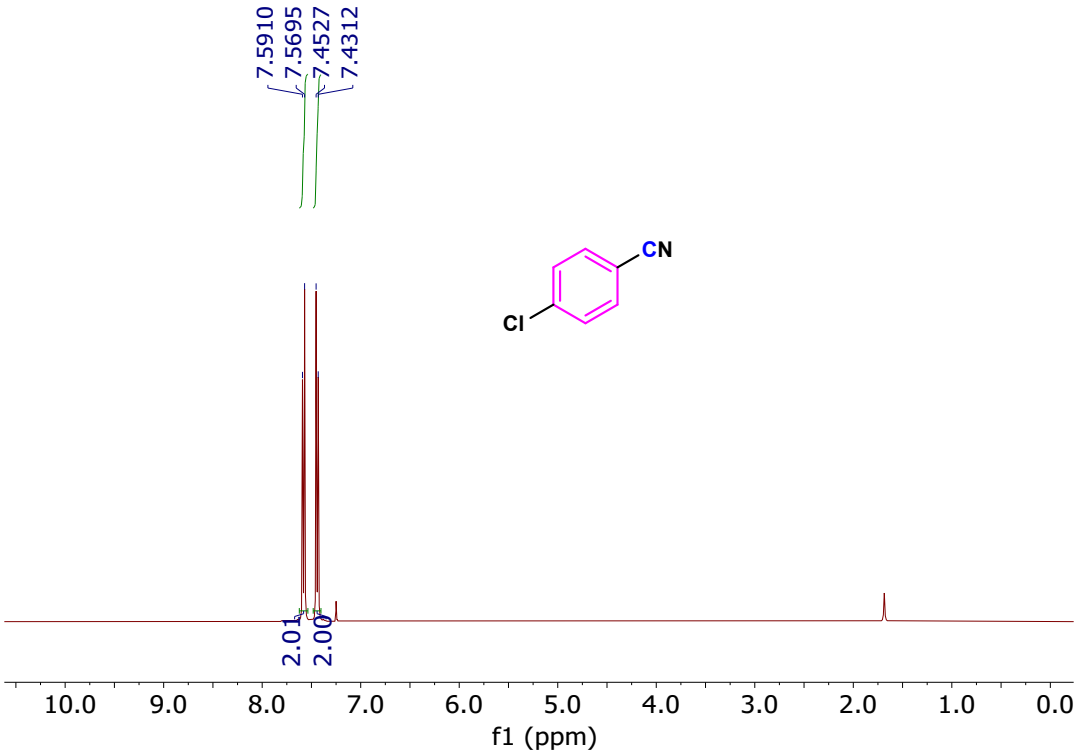
Representative ^{1}H and ^{13}C NMR Spectra of the Products



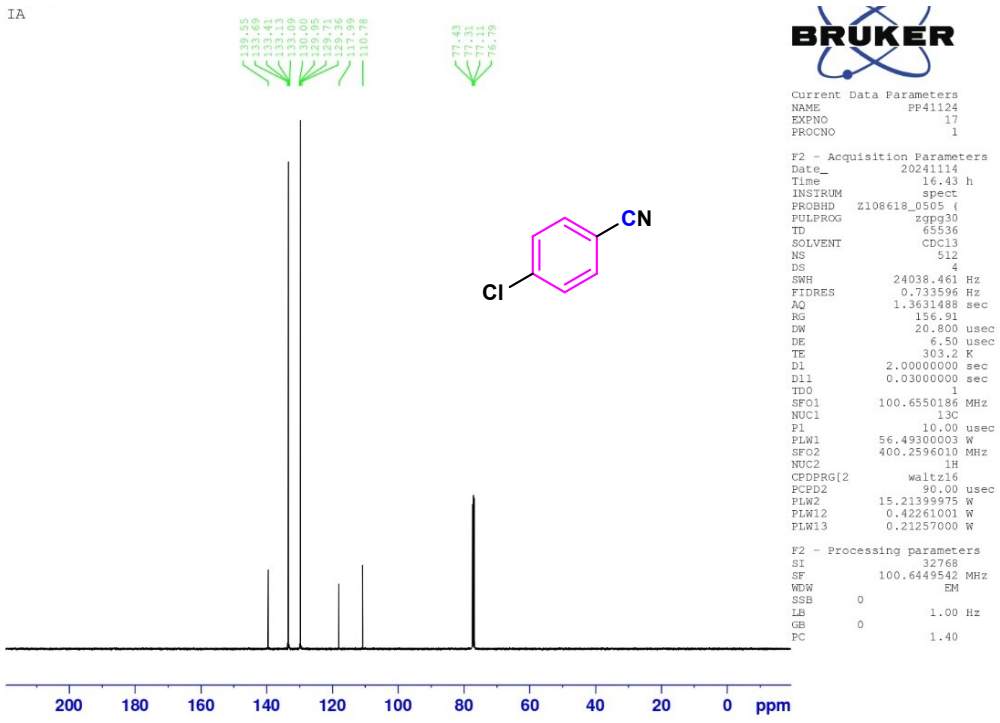
^{1}H NMR of Benzonitrile



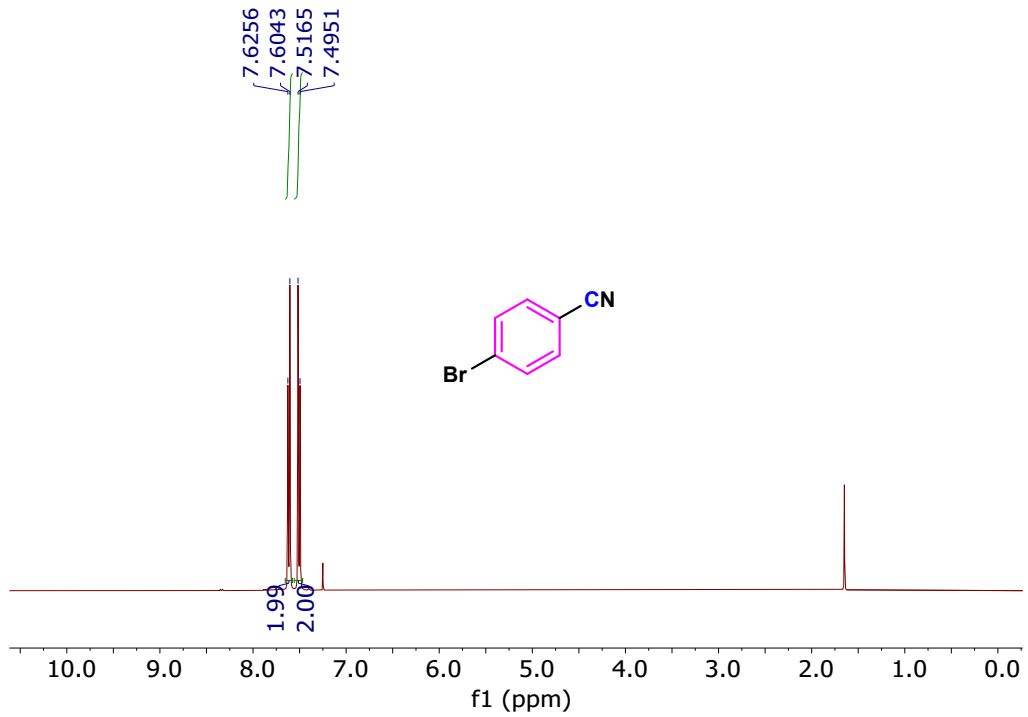
^{13}C NMR of Benzonitrile



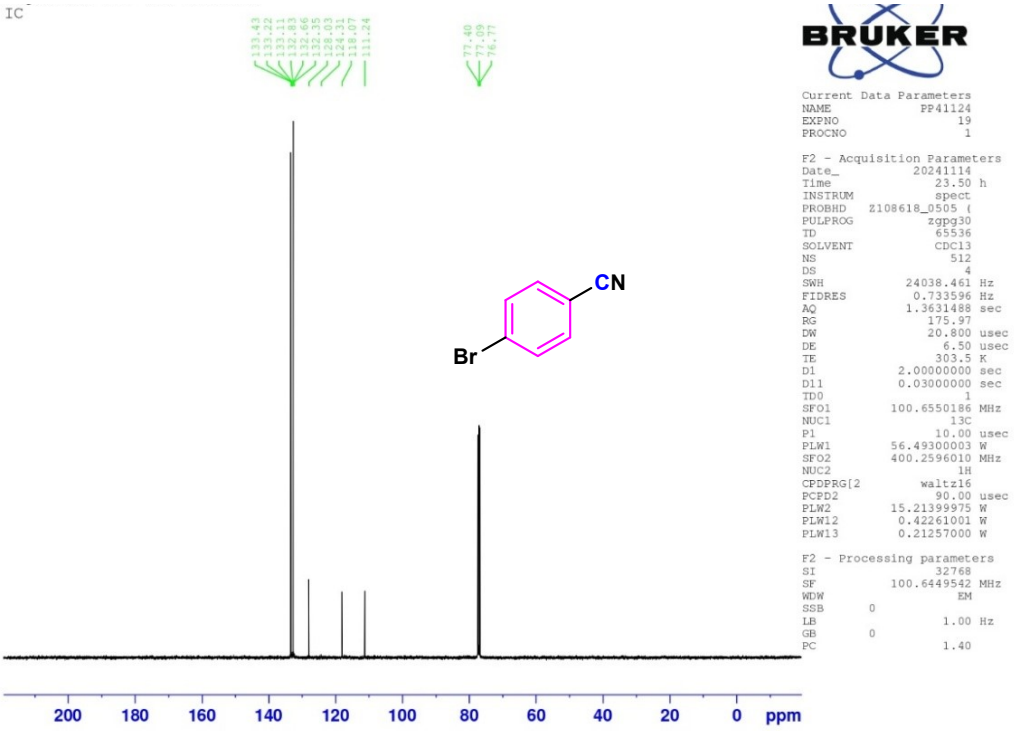
^{1}H NMR of 4-chlorobenzonitrile



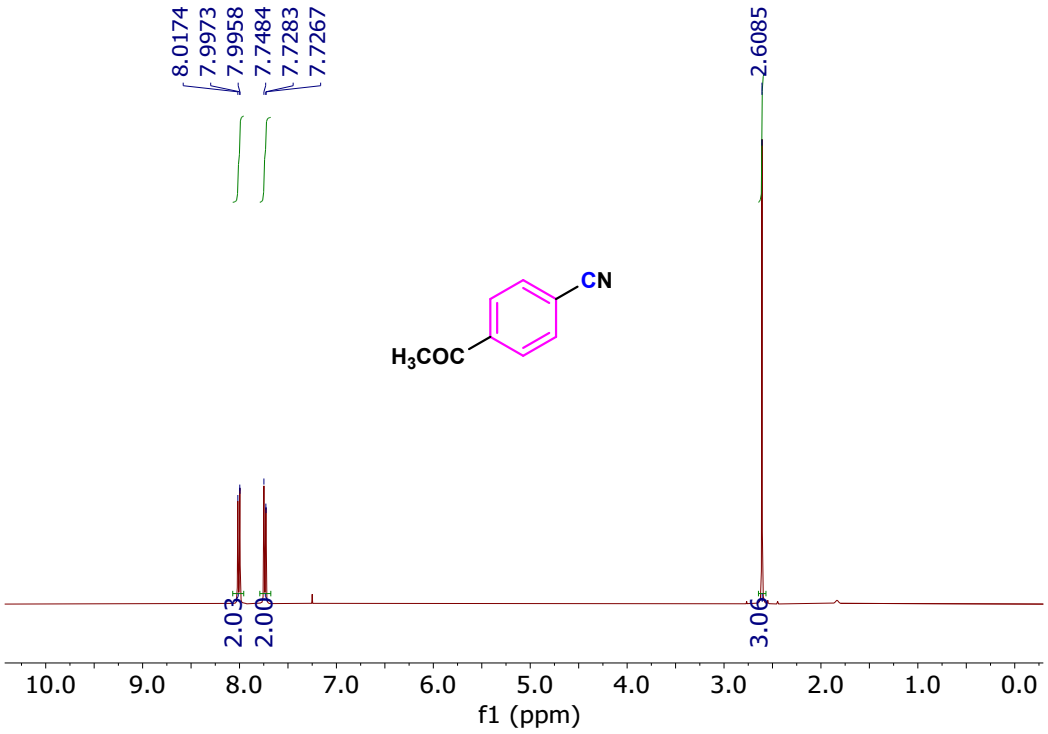
^{13}C NMR of 4-chlorobenzonitrile



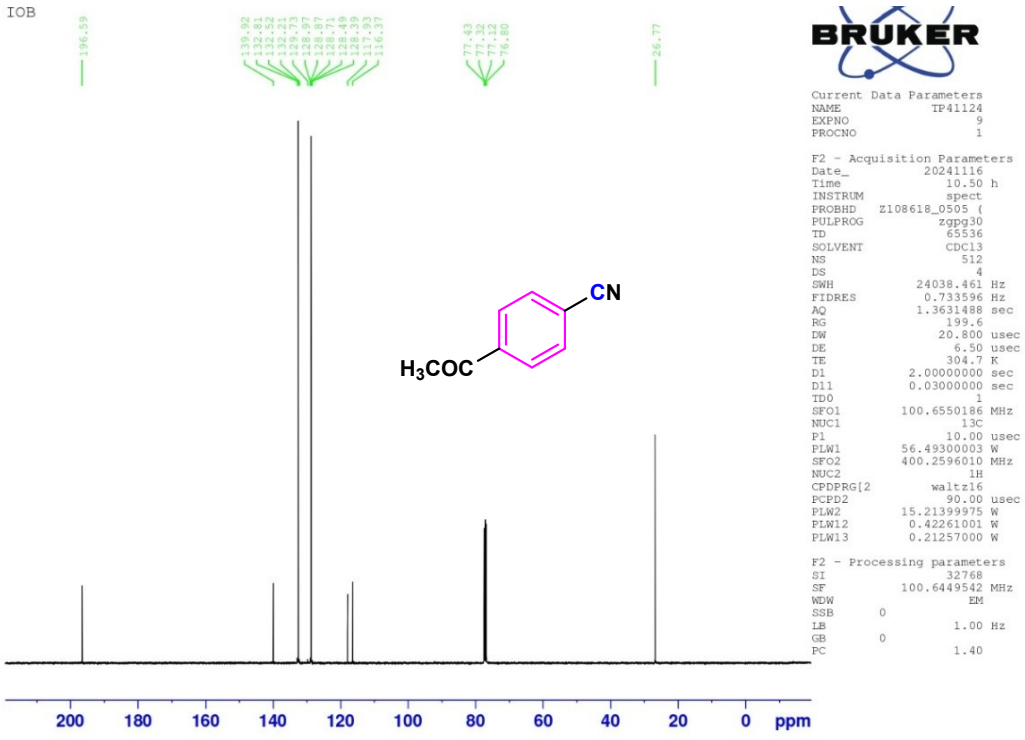
^{1}H NMR of 4-bromobenzonitrile



^{13}C NMR of 4-bromobenzonitrile



^{1}H NMR of 4-acetylbenzonitrile



^{13}C NMR of 4-acetylbenzonitrile

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