

Electronic Supplementary Information

Highly active and recyclable silica gel-supported palladium catalyst for mild cross-coupling reactions of unactivated heteroaryl chlorides

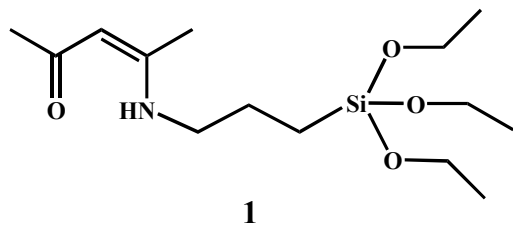
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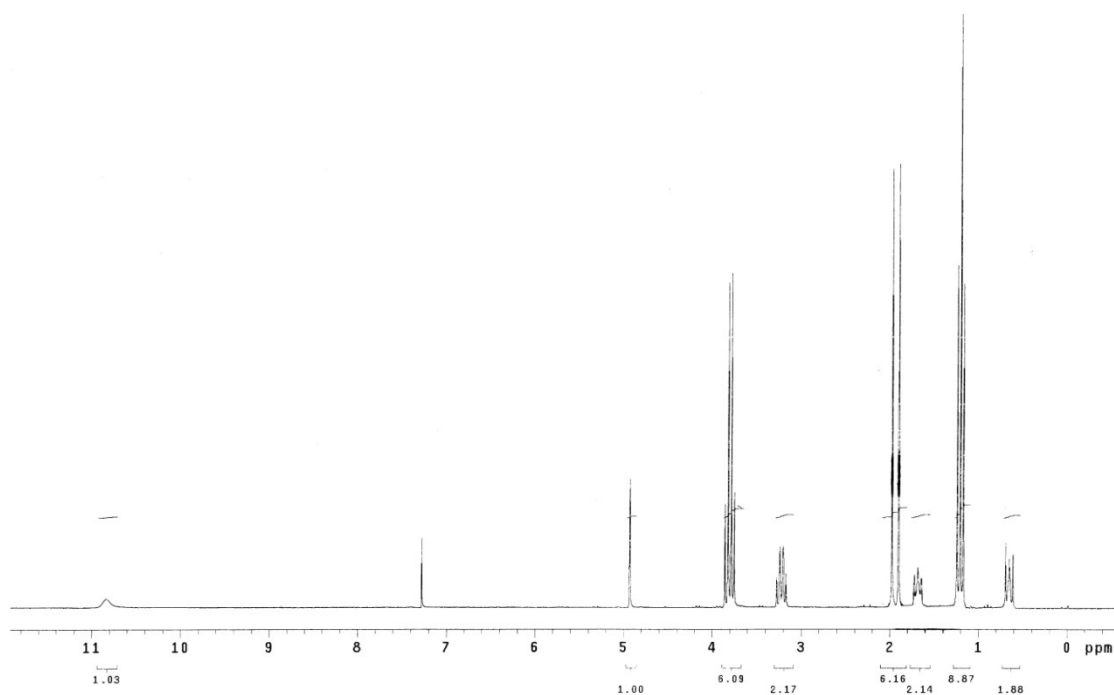
South Korea, E-mail: mjjin@inha.ac.kr

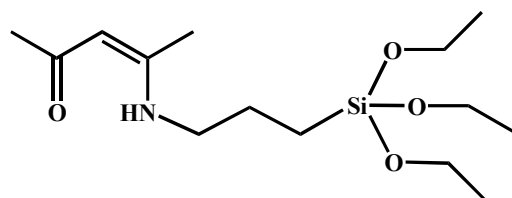
1. ^1H and ^{13}C NMR spectra of β -ketoiminopropyltriethoxysilane 1	S1
2. ^1H , ^{13}C and ^{31}P NMR spectra of palladium complex 2	S3
3. XANES and EXAFS spectra of $\text{Pd}@\text{SiO}_2$ 3	S6
4. FT-IR spectra of $\text{Pd}@\text{SiO}_2$ 3	S7
5. ^1H and ^{13}C NMR spectra of the coupling products	S8

1. ^1H and ^{13}C NMR spectra of β -ketoiminopropyltriethoxysilane **1**

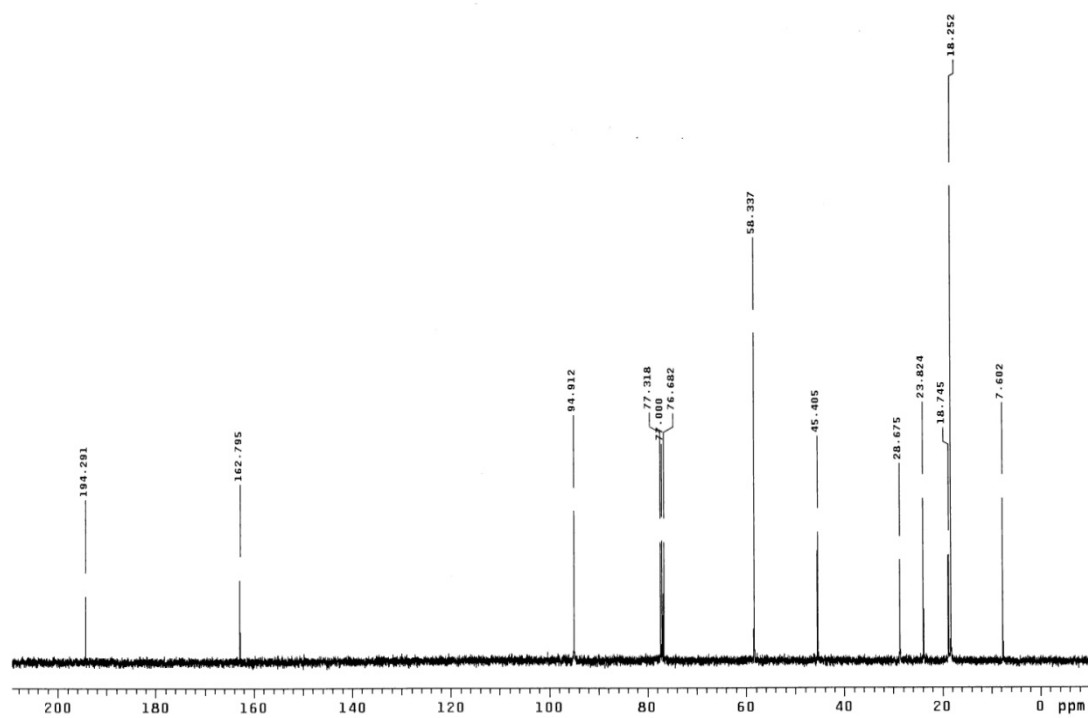


^1H NMR (CDCl_3 , 400 MHz)

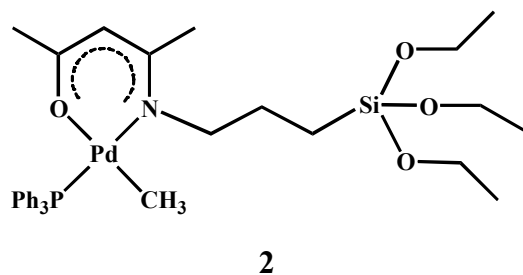




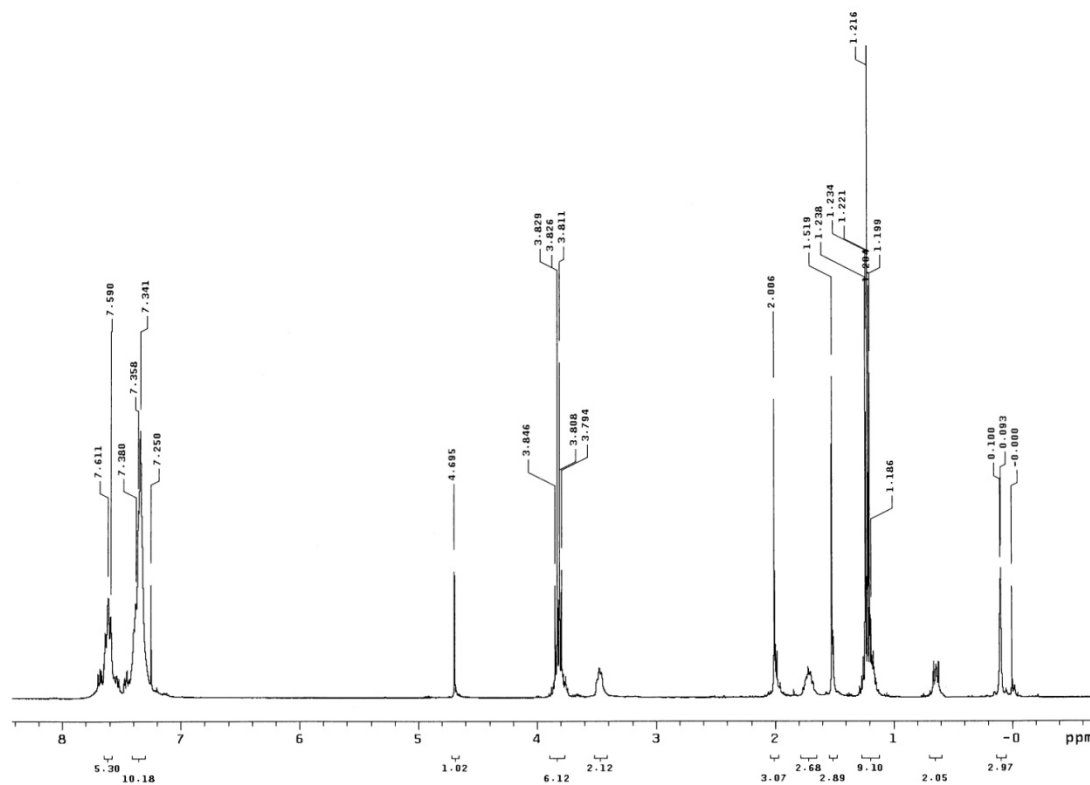
^{13}C NMR (CDCl_3 , 100 MHz)

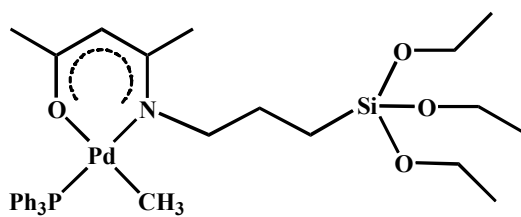


2. ^1H , ^{13}C and ^{31}P NMR spectra of palladium complex 2



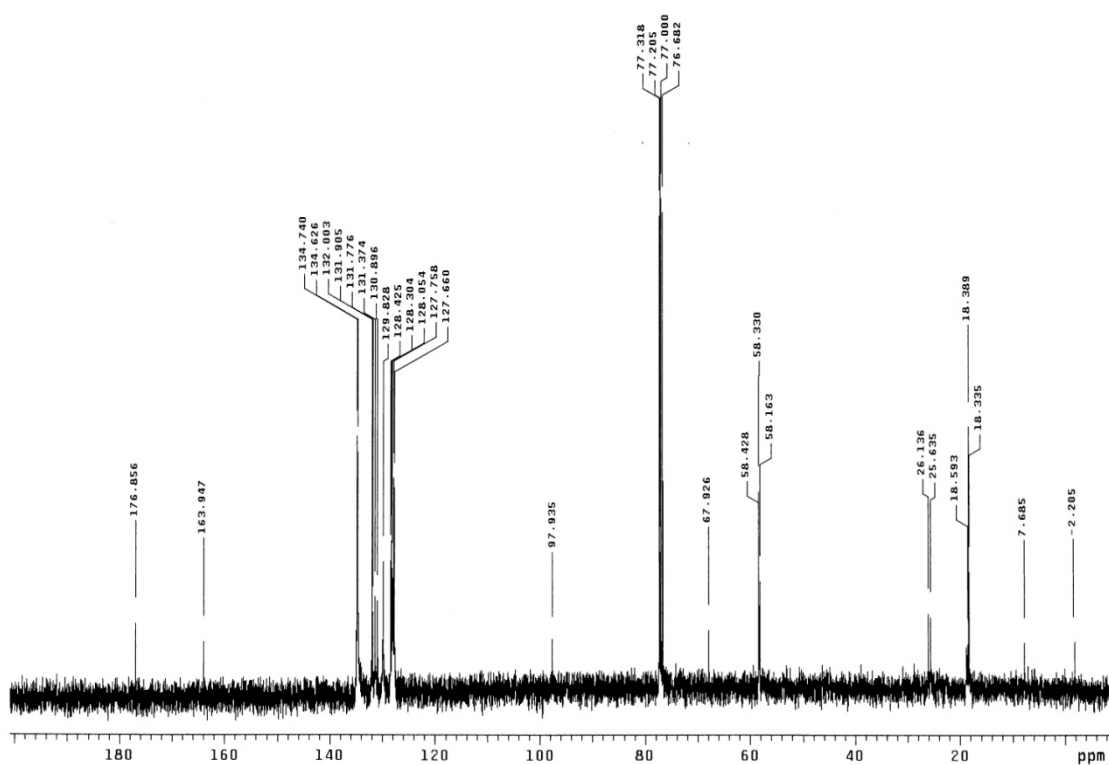
^1H NMR (CDCl_3 , 400 MHz)

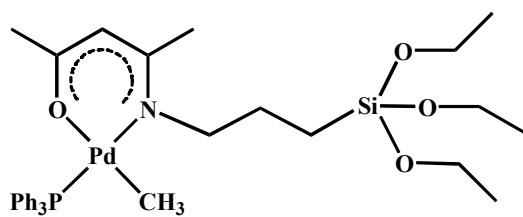




2

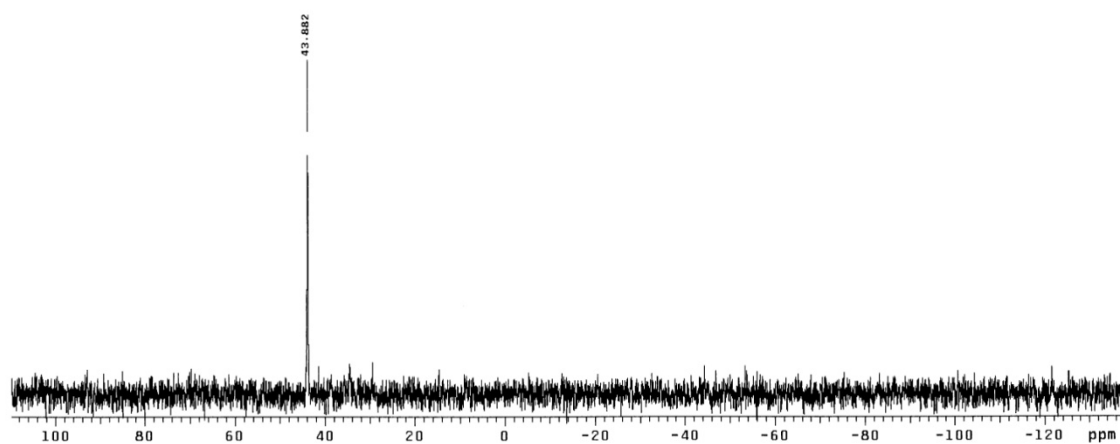
¹³C NMR (CDCl₃, 100 MHz)





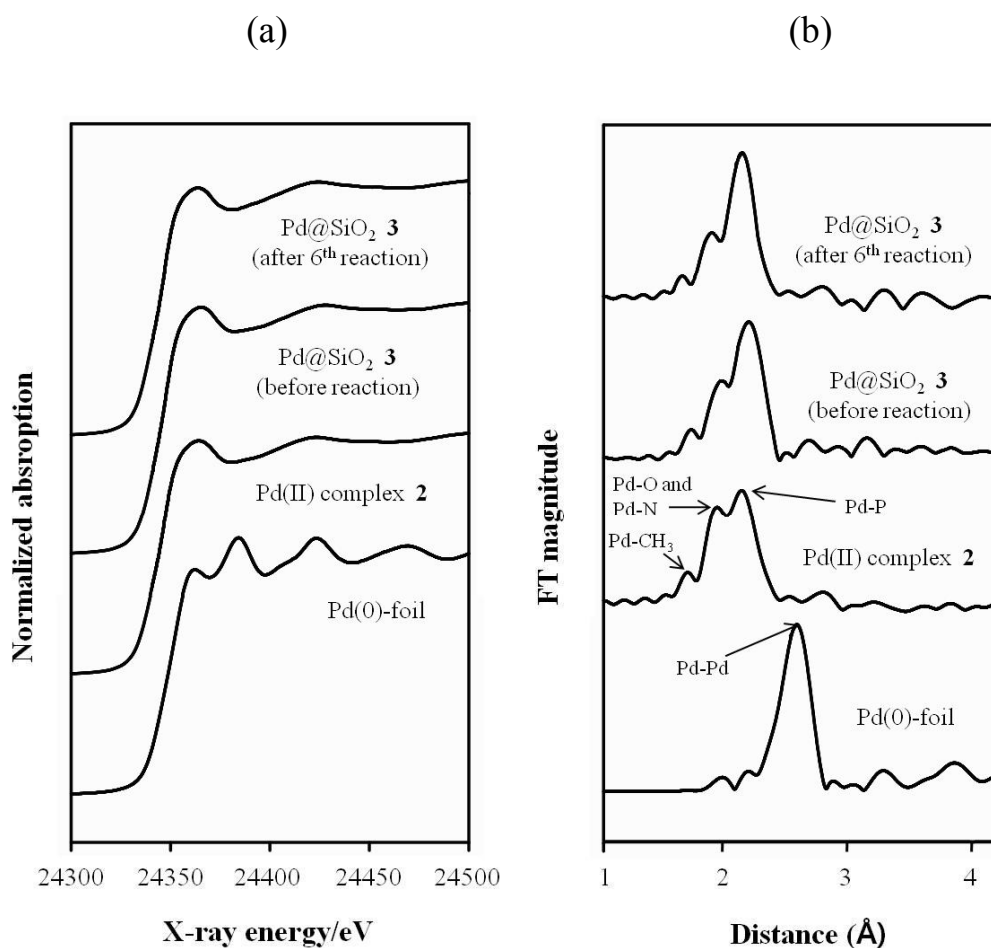
2

^{31}P NMR (CDCl_3 , 162.027 MHz)

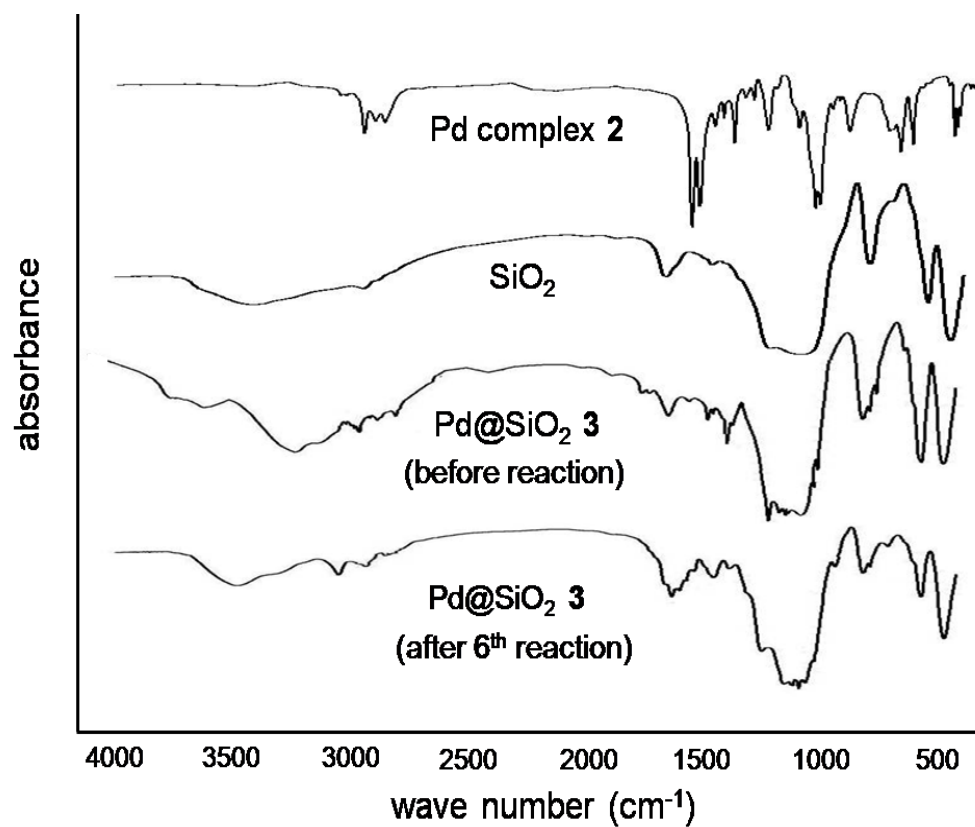


3. (a) X-ray absorption near-edge spectroscopy (XANES) spectra and (b) extended X-ray absorption fine-structure (EXAFS) spectra of Pd@SiO₂ 3 and reference compounds.

Pd@SiO₂ 3 was analyzed before and after the Suzuki coupling reaction of 2-chloro-3-methylpyridine with phenylboronic acid.

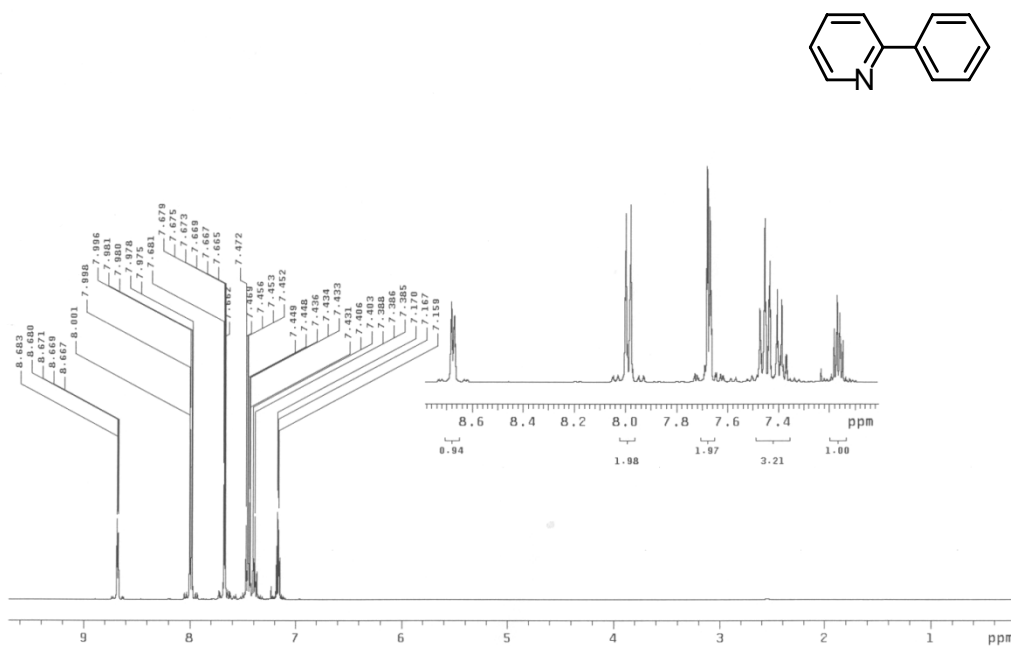


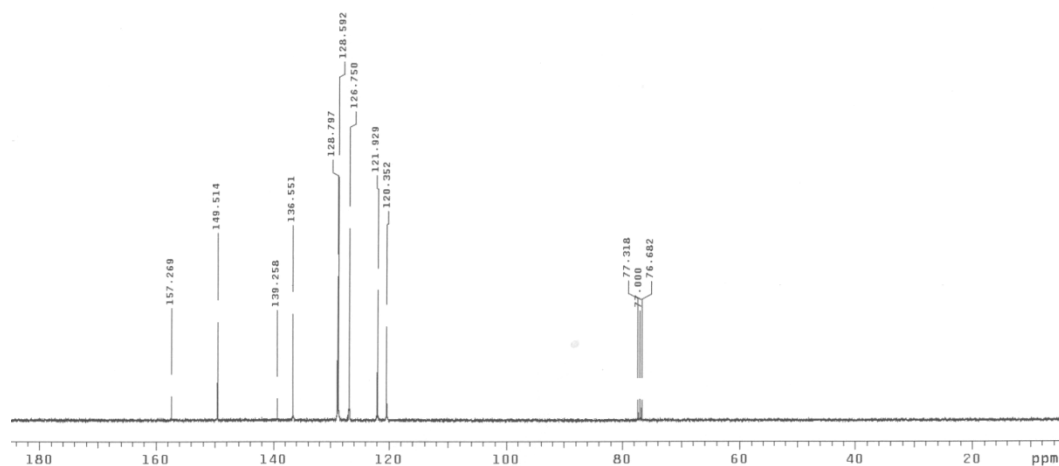
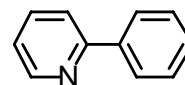
4. FT-IR spectra of Pd@SiO₂ 3



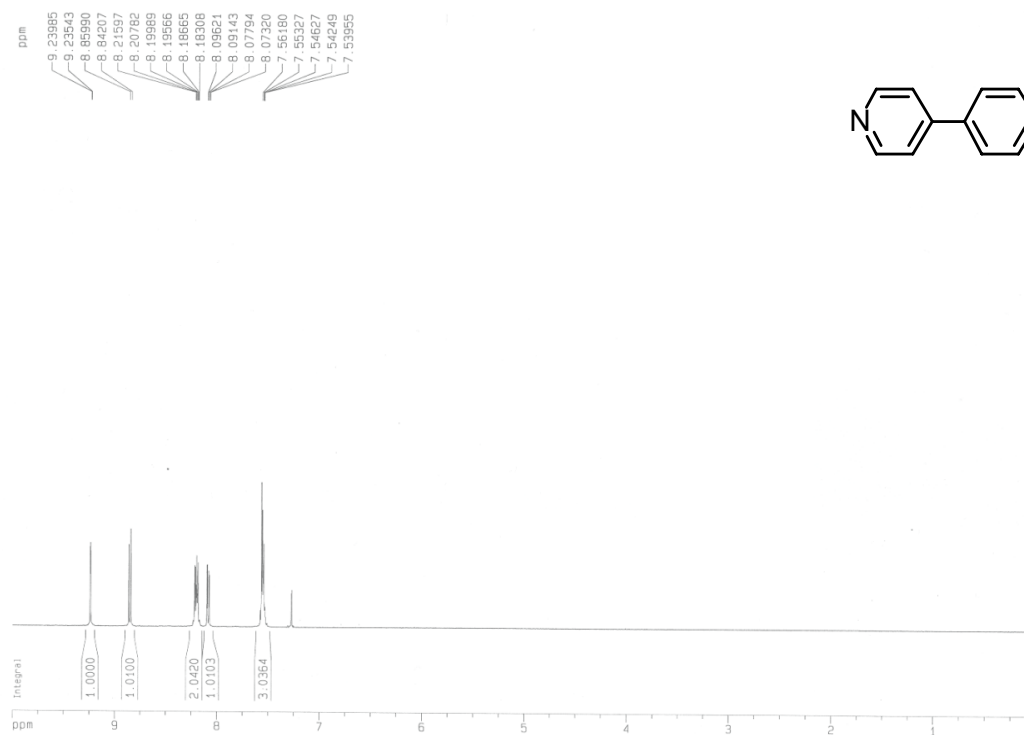
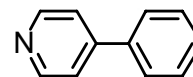
5. ^1H and ^{13}C NMR spectra of the coupling products

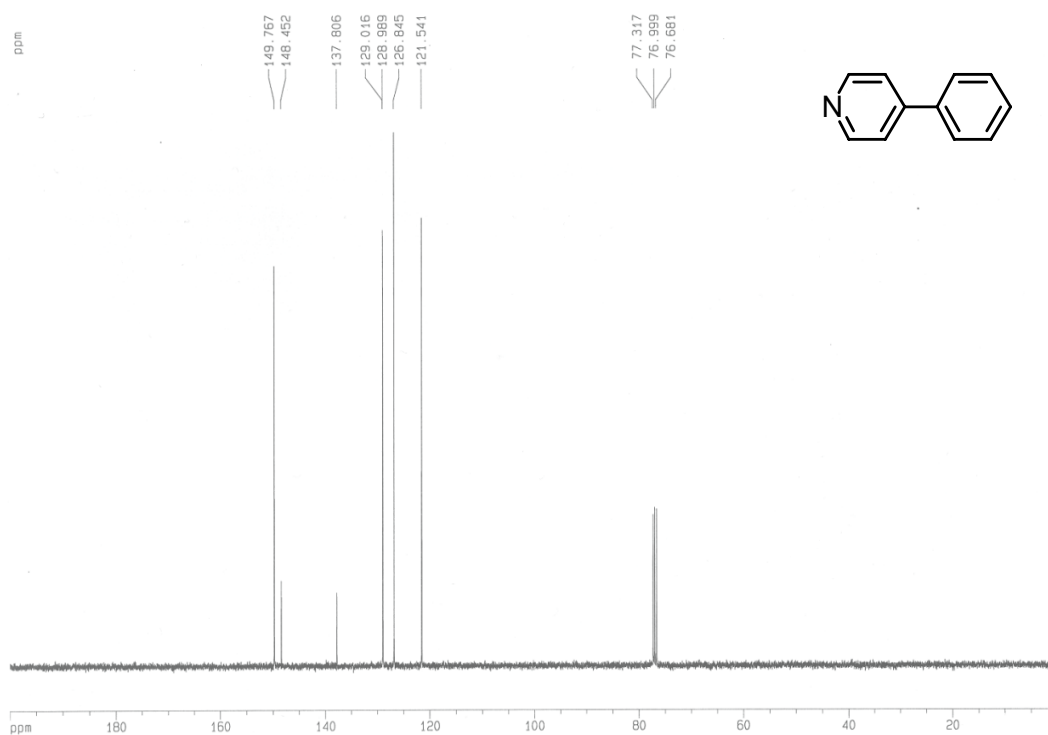
2-Phenylpyridine



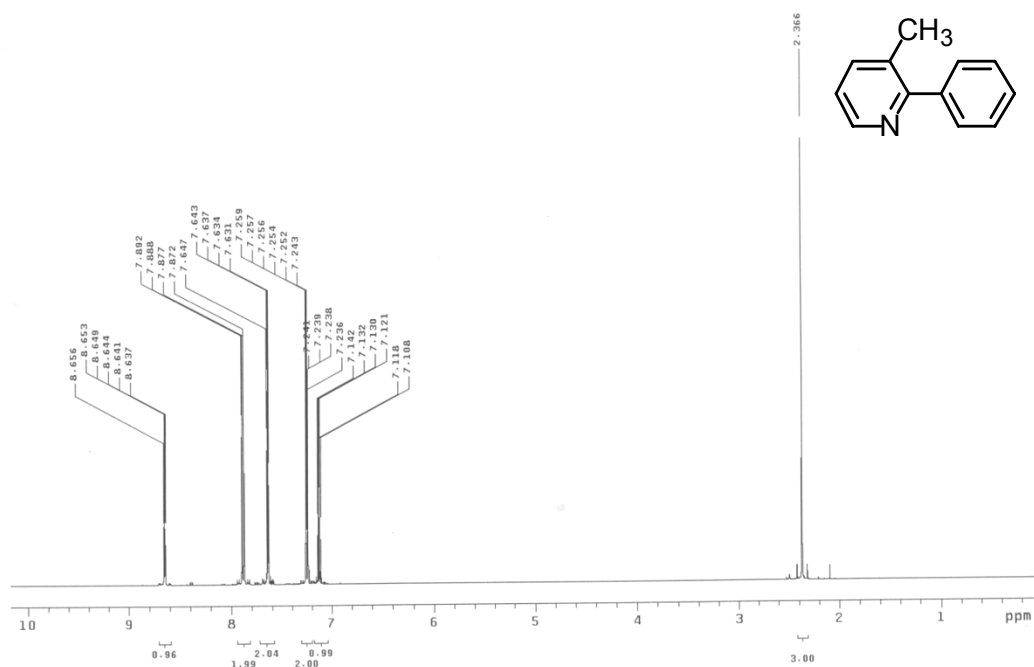


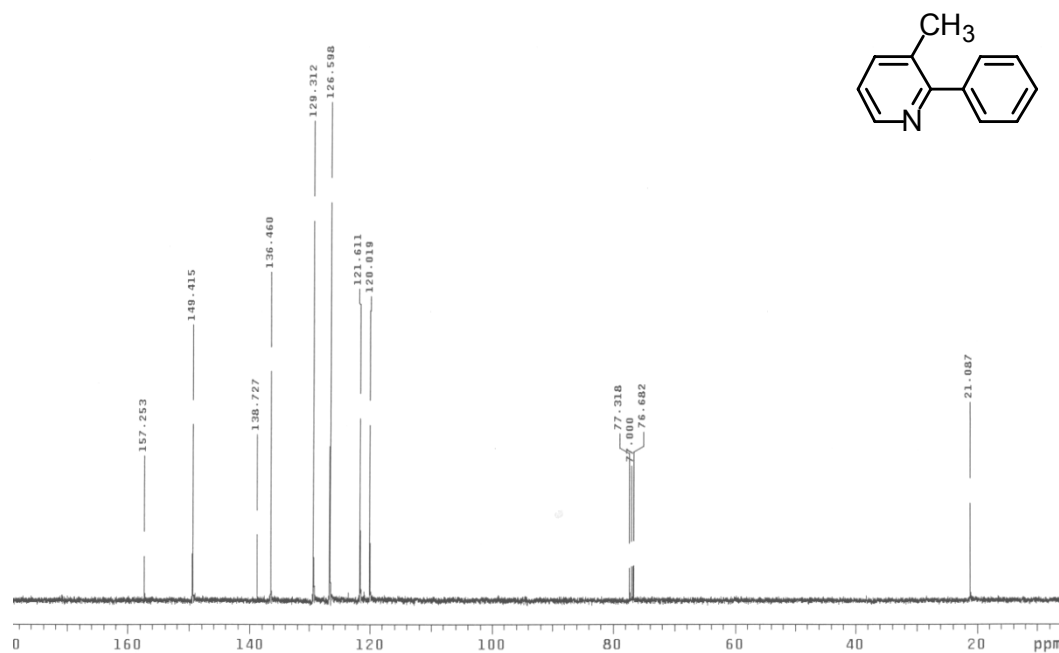
4-Phenylpyridine



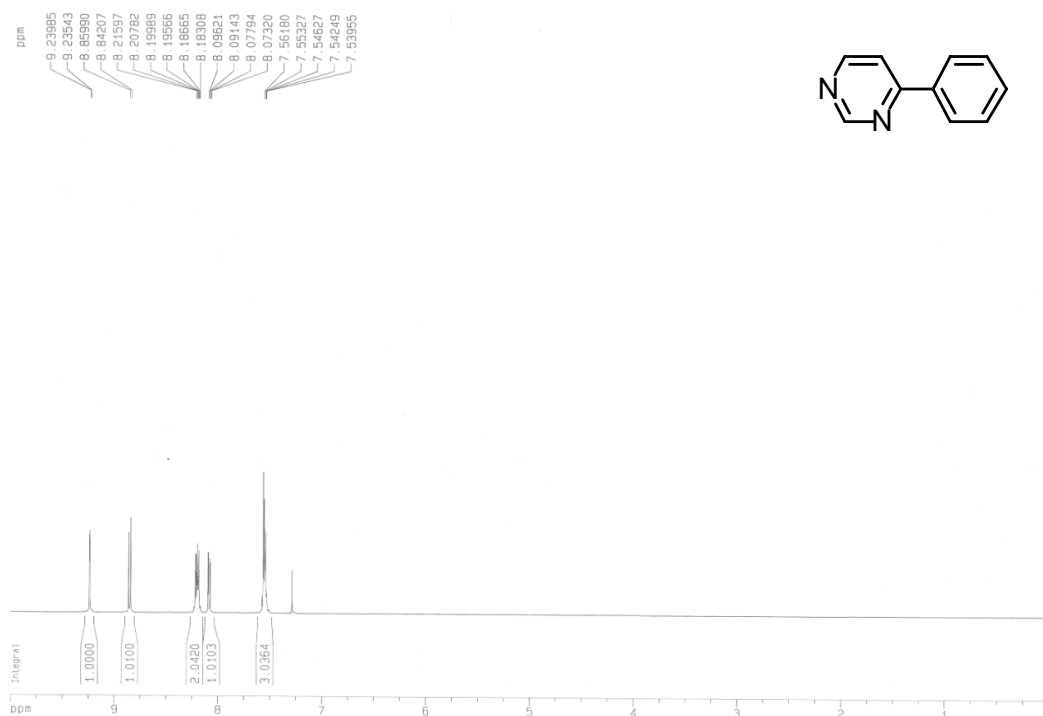


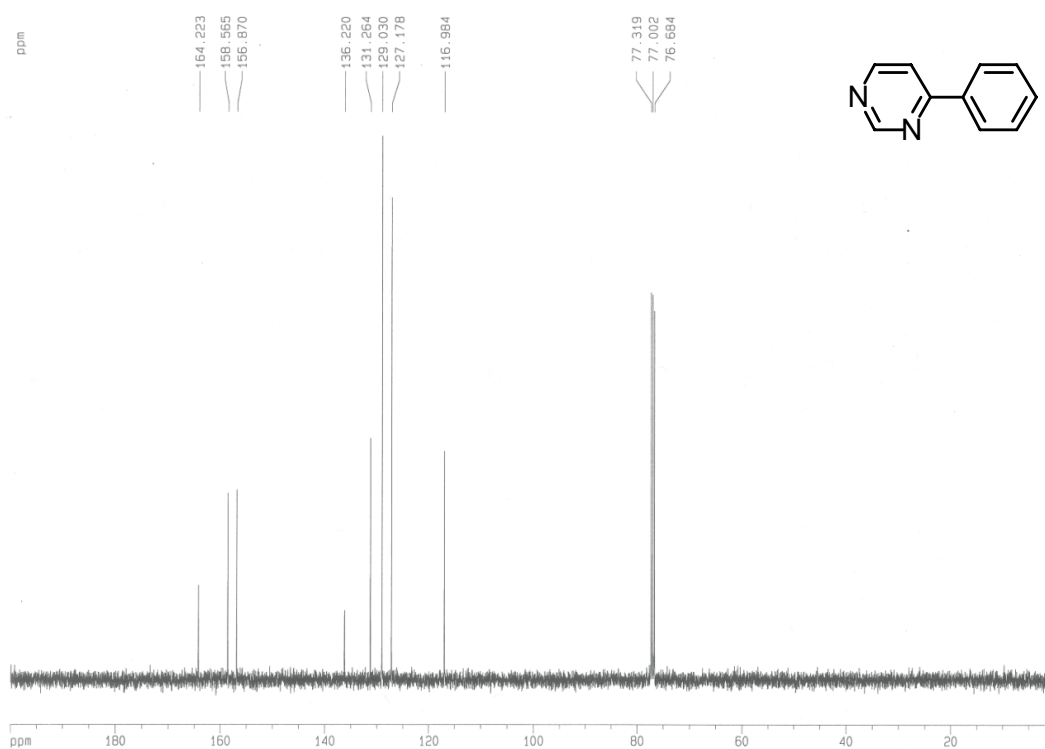
6-Methyl-2-phenylpyridine



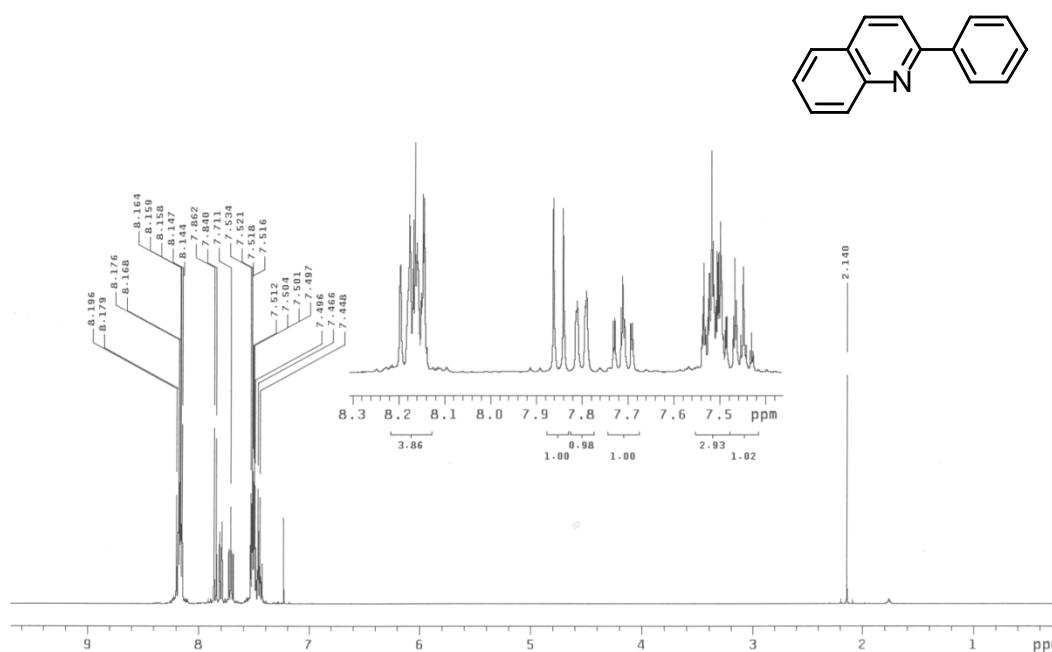


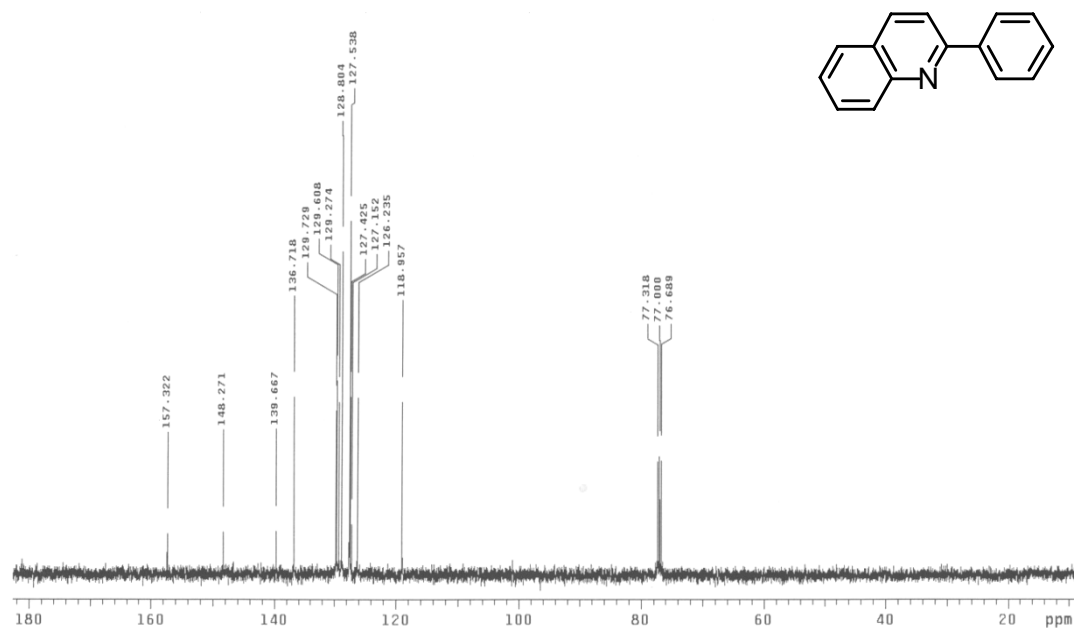
4-Phenylpyrimidine



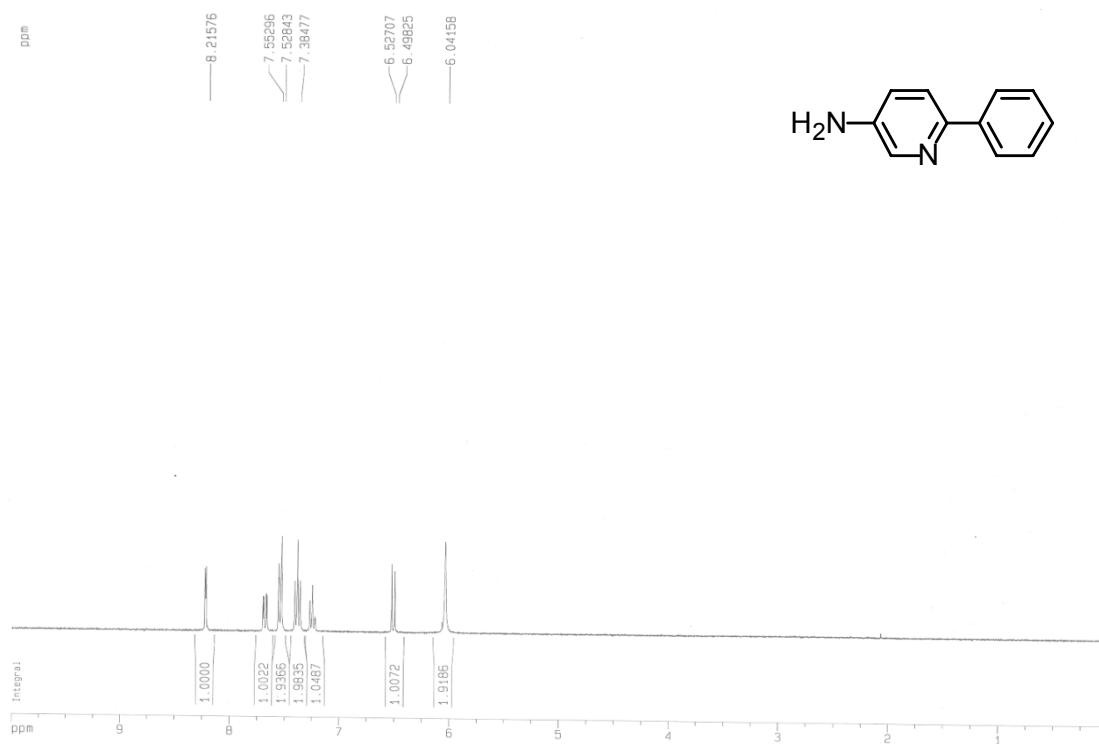


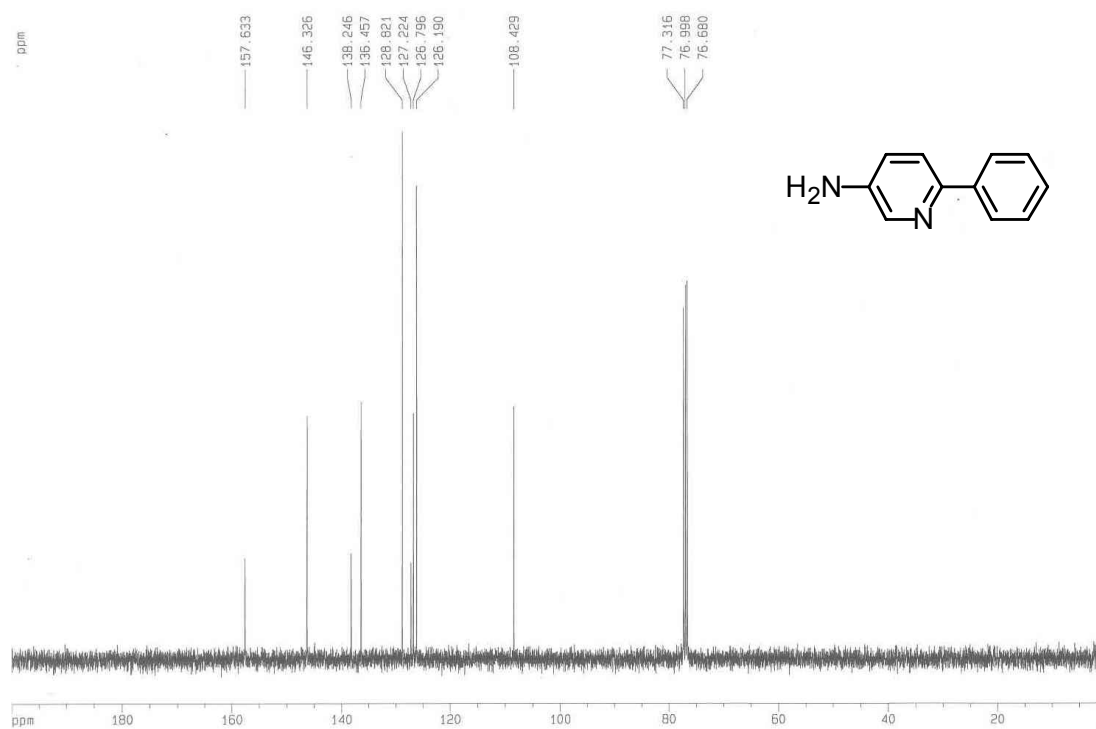
2-Phenylquinoline



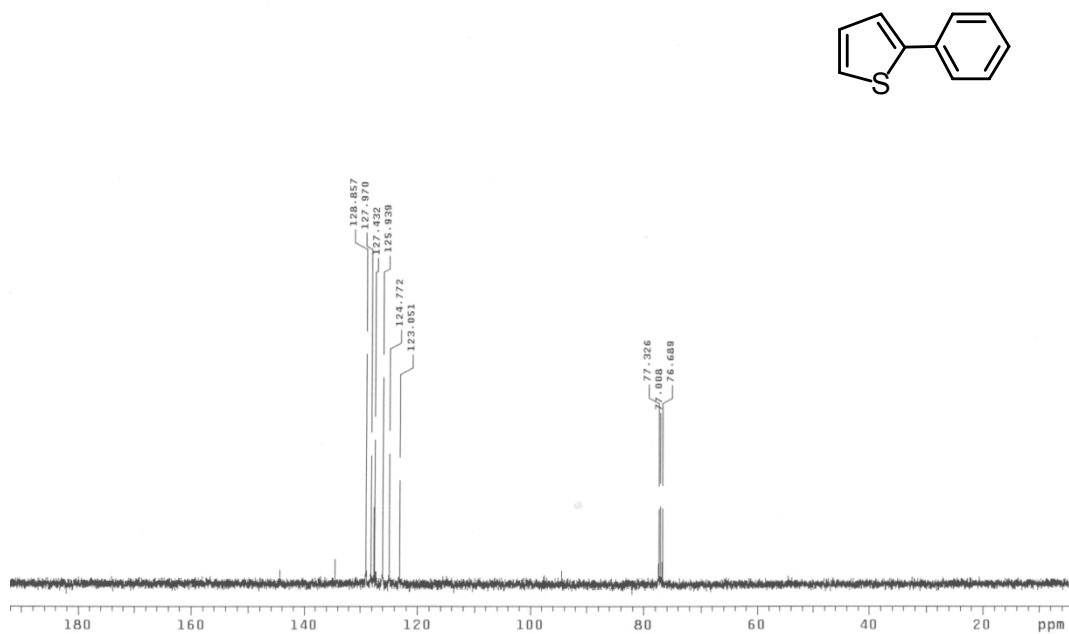
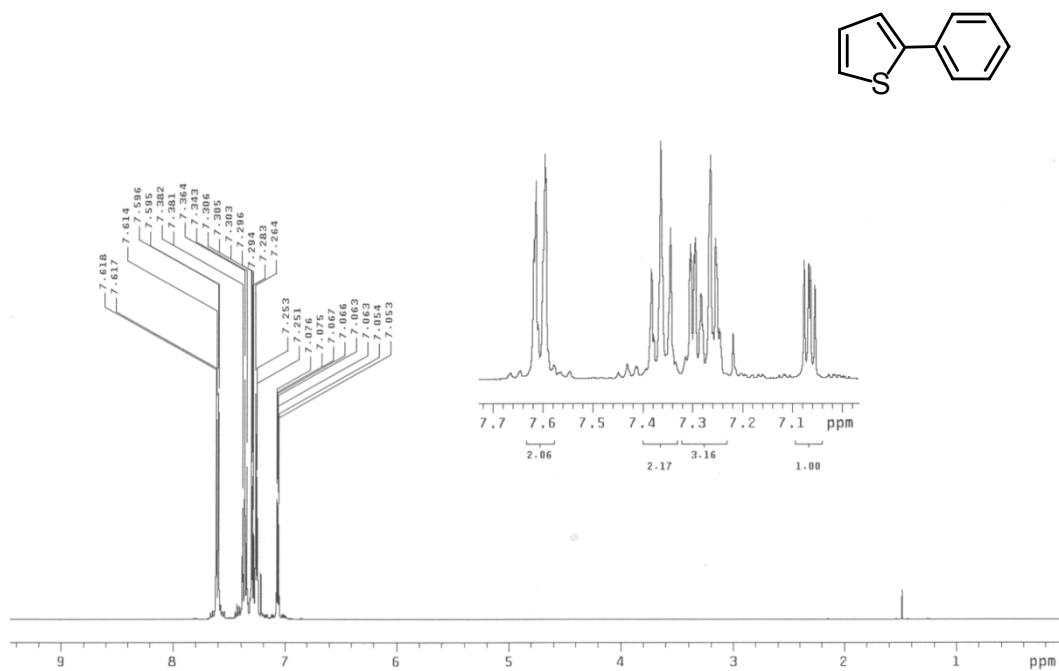


2-Amino-5-Phenylpyridine

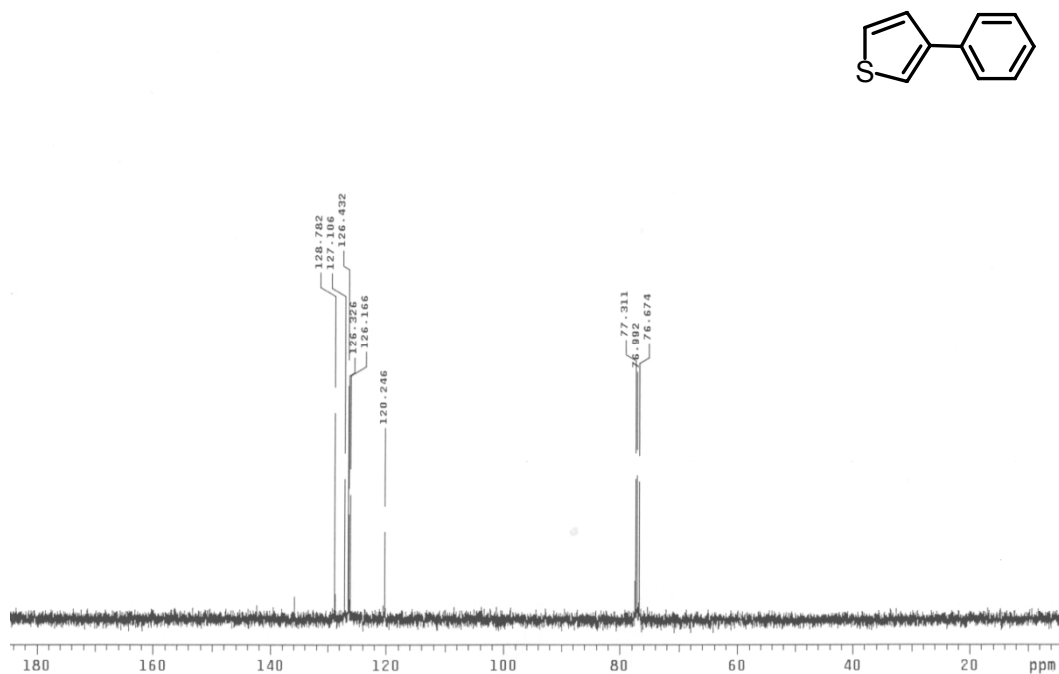
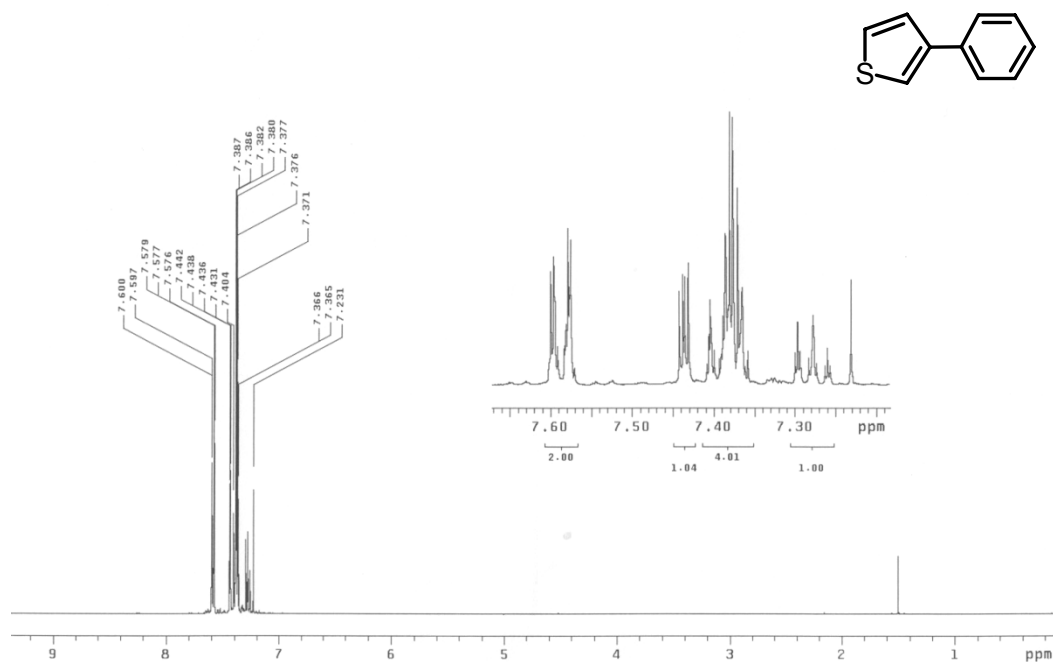




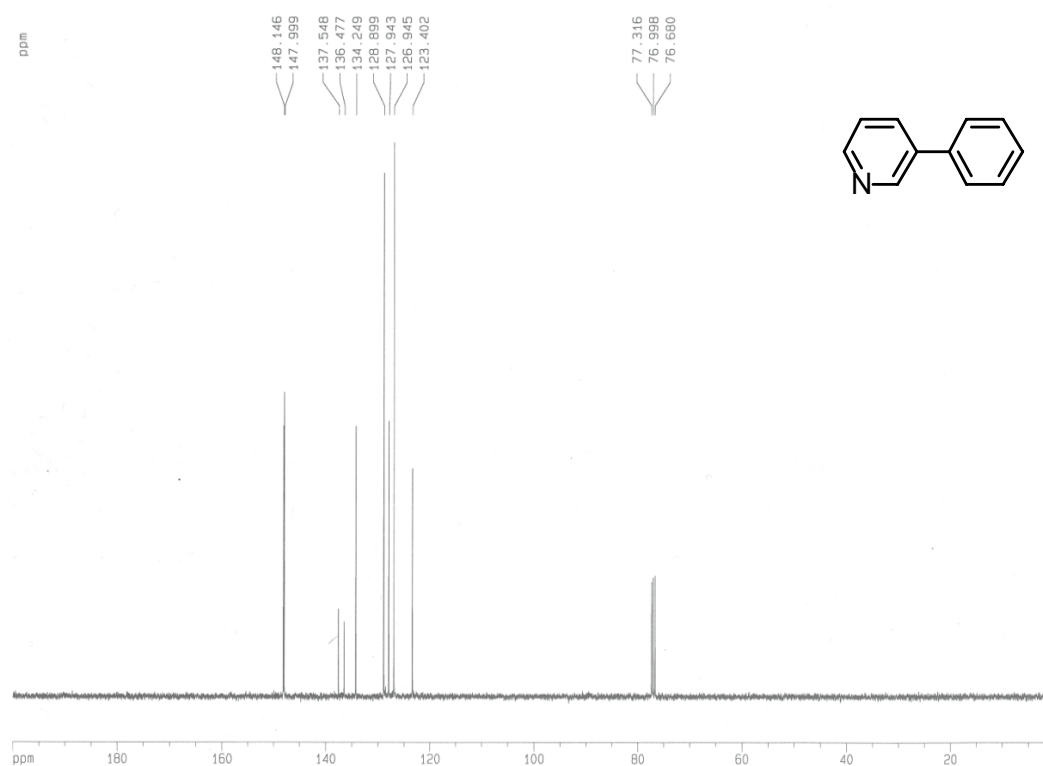
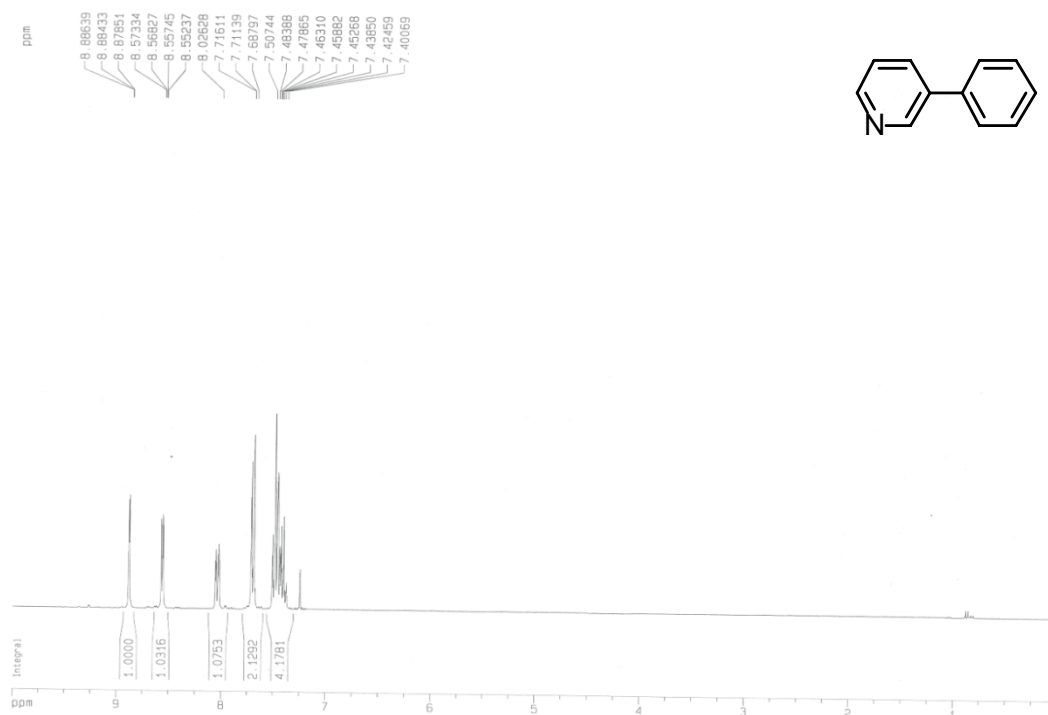
2-Phenylthiophene



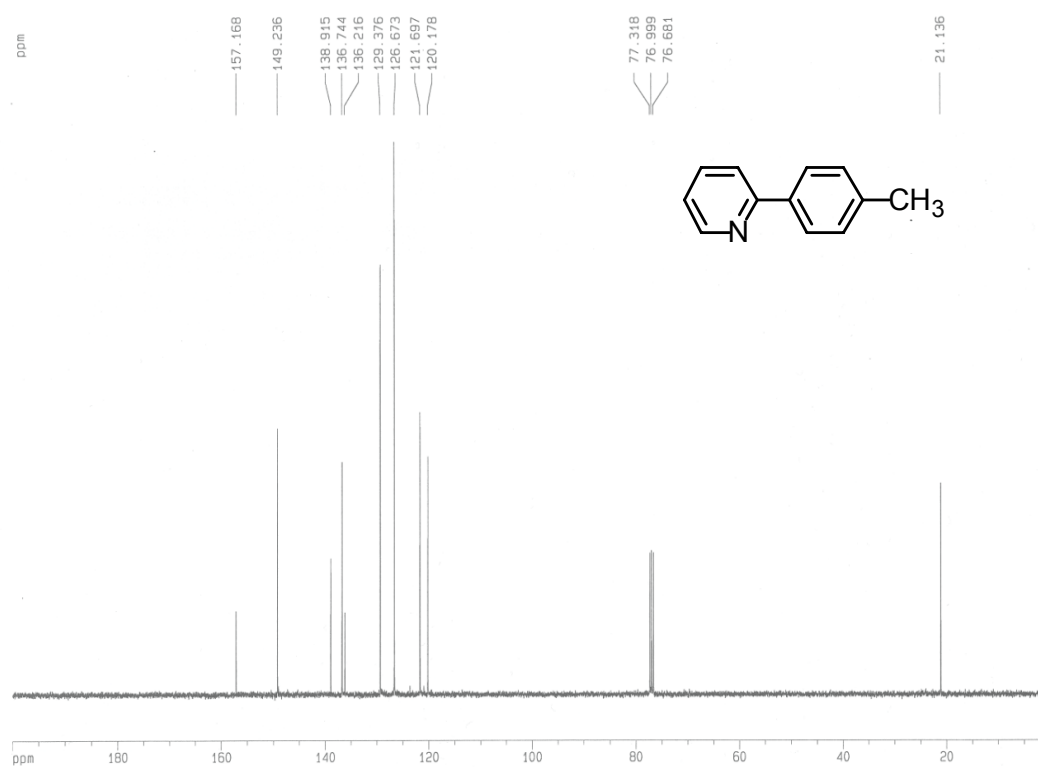
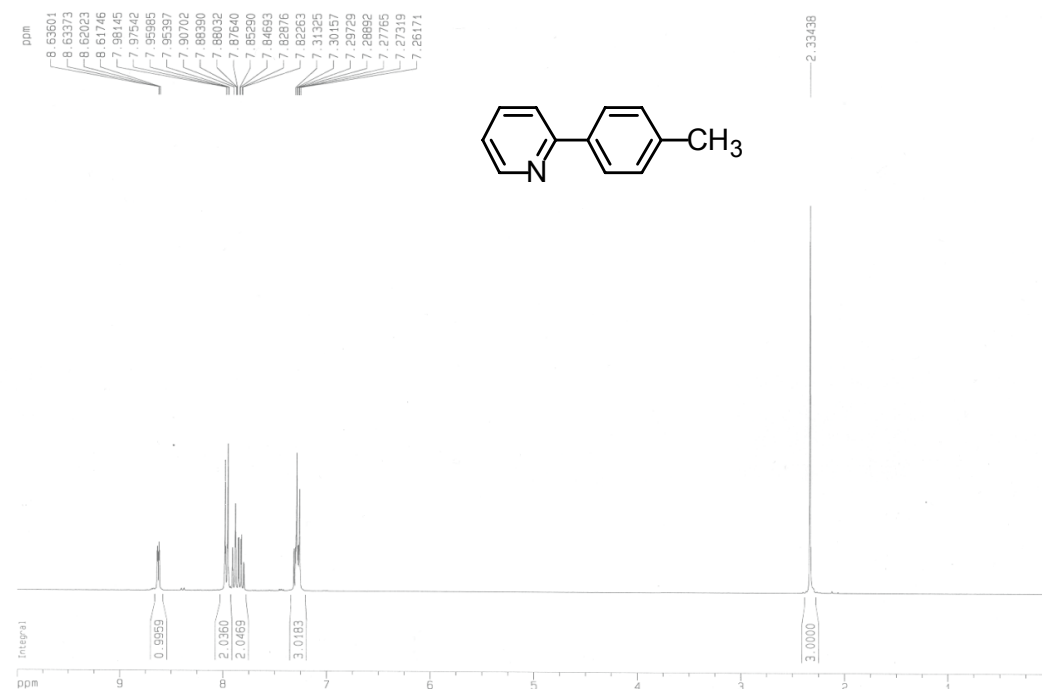
3-Phenylthiophene



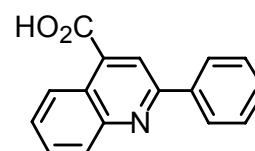
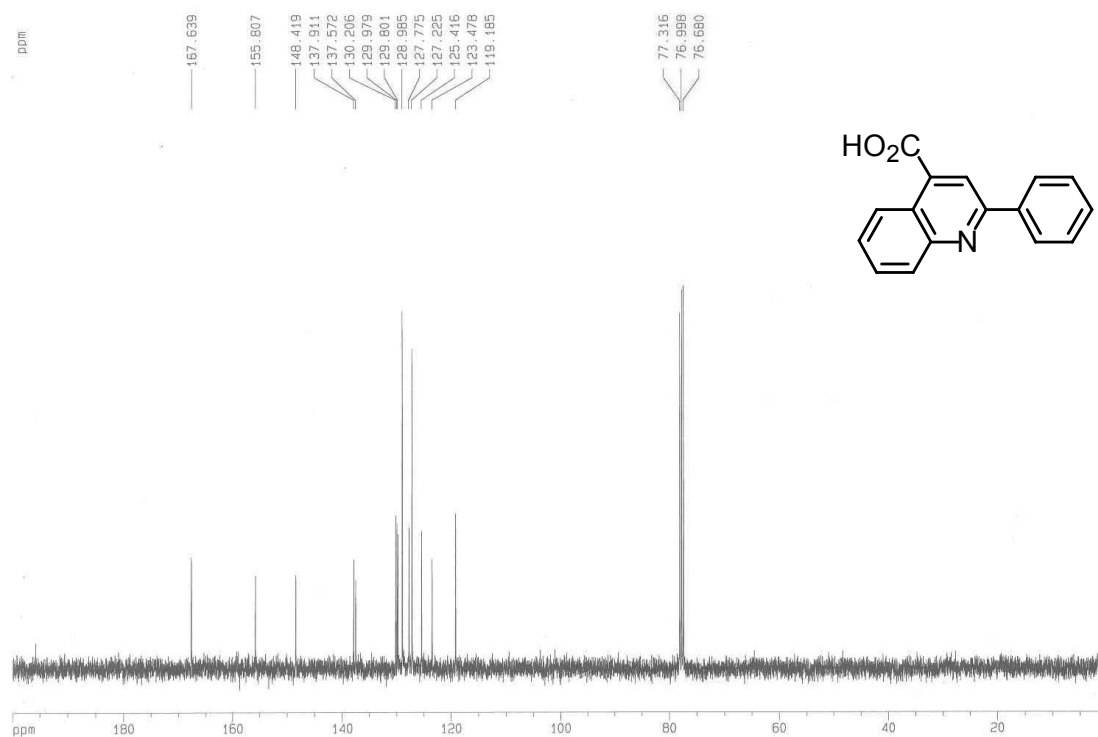
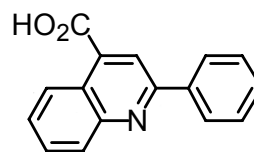
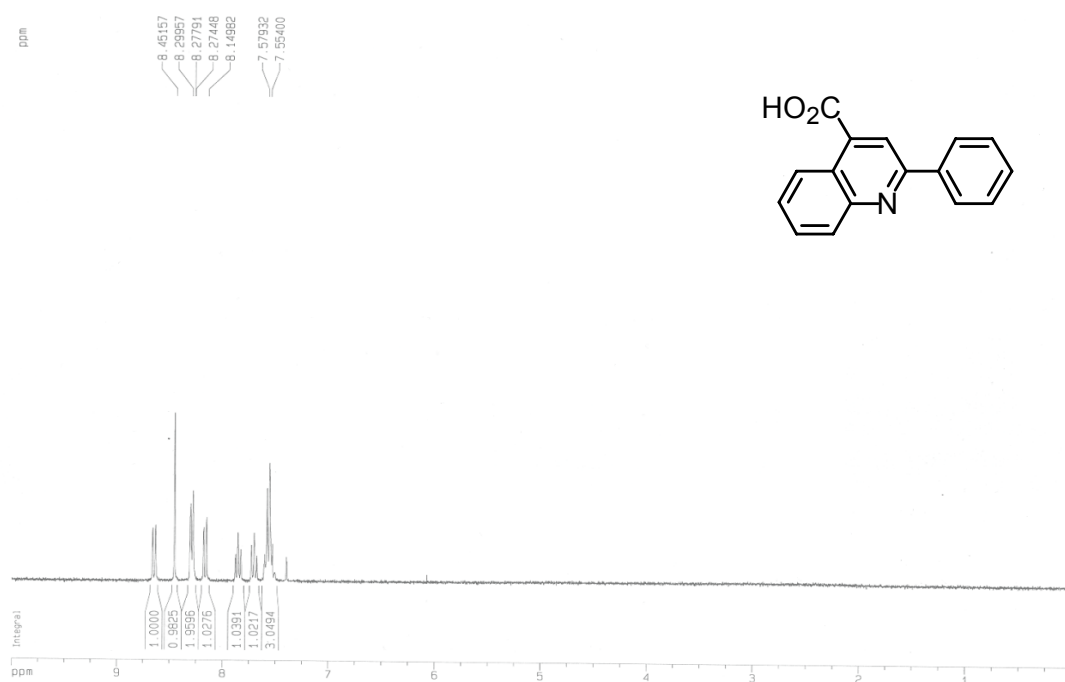
3-Phenylpyridine



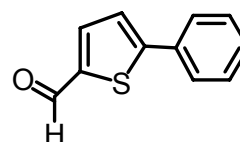
2-(*p*-tolyl)pyridine

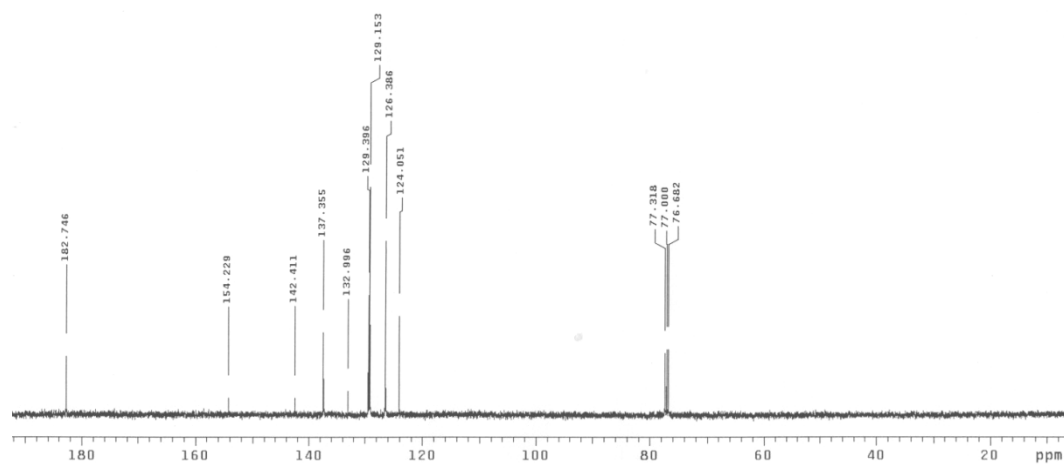
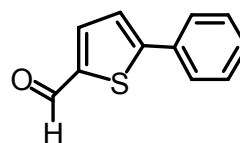
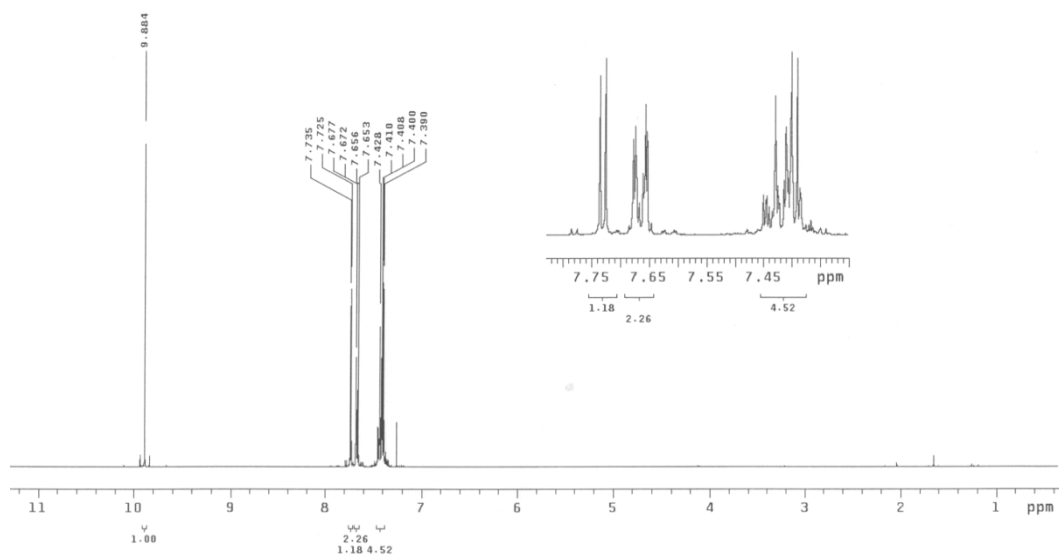


2-Phenyl-4-quinolinecarboxylic acid

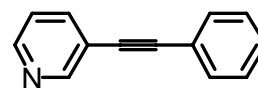
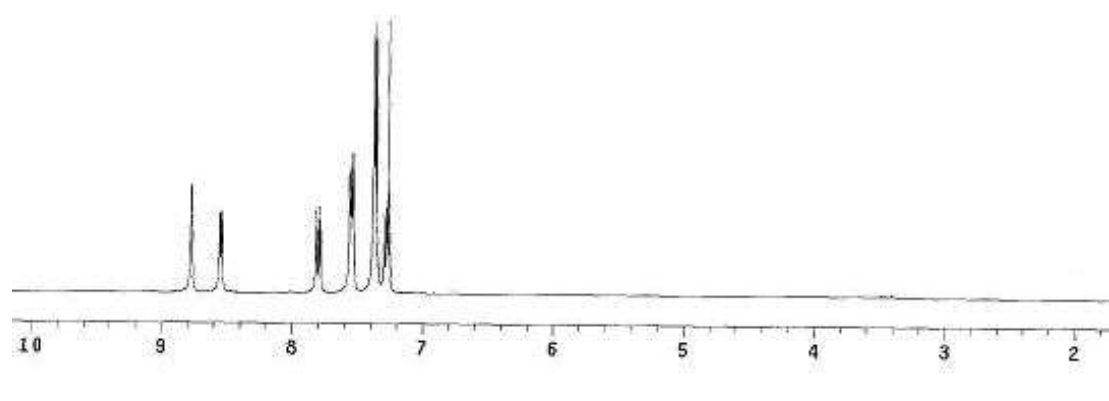
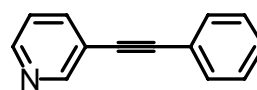


5-Phenylthiophene-2-carboxaldehyde





3-Phenylethynylpyridine



2-Phenylethynyniophene

