

## Supporting Information

### Selective photocatalytic oxidation of aromatic alcohols to aldehydes with air by magnetic $\text{WO}_3\text{ZnO}/\text{Fe}_3\text{O}_4$ . *In situ* photochemical synthesis of 2-substituted benzimidazoles

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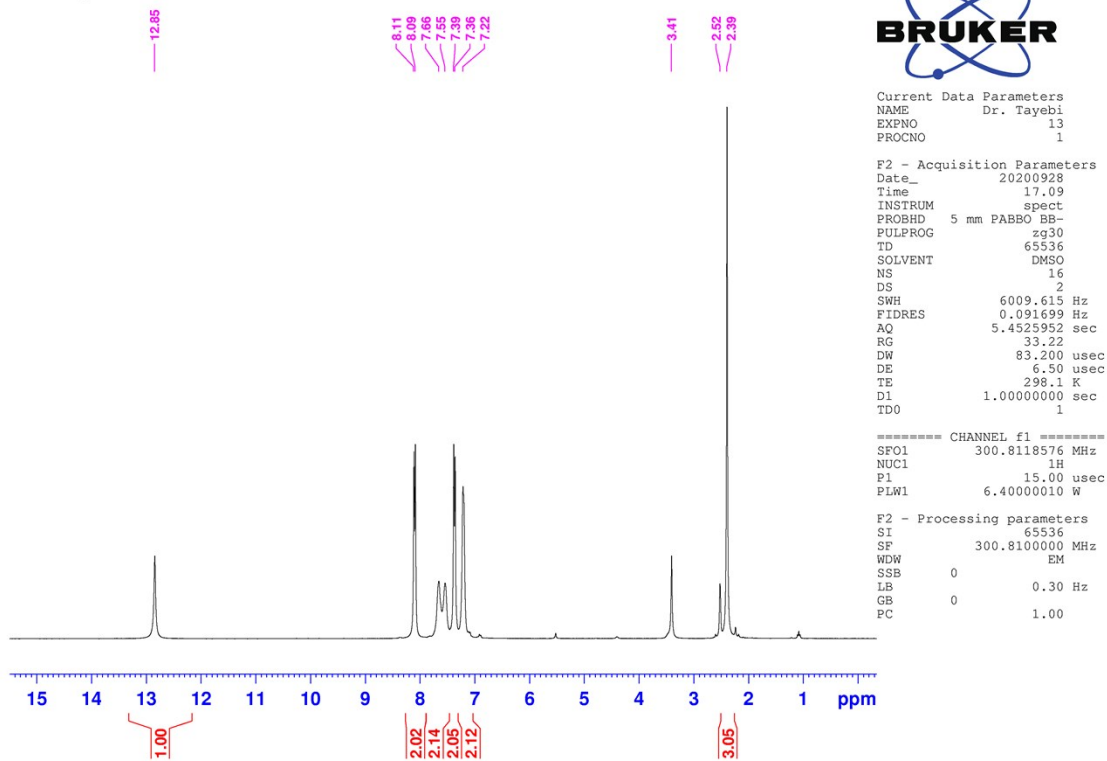
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<sup>3</sup>Department of Chemistry, Payame Noor University (PNU), Tehran, 19395-4697, Iran

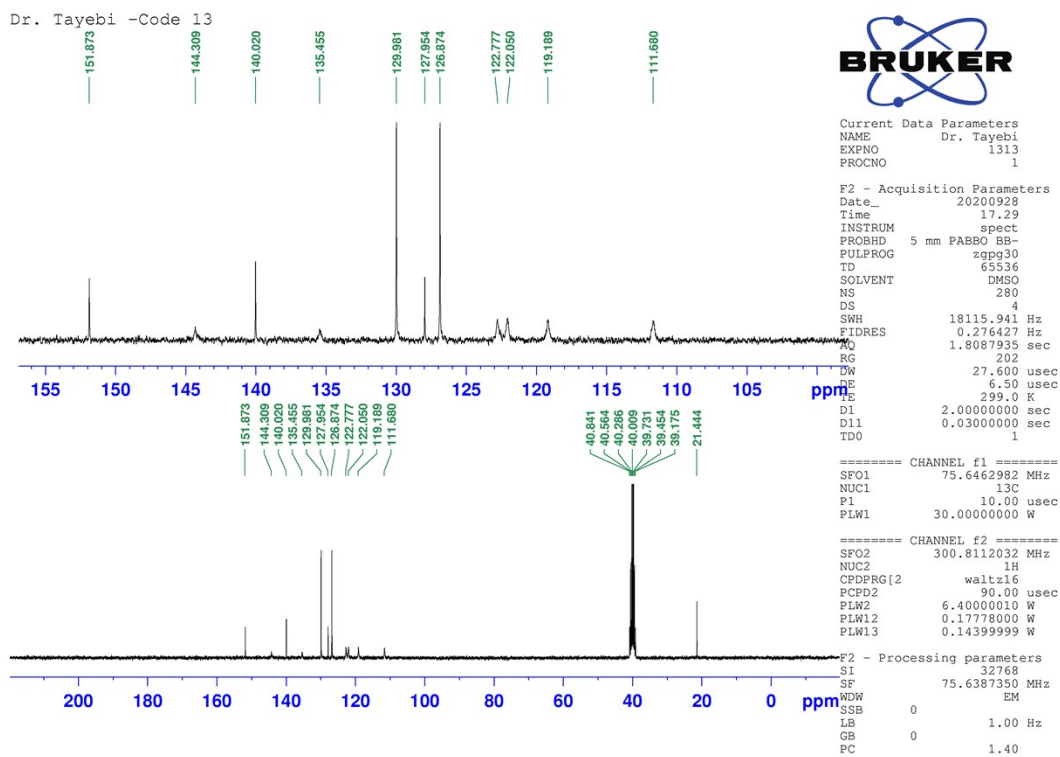
#### General

<sup>1</sup>H- and <sup>13</sup>C-NMR spectra were recorded on a 300 MHz Bruker AVANCEC III spectrometer in DMSO-*d*<sub>6</sub> using TMS as the internal reference.

Dr. Tayebi -Code 13



**Fig. S1**  $^1\text{H}$ -NMR Spectrum of 2-(4-methyl-phenyl)-benzimidazole (Table 2, entry 1).



**Fig. S2**  $^{13}\text{C}$ -NMR Spectrum of 2-(4-methyl-phenyl)-benzimidazole (Table 2, entry 1)

Dr. Tayebi -Code 4-Br

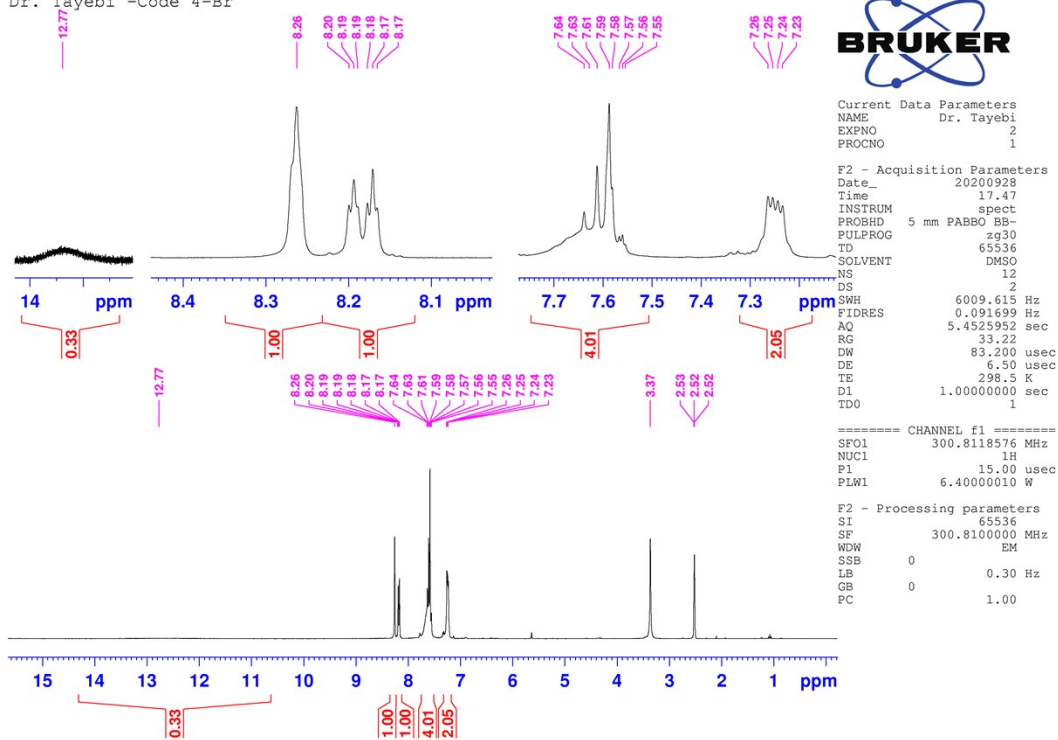
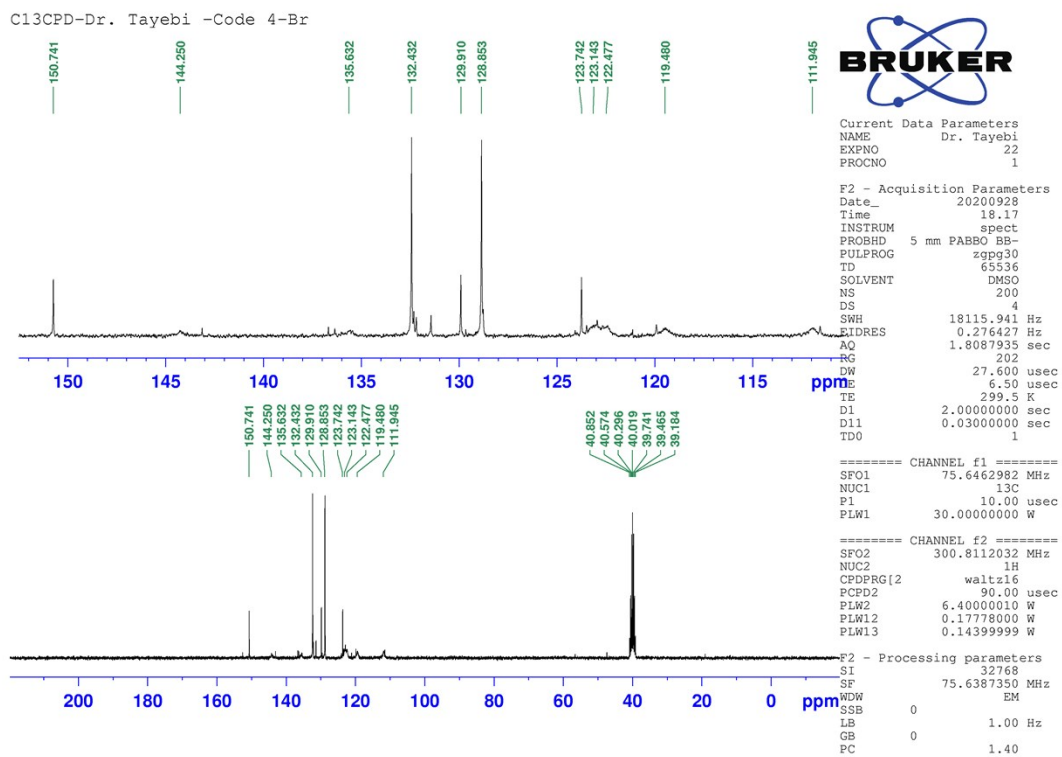
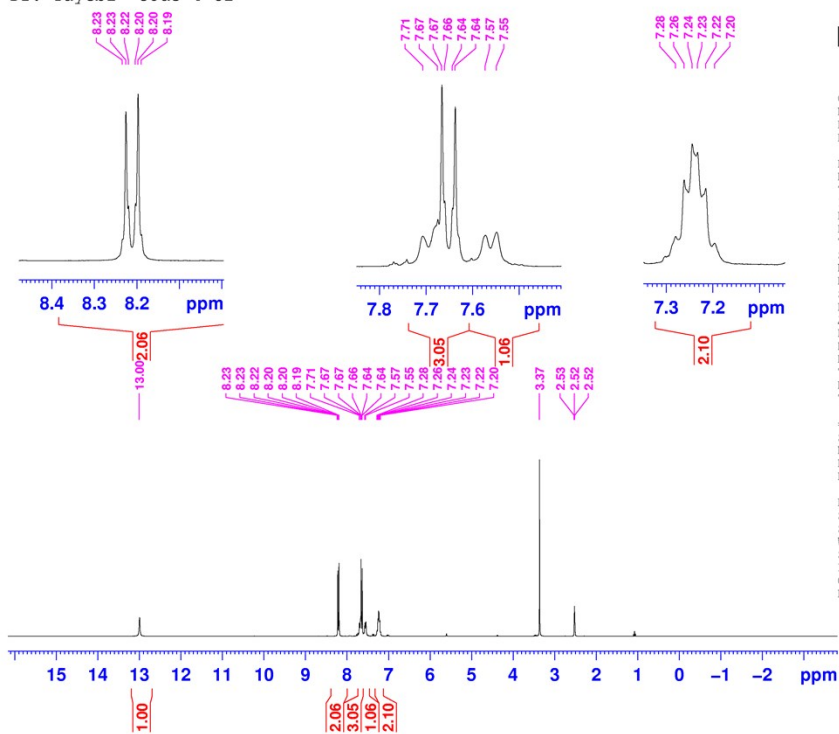


Fig. S3 <sup>1</sup>H-NMR Spectrum of 2-(4-bromo-phenyl)-benzimidazole (Table 2, entry 2)



**Fig. S4**  $^{13}\text{C}$ -NMR Spectrum of 2-(4-bromo-phenyl)-benzimidazole (Table 2, entry 2)

Dr. Tayebi- code 4-C1-



Current Data Parameters  
NAME Dr. Tayebi- code 14  
EXPNO 7  
PROCNO 1

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Time\_ 20.26  
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PULPROG zg30  
TD 65536  
SOLVENT DMSO  
NS 8  
DS 2  
SWH 6009.615 Hz  
FIDRES 0.091699 Hz  
AQ 5.452592 sec  
RG 33.22  
DW 83.200 usec  
DE 6.50 usec  
TE 298.3 K  
D1 1.00000000 sec  
TDO 1

==== CHANNEL f1 =====  
SF01 300.8118576 MHz  
NUC1 1H  
P1 15.00 usec  
PLW1 6.40000010 W

F2 - Processing parameters  
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SF 300.8100000 MHz  
WDW EM  
SSB 0  
LB 0.30 Hz  
GB 0  
PC 1.00

Fig. S5 <sup>1</sup>H-NMR Spectrum of 2-(4-chloro-phenyl)-benzimidazole (Table 2, entry 3)

C13CPD-Dr. Tayebi -Code 4-C1

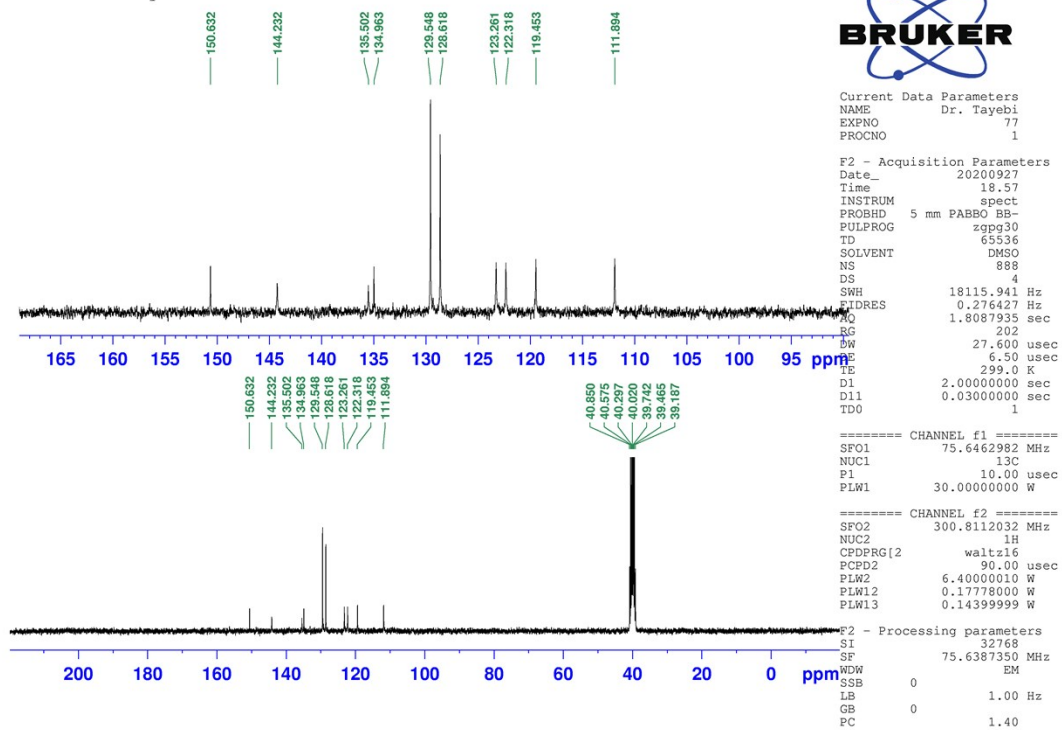
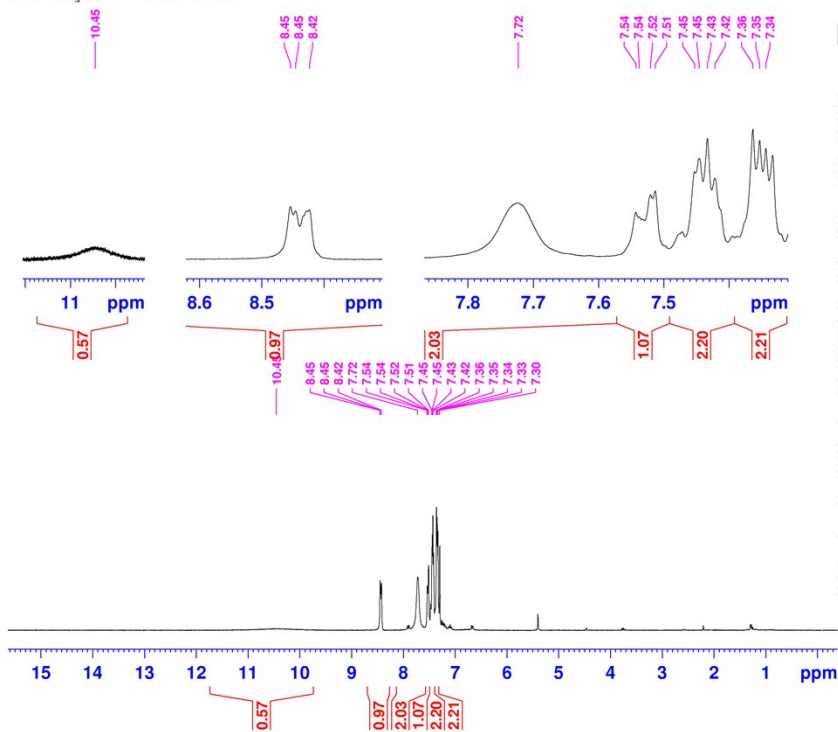


Fig. S6  $^{13}\text{C}$ -NMR Spectrum of 2-(4-chloro-phenyl)-benzimidazole (Table 2, entry 3)

Dr. Tayebi -Code 2-C1



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EXPNO 12  
PROCNO 1

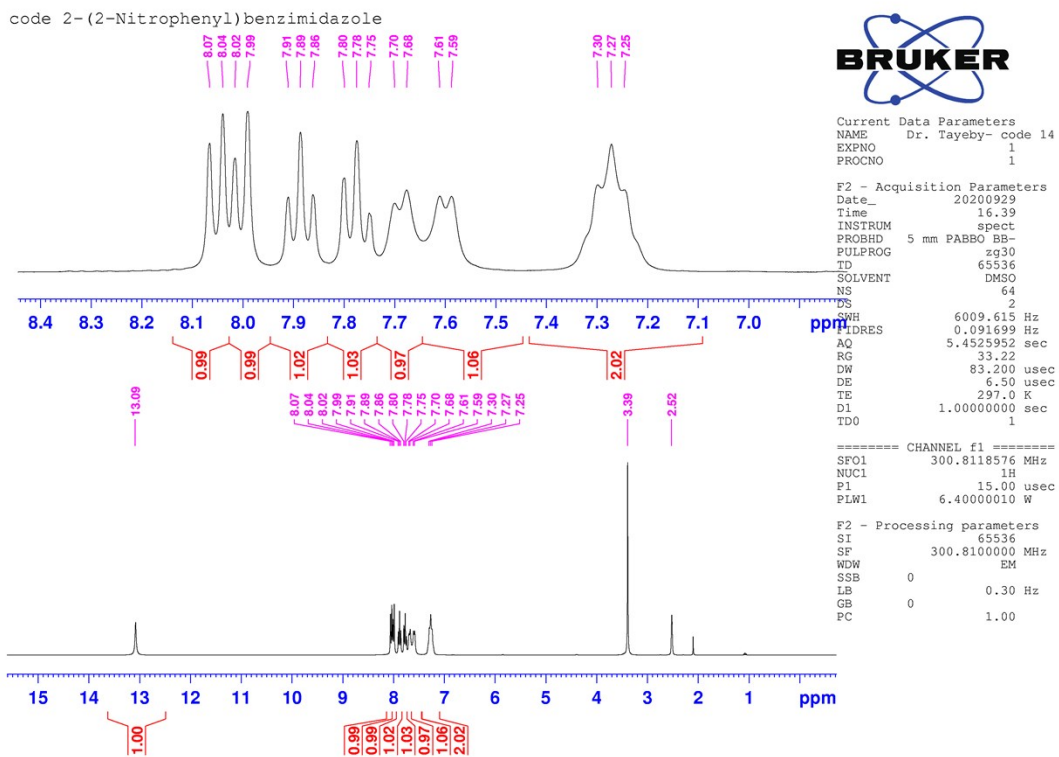
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TD 65536  
SOLVENT CDC13  
NS 200  
DS 2  
SWH 6009.615 Hz  
FIDRES 0.091699 Hz  
AQ 5.4525952 sec  
RG 79.22  
DW 83.200 usec  
DE 6.50 usec  
TE 299.3 K  
D1 1.00000000 sec  
TDO 1

==== CHANNEL f1 =====  
SF01 300.8118576 MHz  
NUC1 1H  
P1 15.00 usec  
PLW1 6.40000010 W

F2 - Processing parameters  
SI 65536  
SF 300.8100000 MHz  
WDW EM  
SSB 0  
LB 0.30 Hz  
GB 0  
PC 1.00

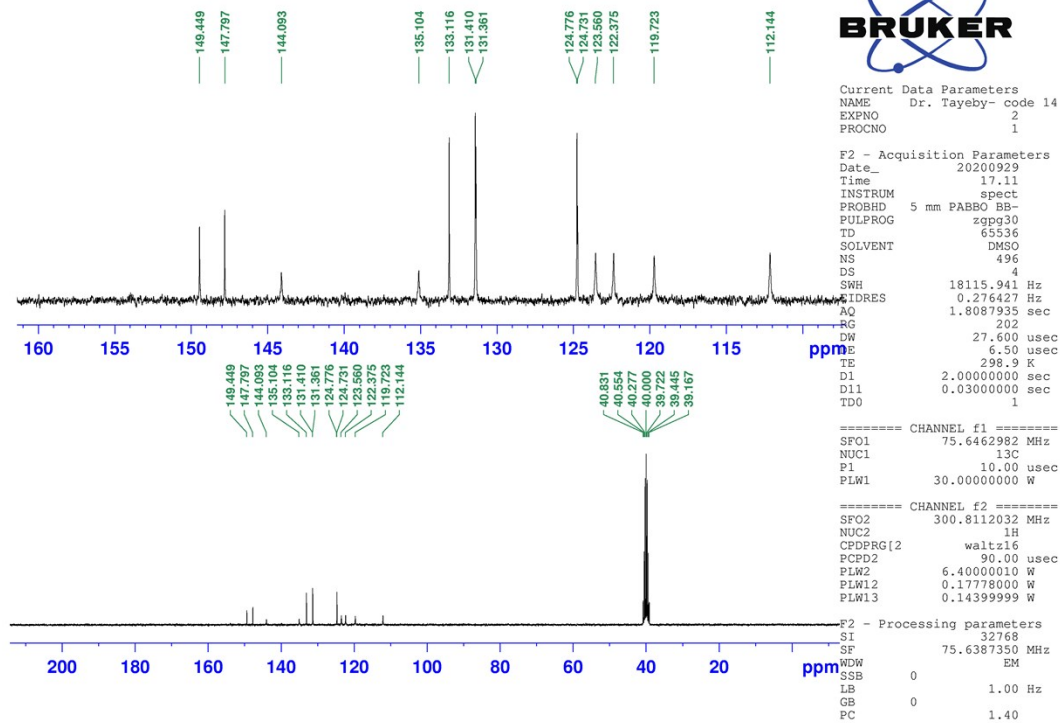
Fig. S7 <sup>1</sup>H-NMR Spectrum of 2-(2-chloro-phenyl)-benzimidazole (Table 2, entry 4)





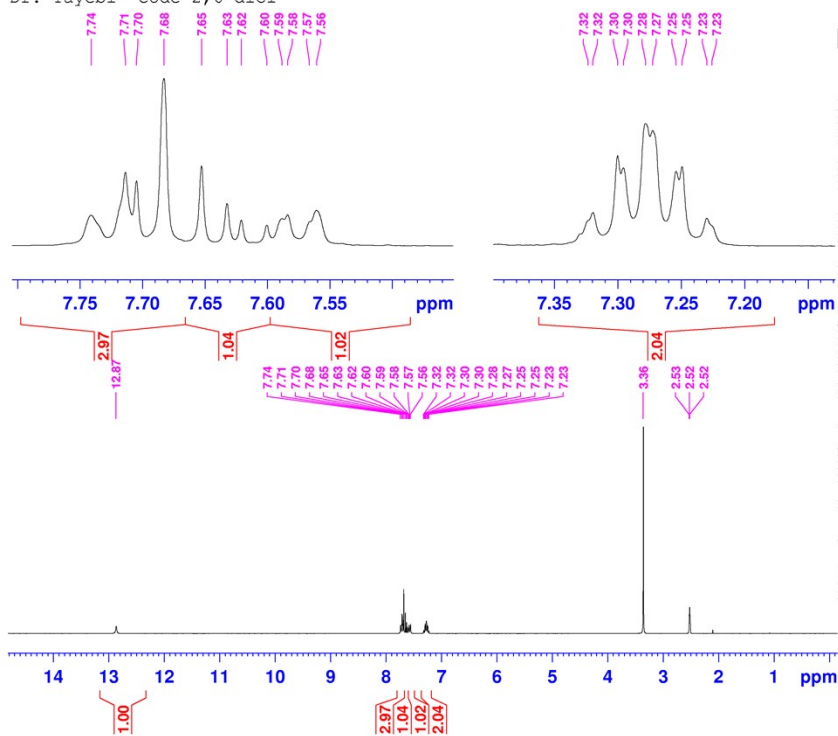
**Fig. S8**  $^1\text{H-NMR}$  Spectrum of 2-(2-nitro-phenyl)-benzimidazole (Table 2, entry 5)

Dr. Tayebi- code 2-(2-Nitrophenyl)benzimidazole



**Fig. S9**  $^{13}\text{C}$ -NMR Spectrum of 2-(2-nitro-phenyl)-benzimidazole (Table 2, entry 5)

Dr. Tayebi- code 2,6-diCl



Current Data Parameters  
NAME Dr. Tayebi  
EXPNO 13  
PROCNO 1

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INSTRUM spect  
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SOLVENT DMSO  
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FIDRES 0.091699 Hz  
AQ 5.4525952 sec  
RG 33.22  
DW 83.200 usec  
DE 6.50 usec  
TE 298.6 K  
D1 1.00000000 sec  
TDO 1

==== CHANNEL f1 =====  
SF01 300.8118576 MHz  
NUC1 1H  
P1 15.00 usec  
PLW1 6.40000010 W

F2 - Processing parameters  
SI 65536  
SF 300.8100000 MHz  
WDW EM  
SSB 0  
LB 0.30 Hz  
GB 0  
PC 1.00

Fig. S10 <sup>1</sup>H-NMR Spectrum of 2-(2, 6-dichloro-phenyl)-benzimidazole (Table 2, entry 6)

C13CPD- Dr. Tayebi- code 2,6-diCl

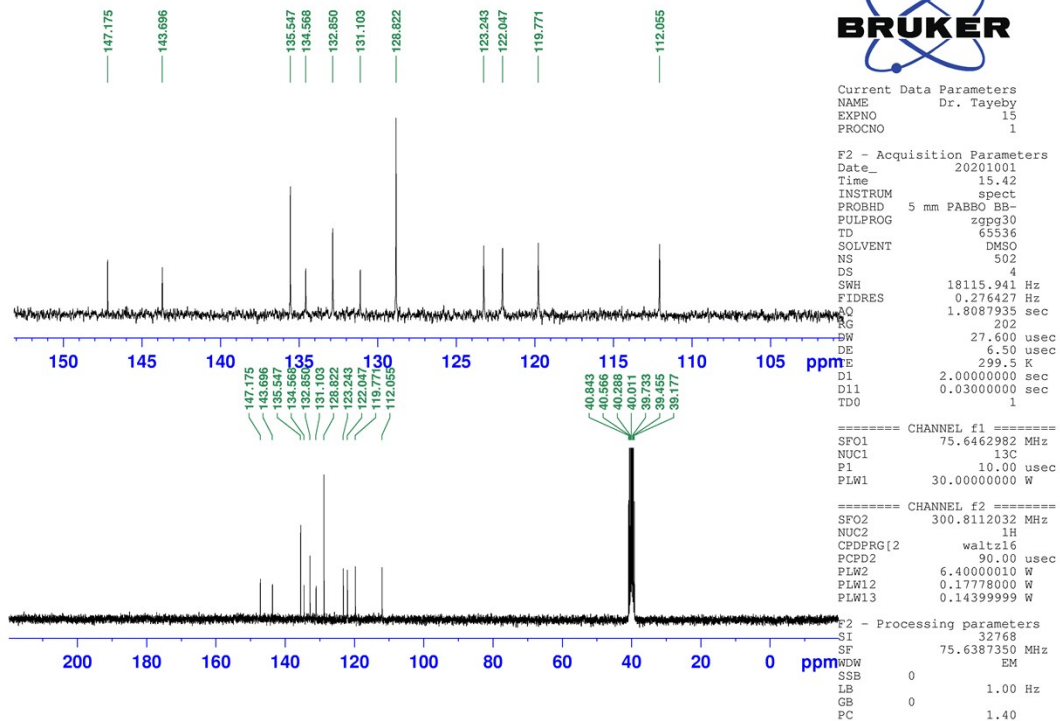
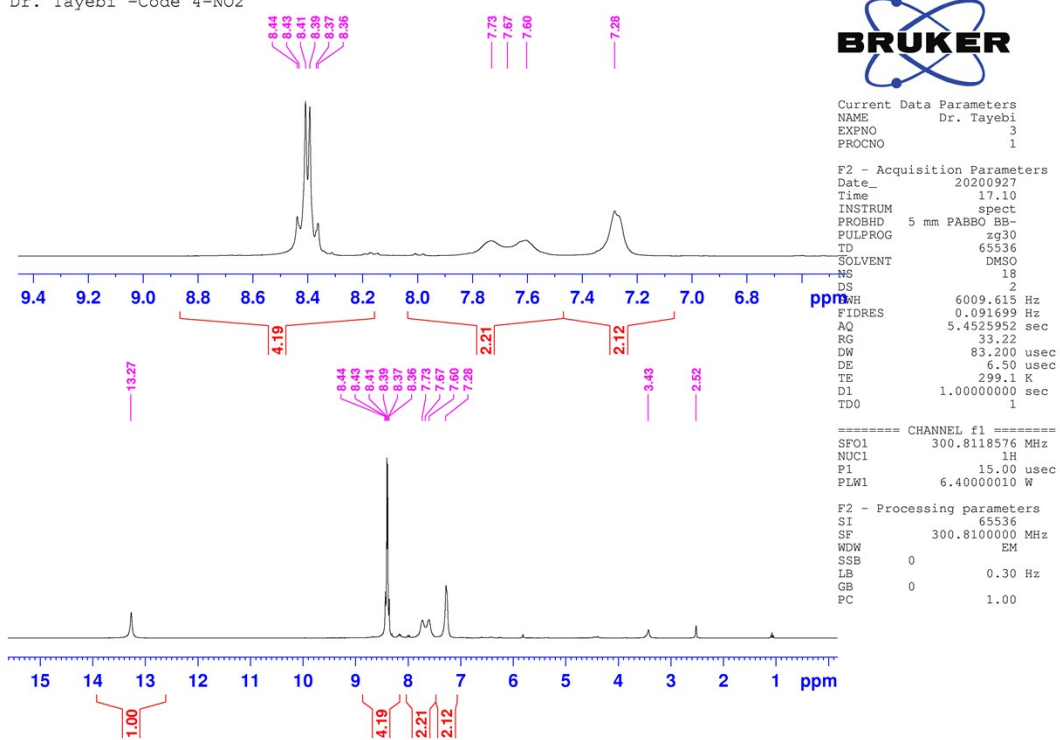


Fig. S11  $^{13}\text{C}$ -NMR Spectrum of 2-(2, 6-dichloro-phenyl)-benzimidazole (Table 2, entry 6)

Dr. Tayebi -Code 4-NO2



**Fig. S12** <sup>1</sup>H-NMR Spectrum of 2-(4-nitro-phenyl)- benzimidazole (Table 2, entry 7)

Dr. Tayebi -Code 4-NO2

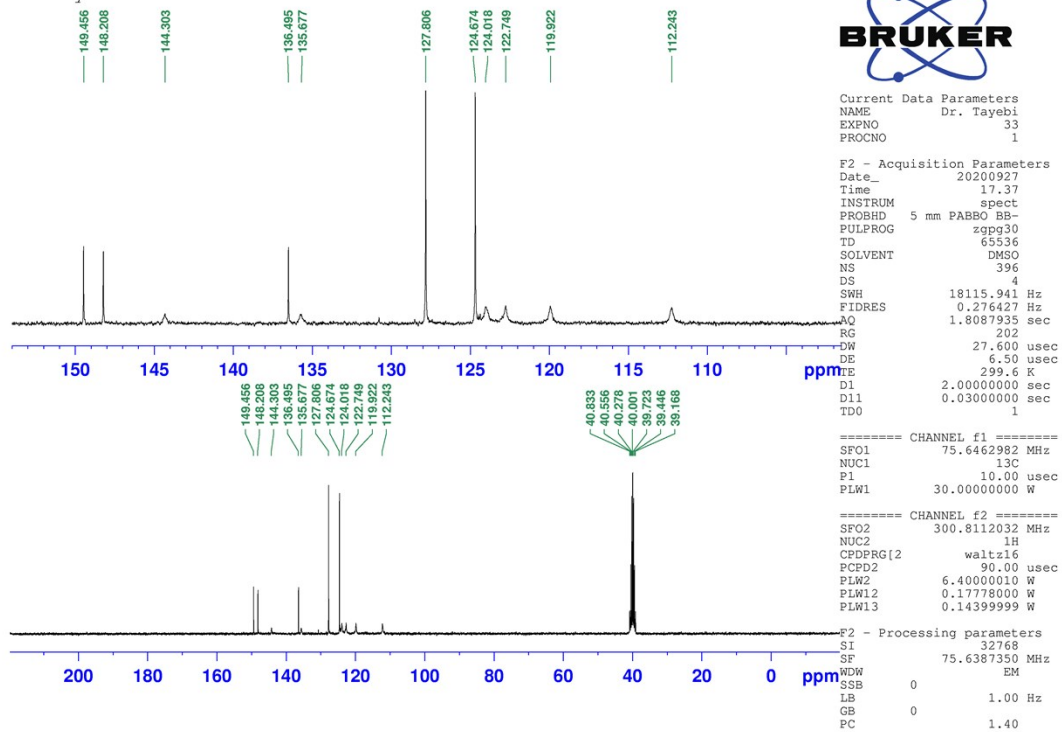
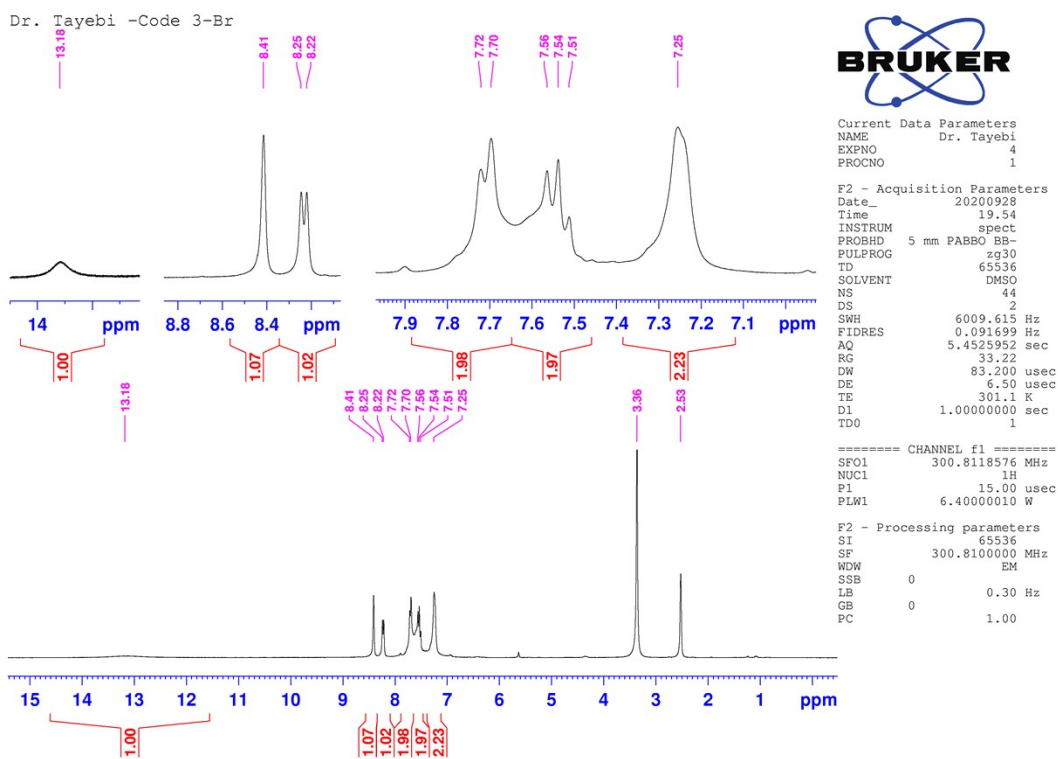
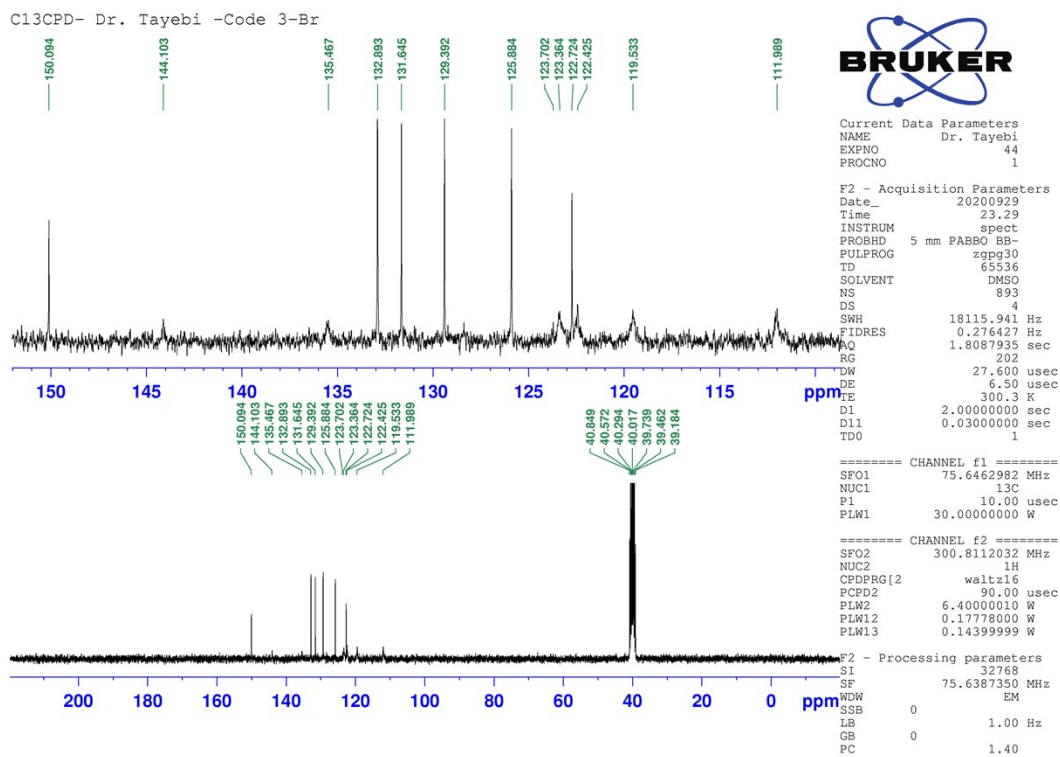


Fig. S13 <sup>13</sup>C-NMR Spectrum of 2-(4-nitro-phenyl)- benzimidazole (Table 2, entry 7)



**Fig. S14**  $^1\text{H}$ -NMR Spectrum of 2-(3-bromo-phenyl)-benzimidazole (Table 2, entry 8)



**Fig. S15**  $^{13}\text{C}$ -NMR Spectrum of 2-(3-bromo -phenyl)-benzimidazole (Table 2, entry 8)



Dr. Tayebi -Code 3-C1

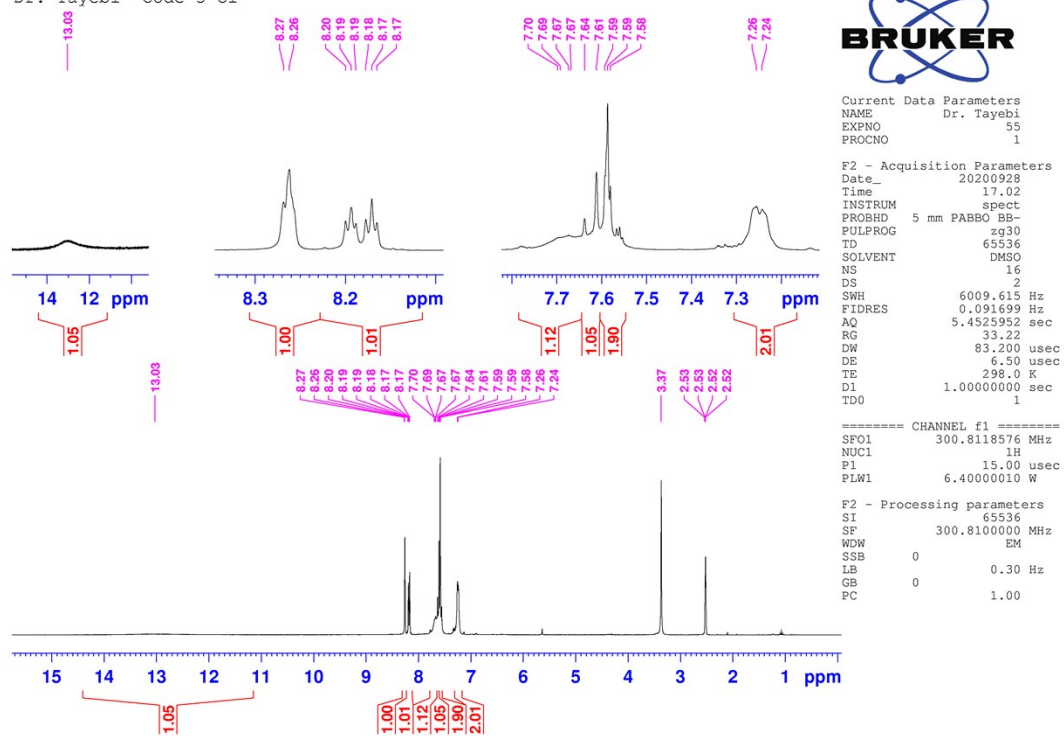


Fig. S16 <sup>1</sup>H-NMR Spectrum of 2-(3-chloro-phenyl)-benzimidazole (Table 2, entry 9)

C13CPD- Dr. Tayebi- code 3-C1

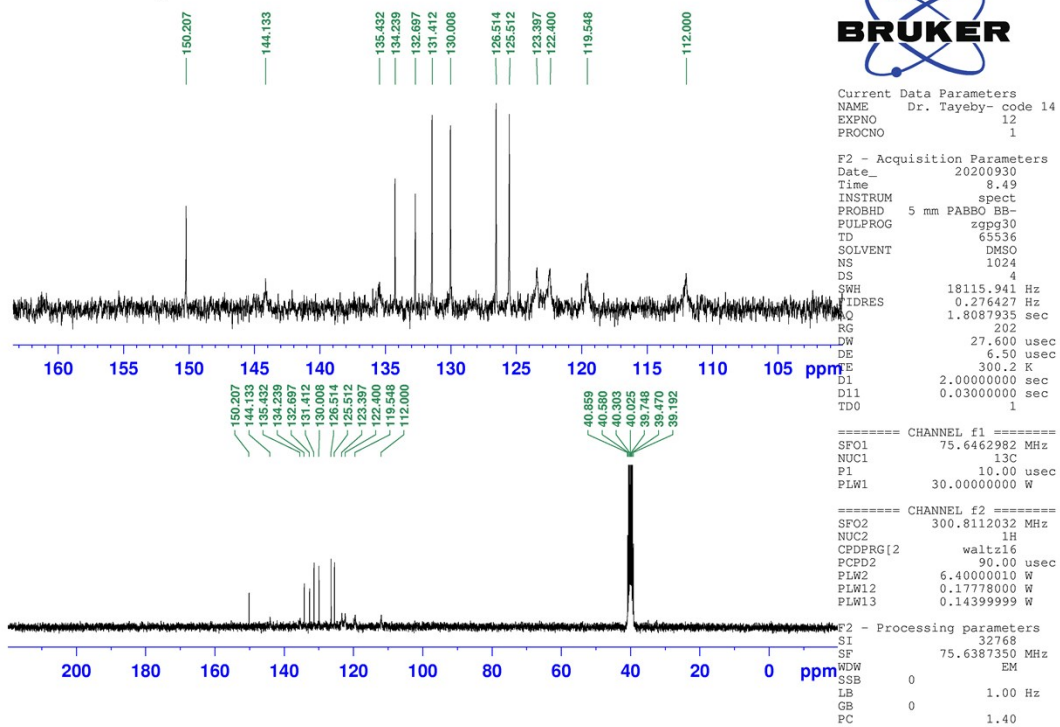
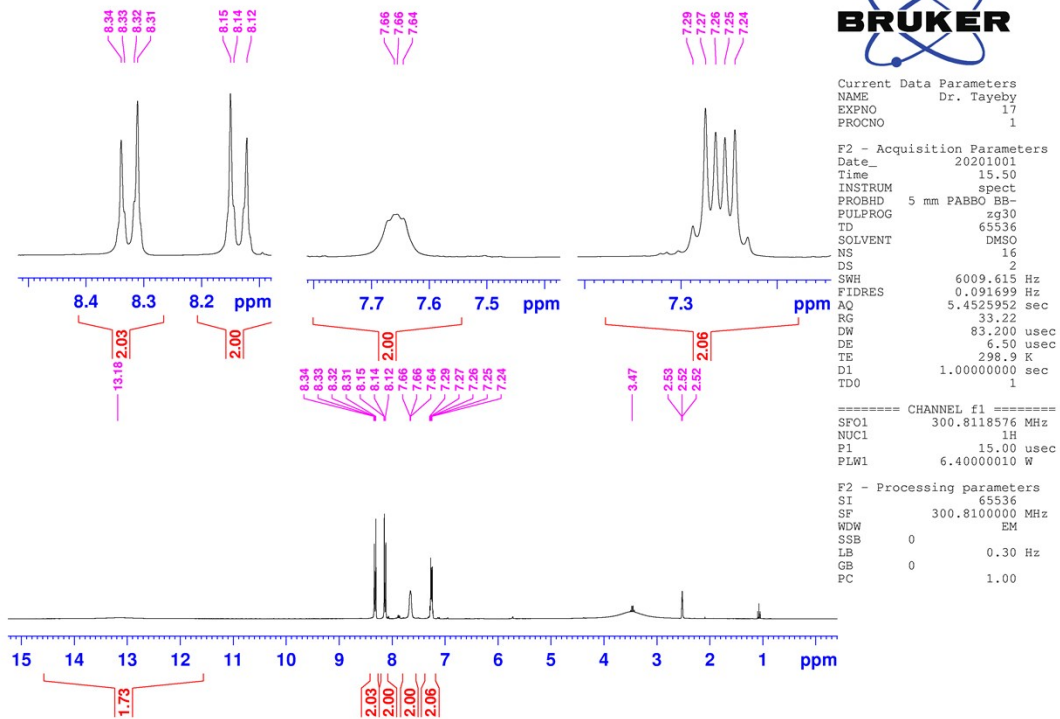


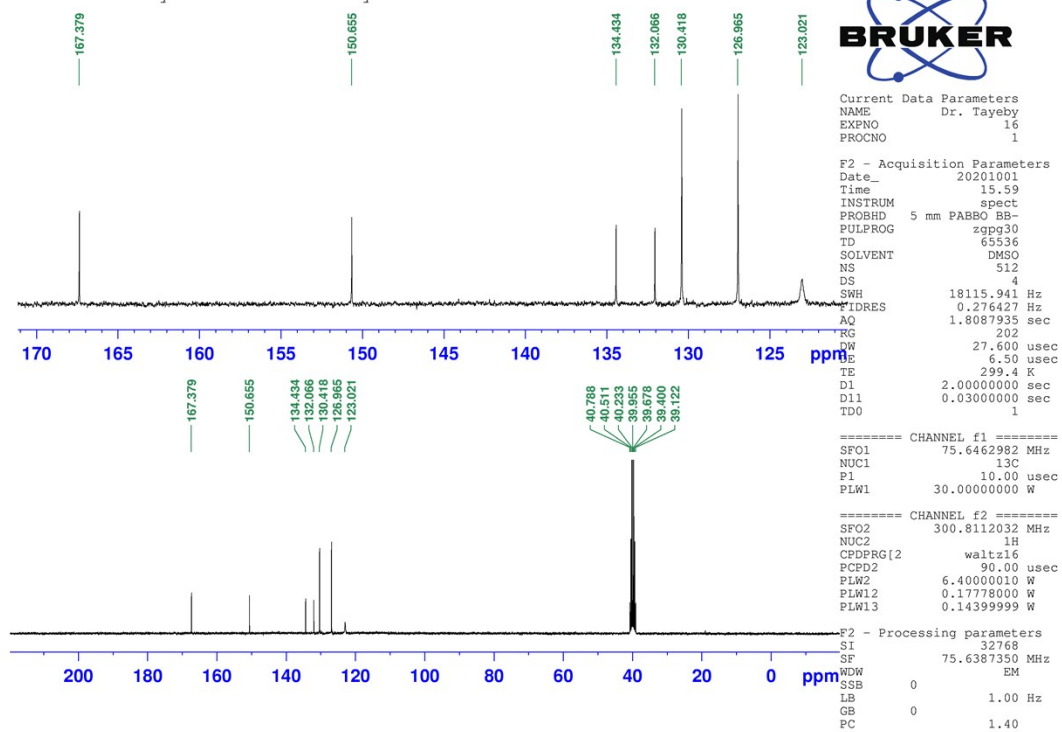
Fig. S17  $^{13}\text{C}$ -NMR Spectrum of 2-(3-chloro-phenyl)-benzimidazole (Table 2, entry 9)

Dr. Tayebi- code 4-Carboxy



**Fig. S18**  $^1\text{H-NMR}$  Spectrum of 2-(4-carboxy-phenyl)-benzimidazole (Table 2, entry 10)

C13CPD- Dr. Tayebi- code 4-Carboxy



**Fig. S19**  $^{13}\text{C}$ -NMR Spectrum of 2-(4-carboxy-phenyl)-benzimidazole (Table 2, entry 10)

Dr. Tayebi -Code Benz (code 11)-

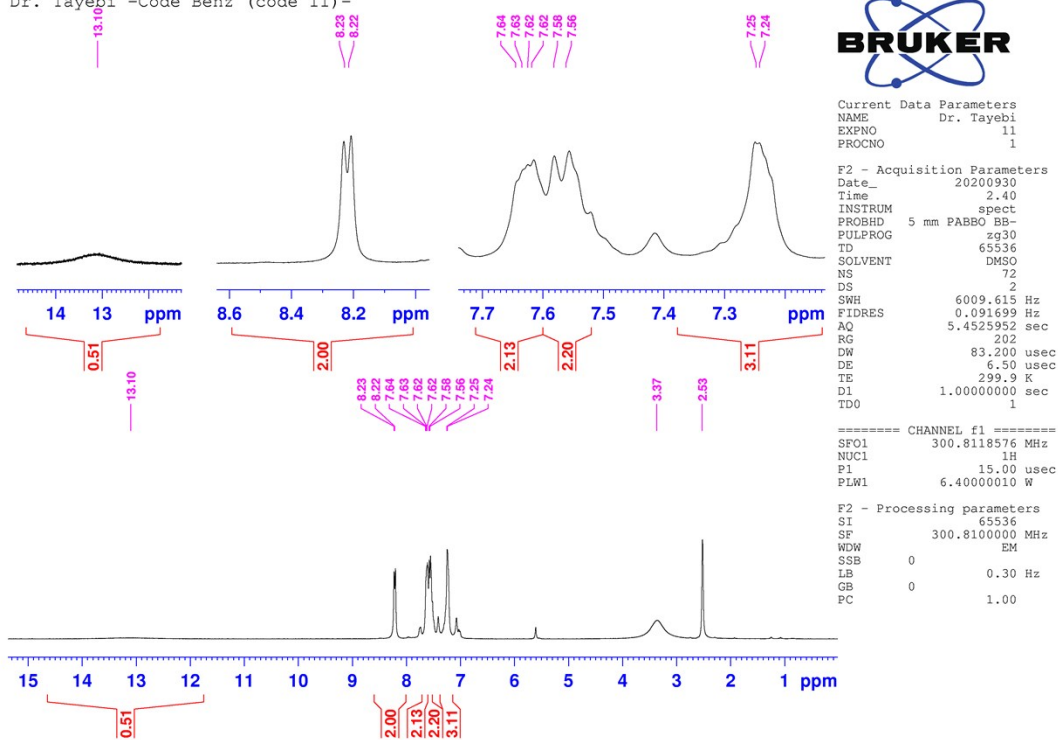


Fig. S20. <sup>1</sup>H-NMR Spectrum of 2-(phenyl)-benzimidazole (Table 2, entry 11)

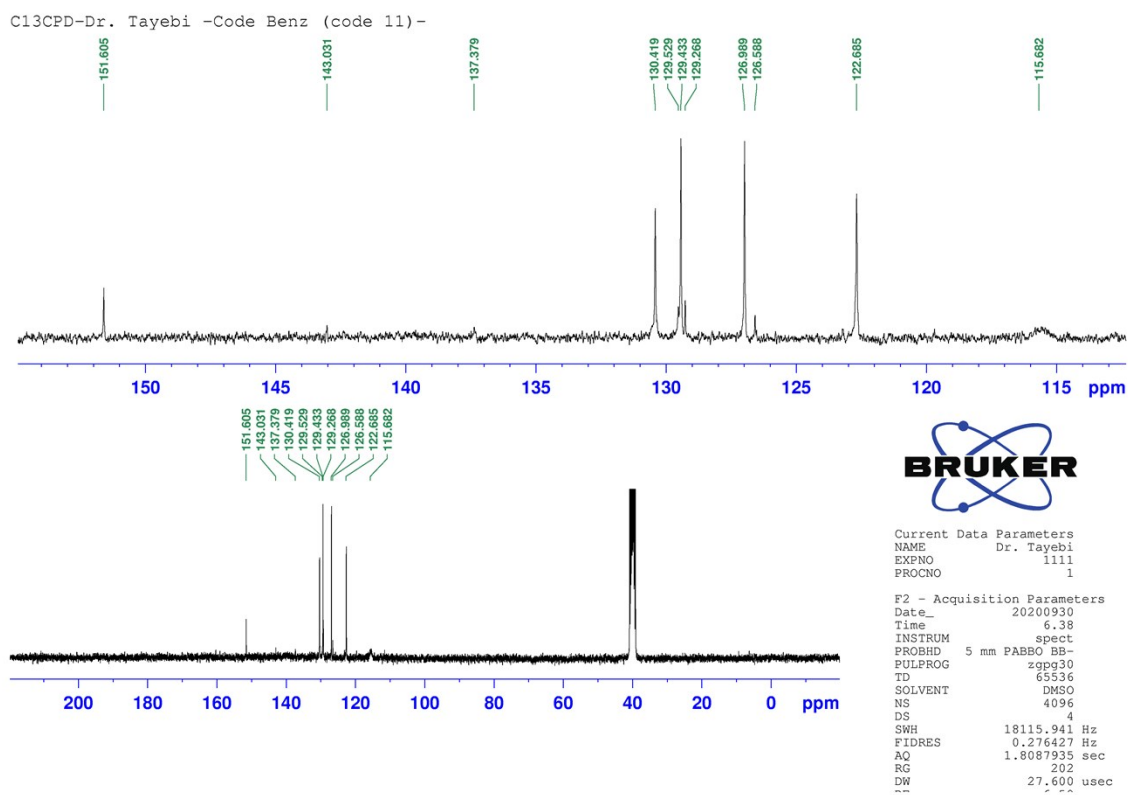


Fig. S21.  $^{13}\text{C}$ -NMR Spectrum of 2-(phenyl)-benzimidazole (Table 2, entry 11)

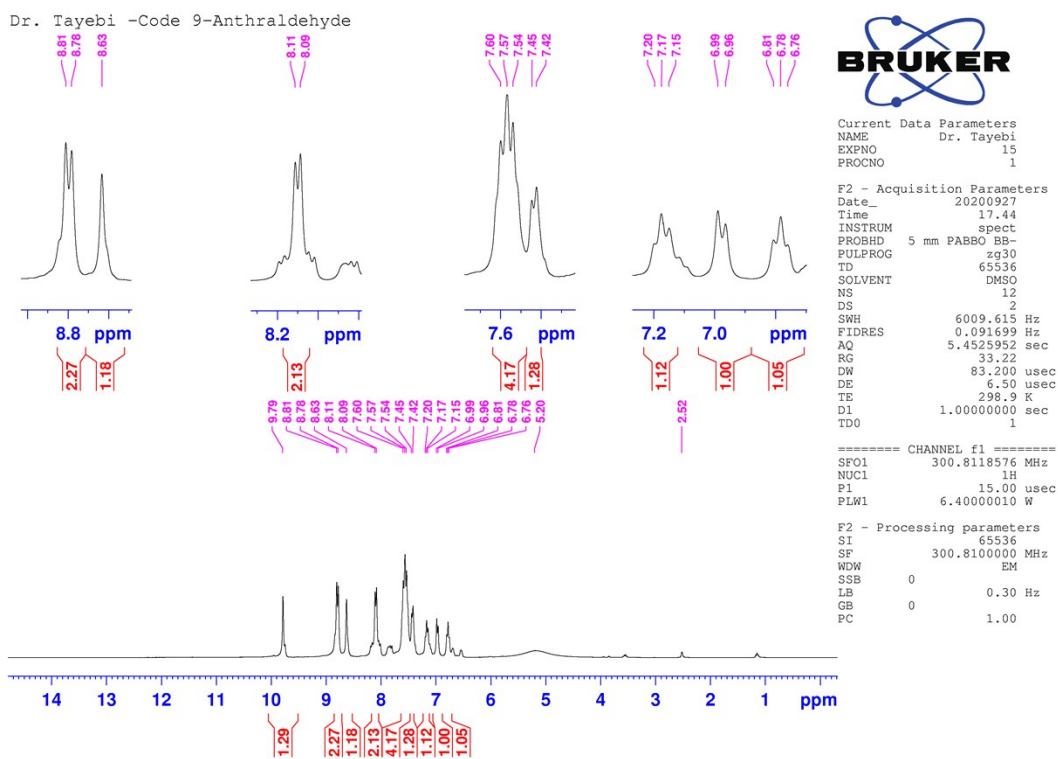


Fig. S22. <sup>1</sup>H-NMR Spectrum of 2-(9-anthracene)-benzimidazole (Table 2, entry 12)

C13CPD- Dr. Tayebi -Code 9-Anthraldehyde

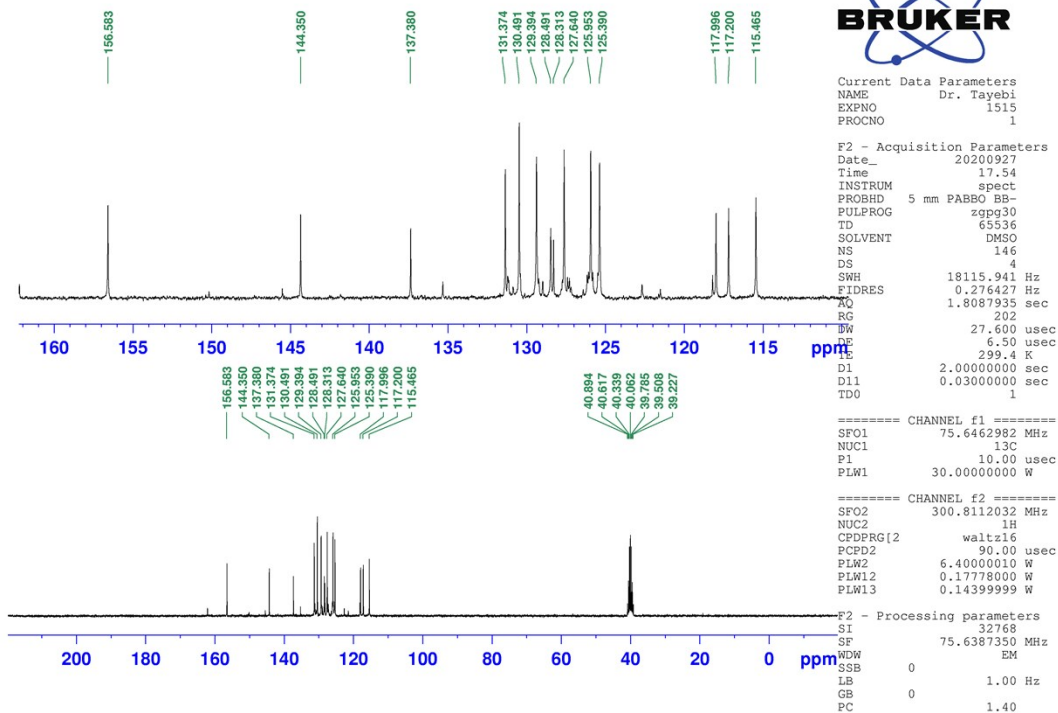


Fig. S23 <sup>13</sup>C-NMR Spectrum of 2-(9-anthracene)-benzimidazole (Table 2, entry 12)



Dr. Tayebi- code 3,4-OH

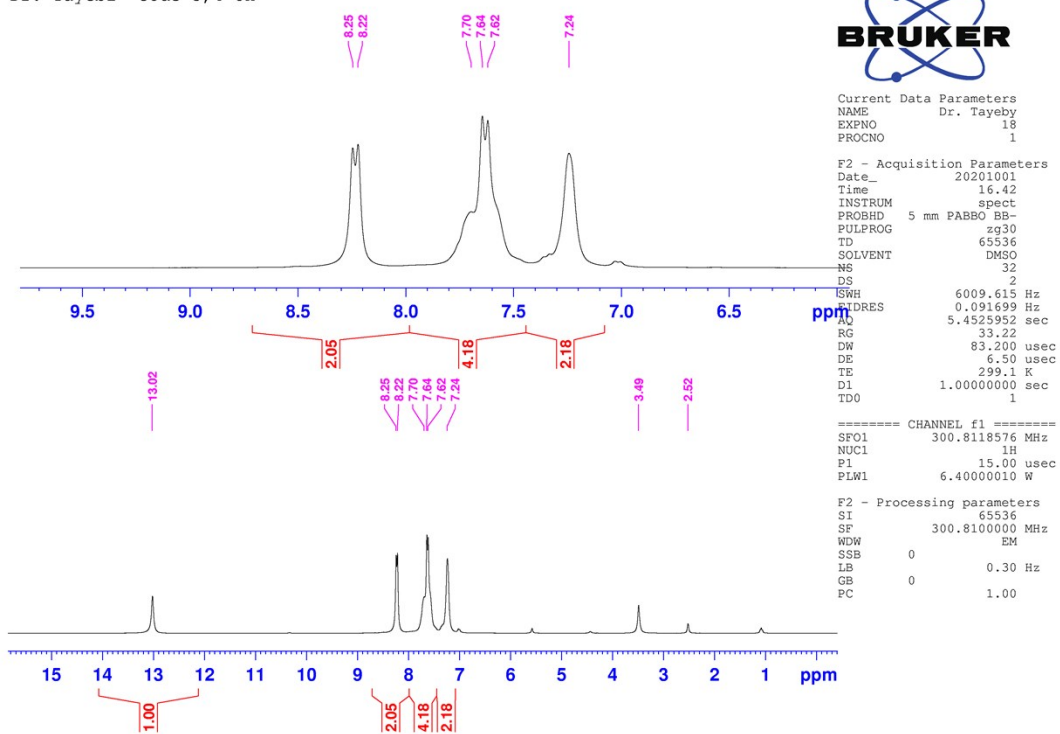


Fig. S24 <sup>1</sup>H-NMR Spectrum of 2-(3,4-dihydroxy-phenyl)-benzimidazole (Table 2, entry 13)

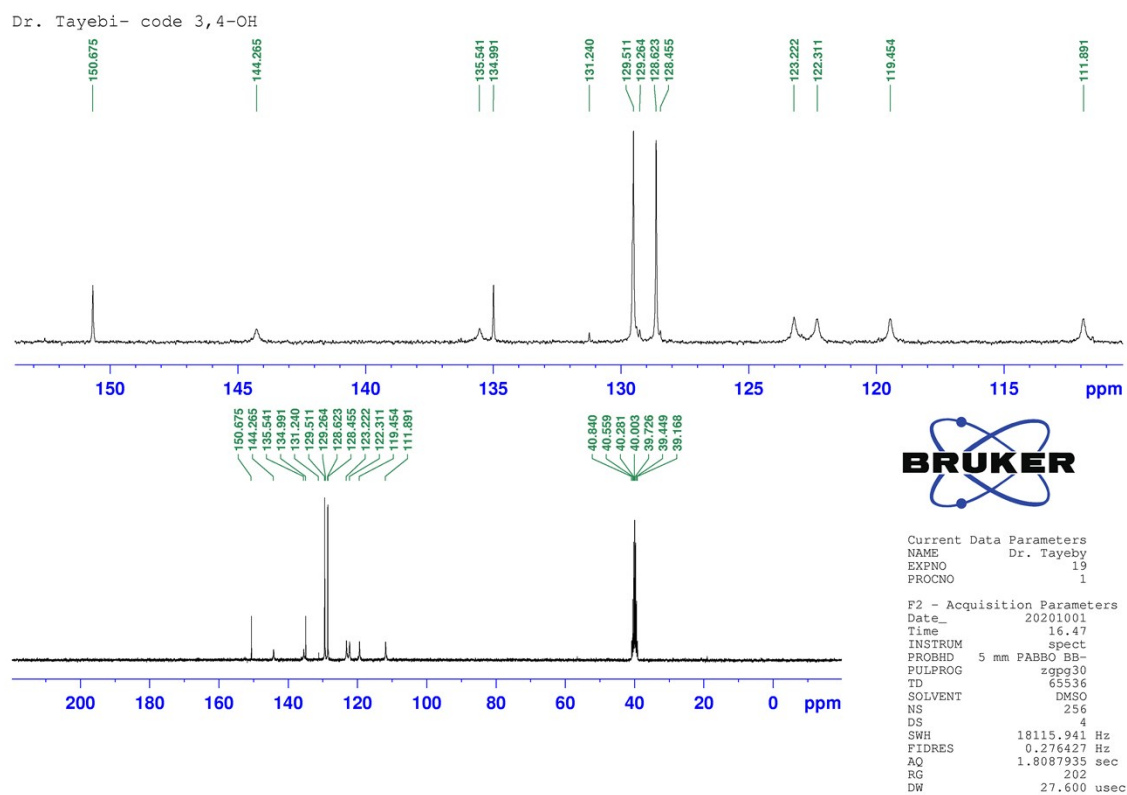


Fig. S25  $^{13}\text{C}$ -NMR Spectrum of 2-(3,4-dihydroxy-phenyl)-benzimidazole (Table 2, entry 13)