
Supplementary Materials

Enhanced Selectivity in 4-Quinolone Formation: A Dual-Base System for Palladium-Catalyzed Carbonylative Cyclization with $\text{Fe}(\text{CO})_5$

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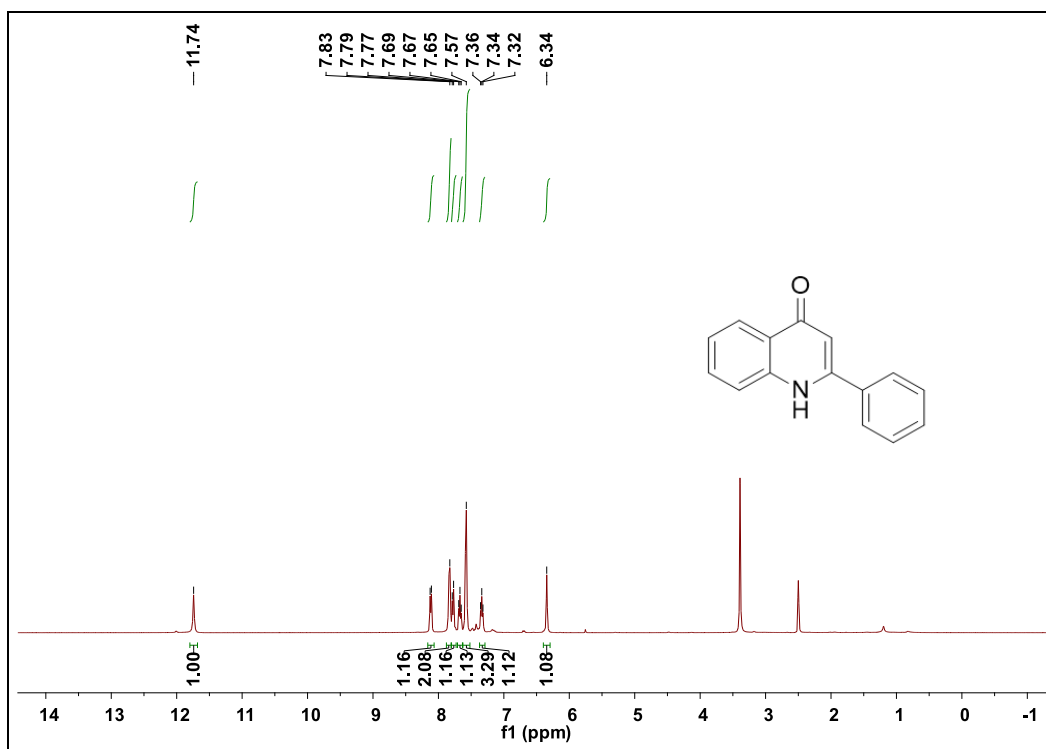
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1. Real-time monitoring of carbon monoxide pressure

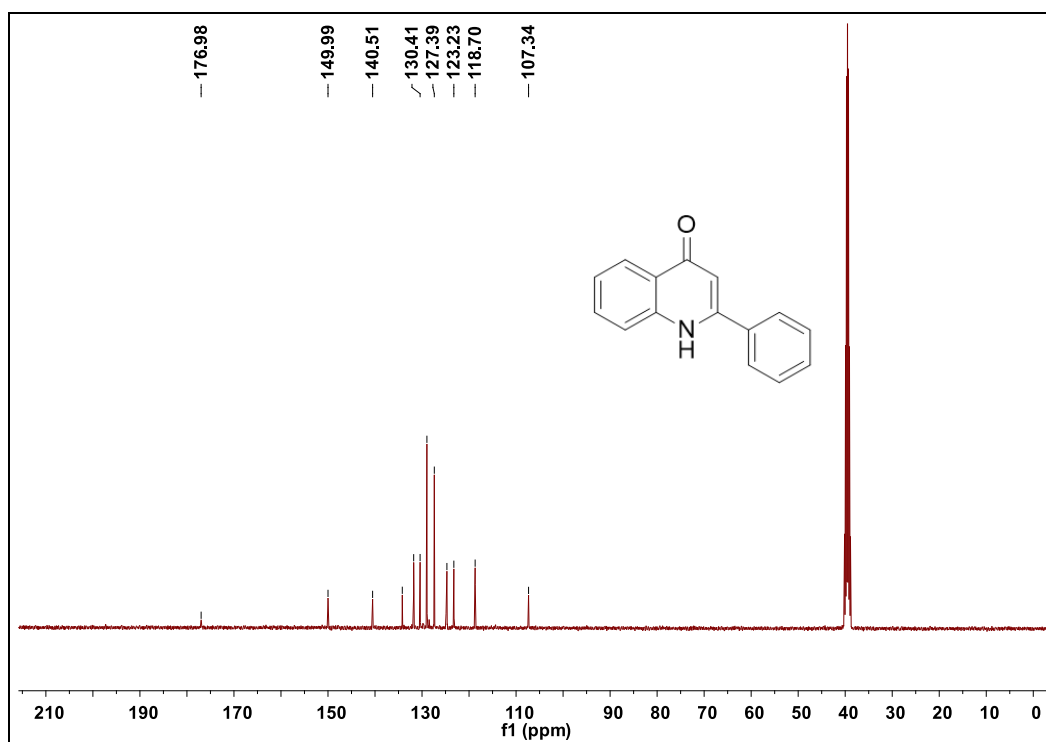
The Sonogashira carbonylative annulation of 2-iodoaniline, phenylacetylene, and $\text{Fe}(\text{CO})_5$ was used as the model reaction. Under the identified reaction conditions (**Table 1**, entry 12), we observed pressure changes in the reaction vial (**Figure 1**). All reagents were added to a 31 mL vial at room temperature, then a stirrer was added and the vial was sealed with a rubber stopper. The differential pressure gauge was connected and the needle hole was sealed with hot melt adhesive. After preparation, the reaction vial was immediately placed on a stirring table heated to 60°C and the speed was adjusted to 400 rpm. Pressure changes were recorded continuously for 4 hours, and the results are shown in **Figure 1**.

2. ^1H NMR and ^{13}C NMR Spectra

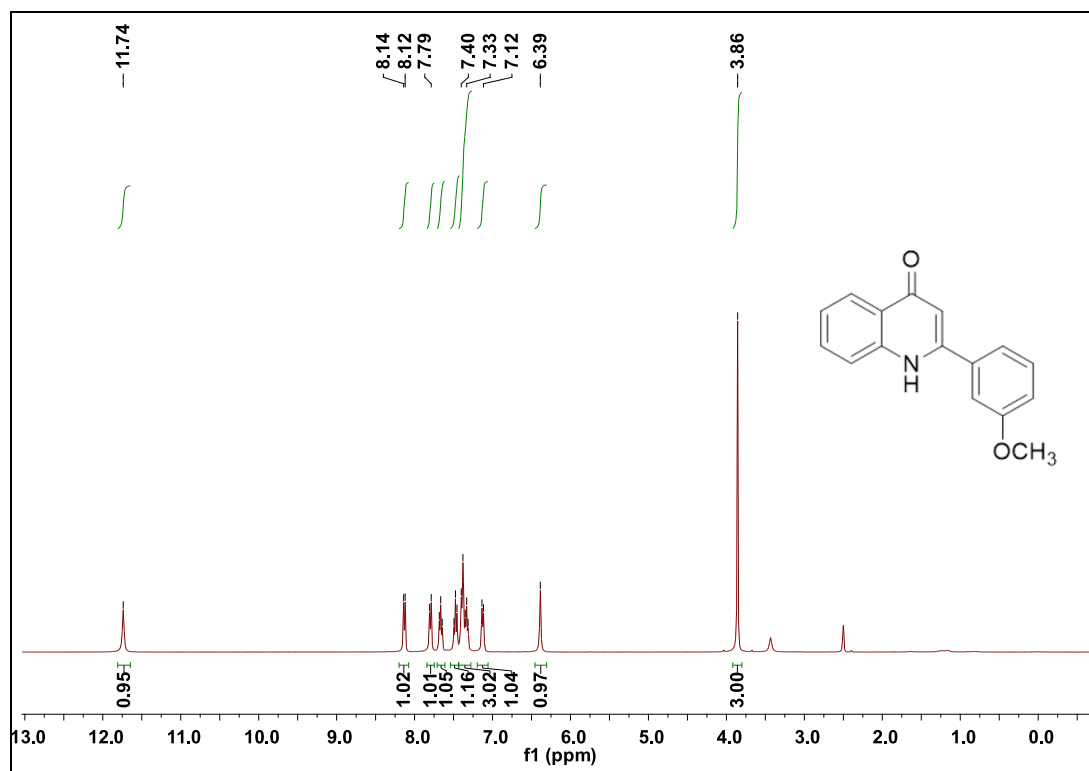
2-phenylquinolin-4(1H)-one (4a) ^1H NMR



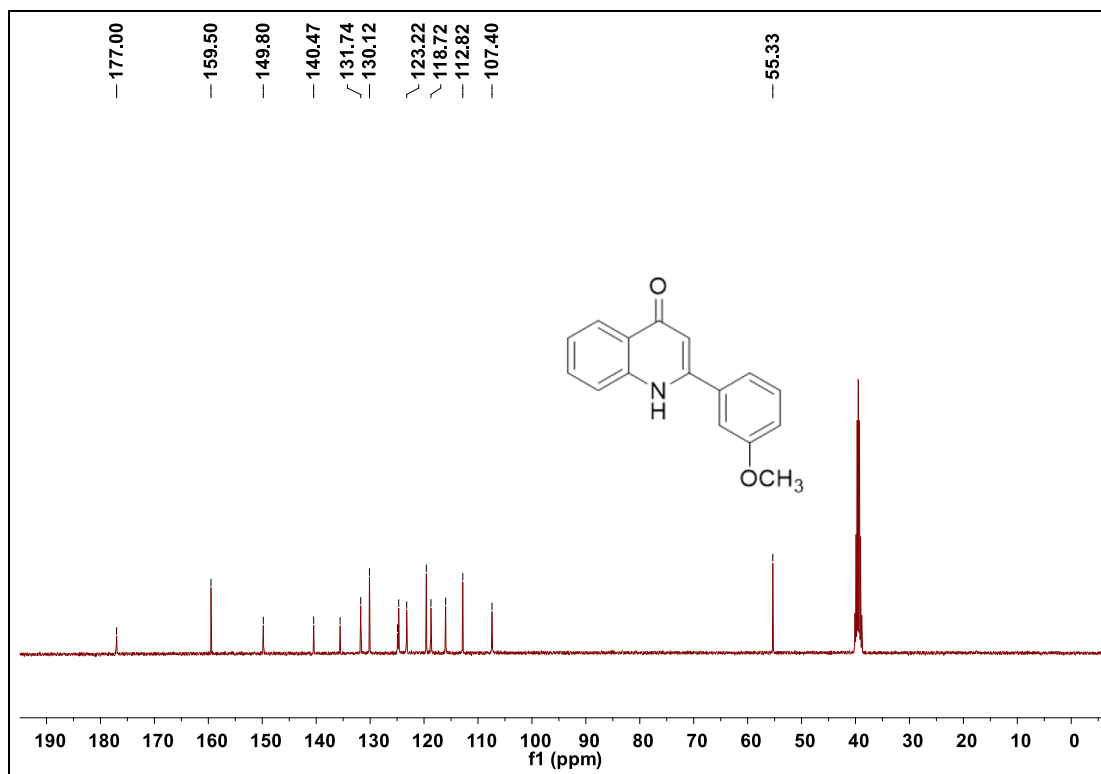
2-phenylquinolin-4(1H)-one (4a) ^{13}C NMR



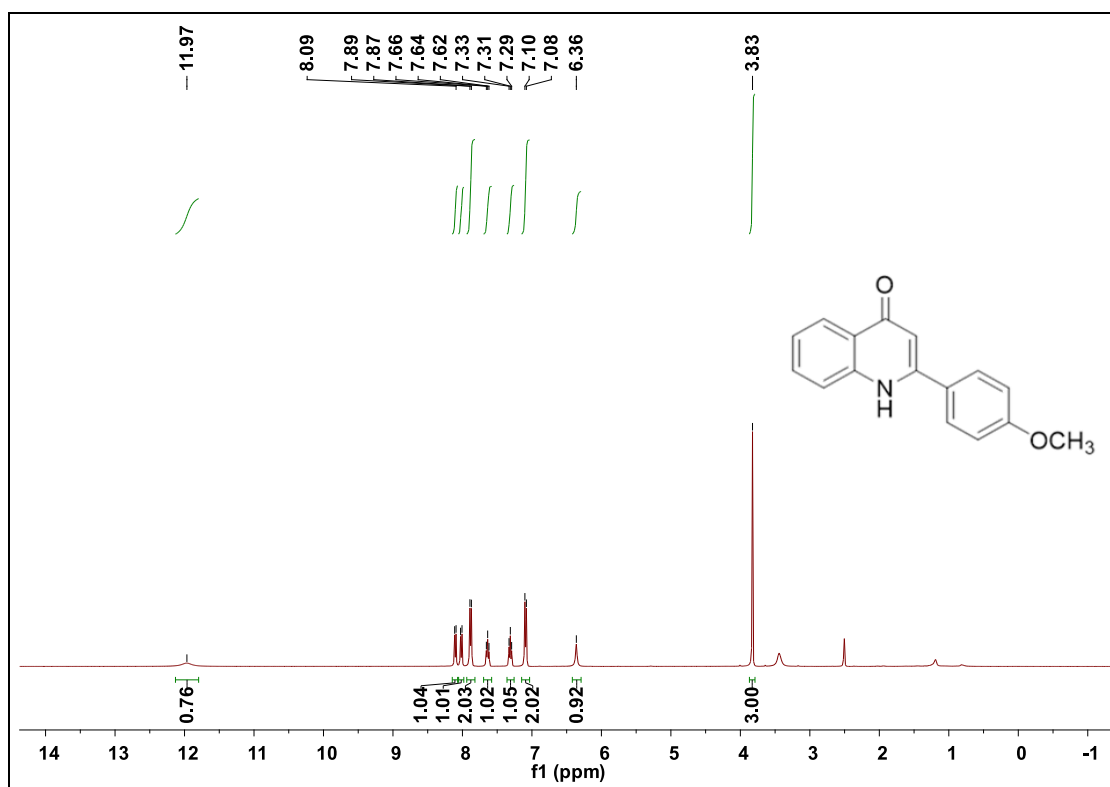
2-(m-methoxyphenyl) quinolin-4(1H)-one (4b) ^1H NMR



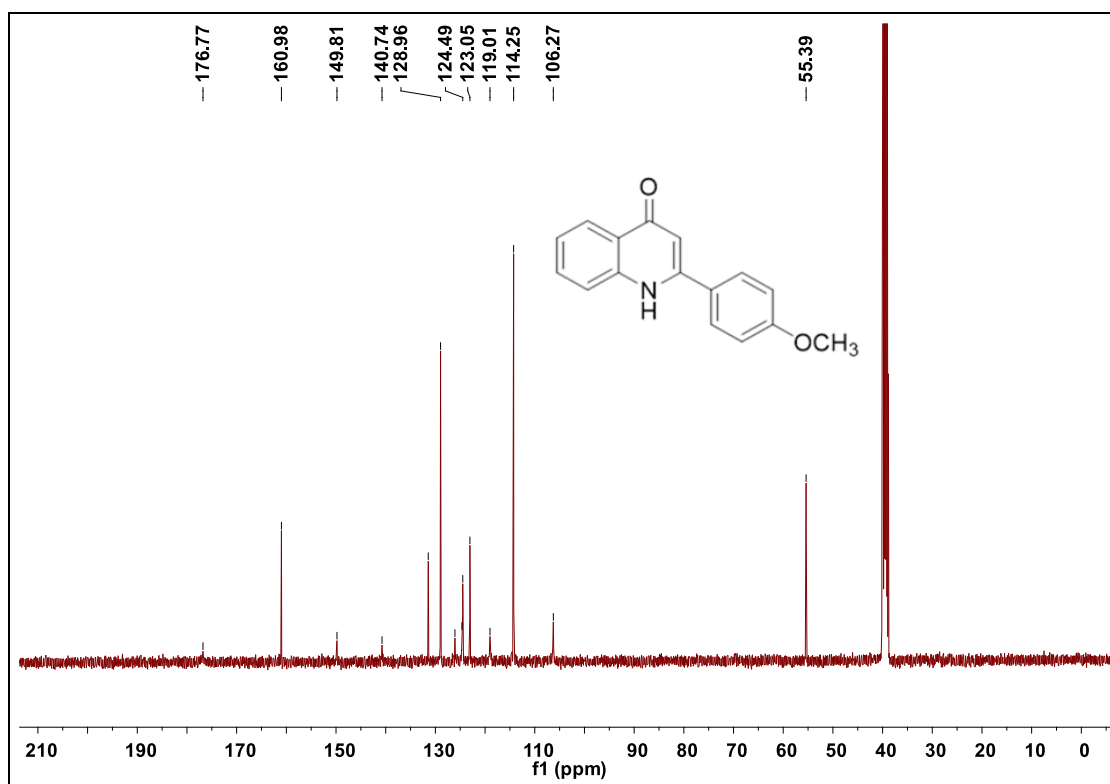
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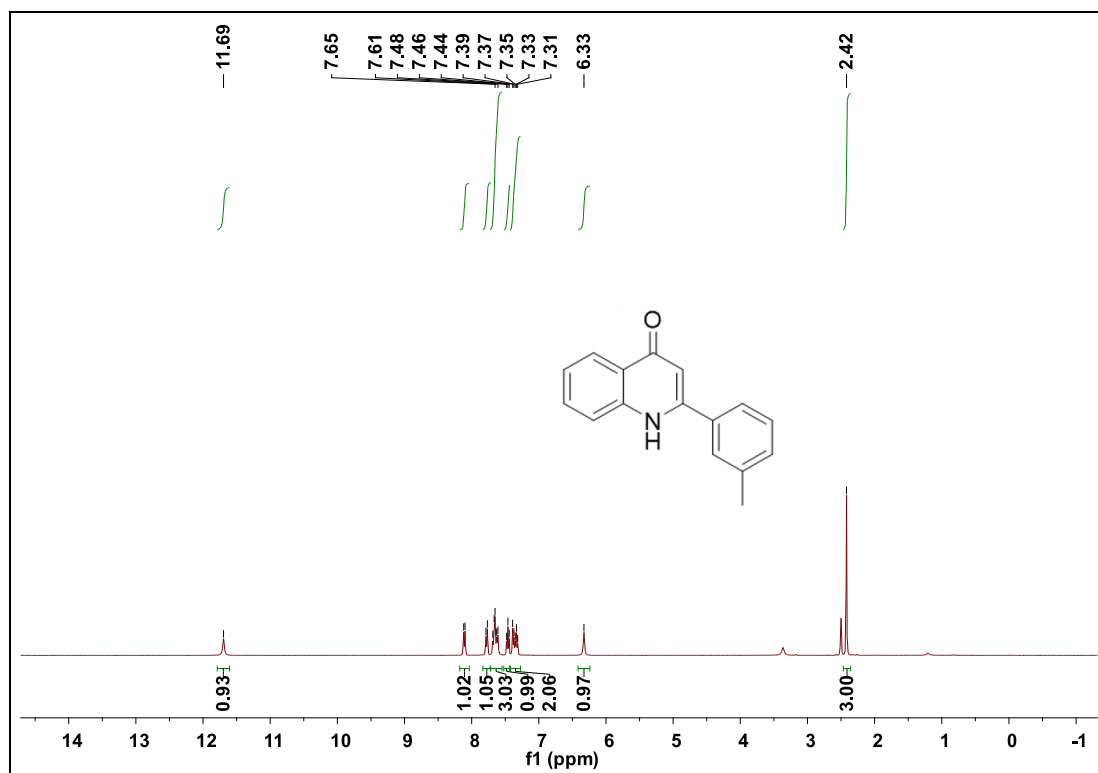
2-(p-methoxyphenyl) quinolin-4(1H)-one (4c) ^1H NMR



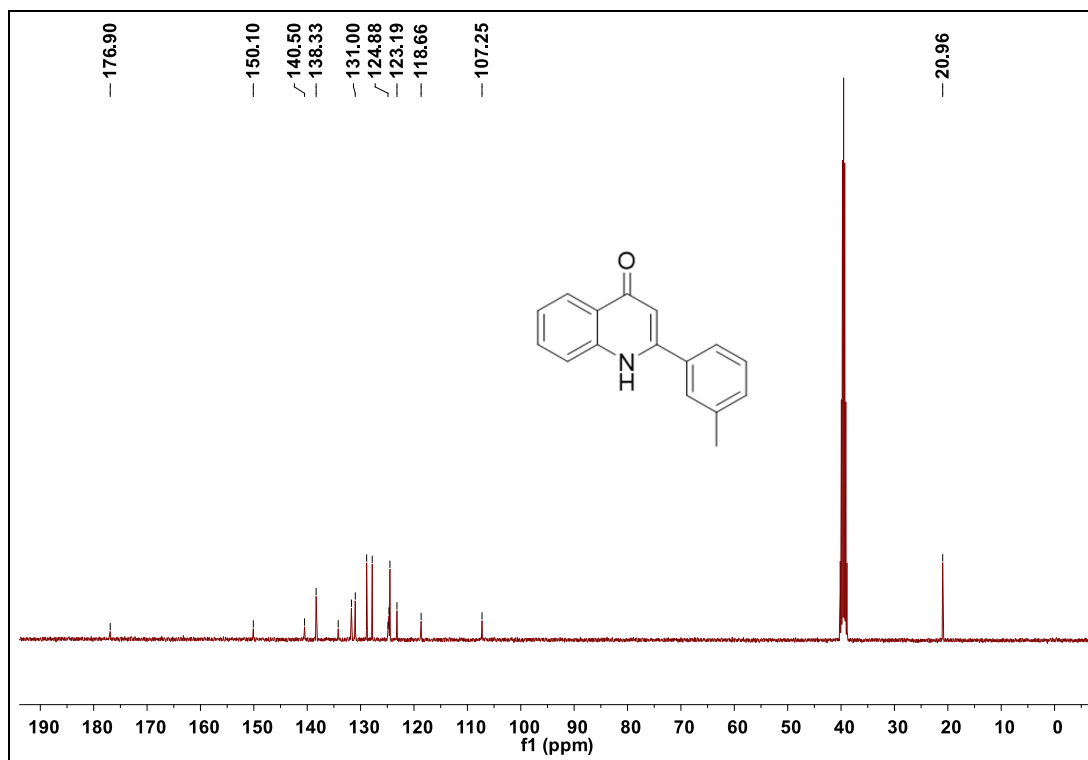
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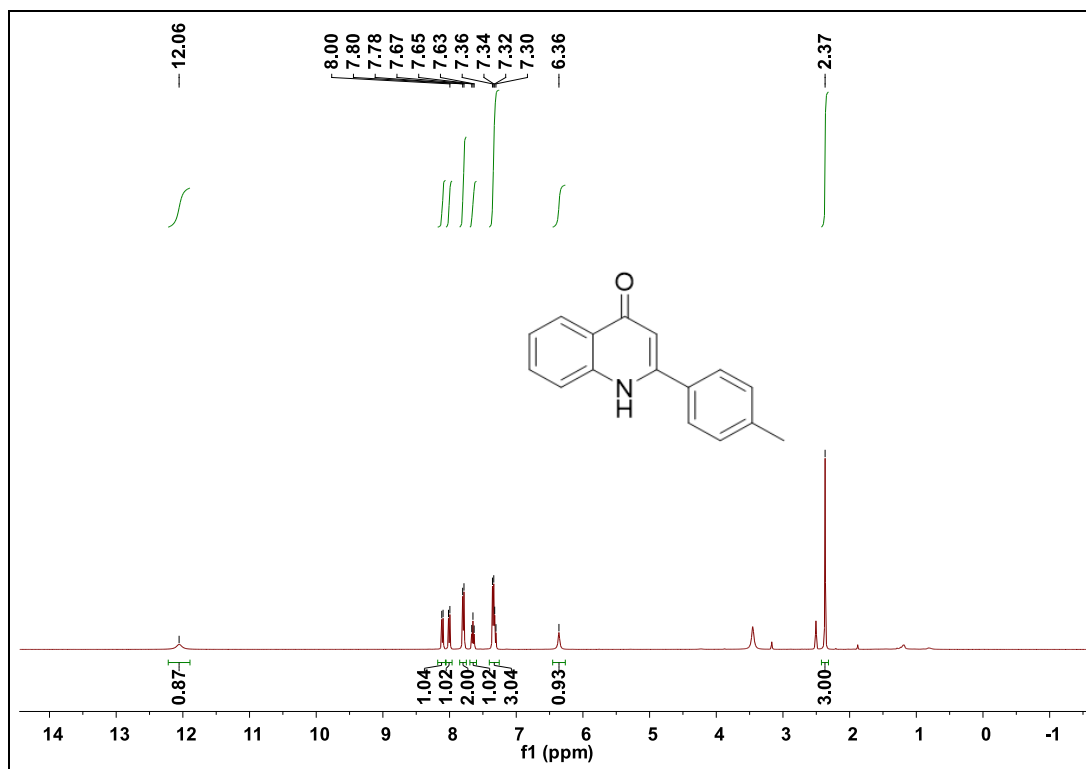
2-(m-tolyl) quinolin-4(1H)-one (4d) ^1H NMR



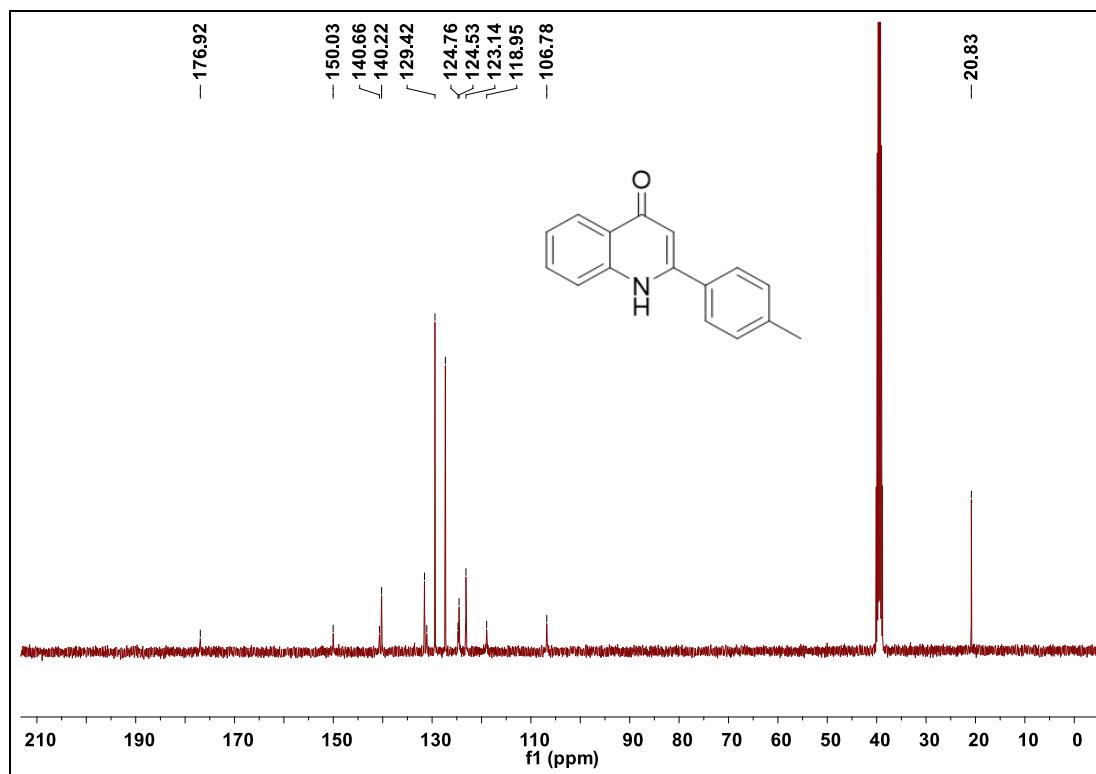
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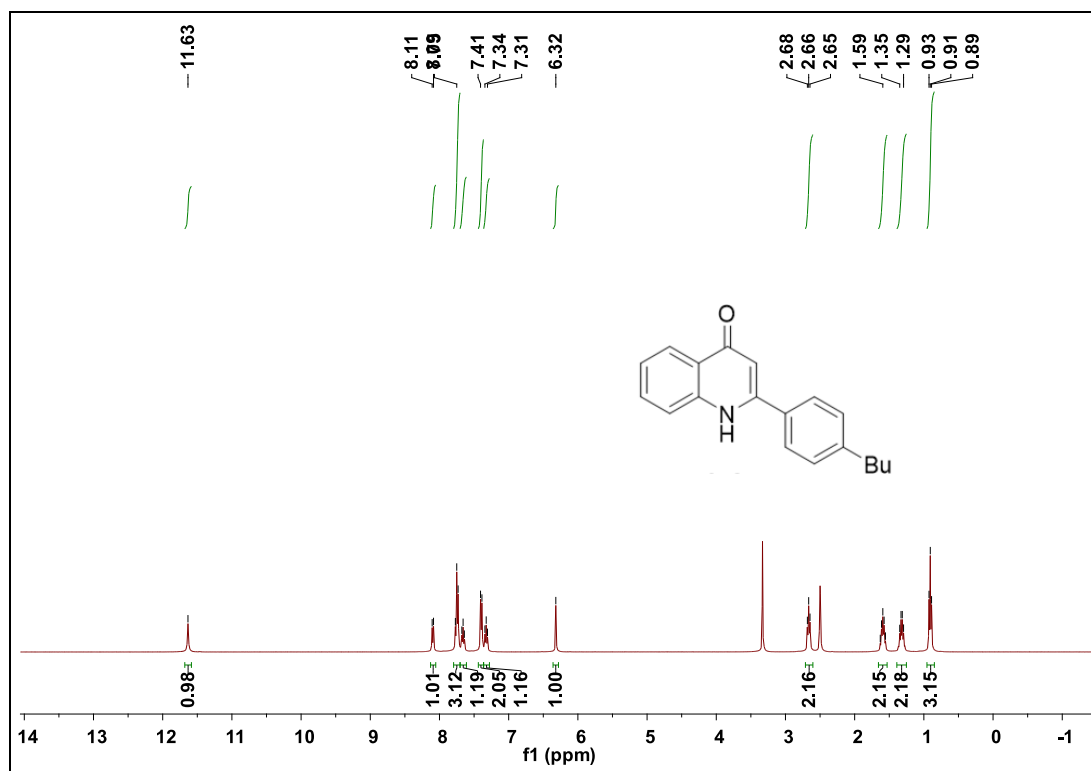
2-(p-tolyl) quinolin-4(1H)-one (4e) ^1H NMR



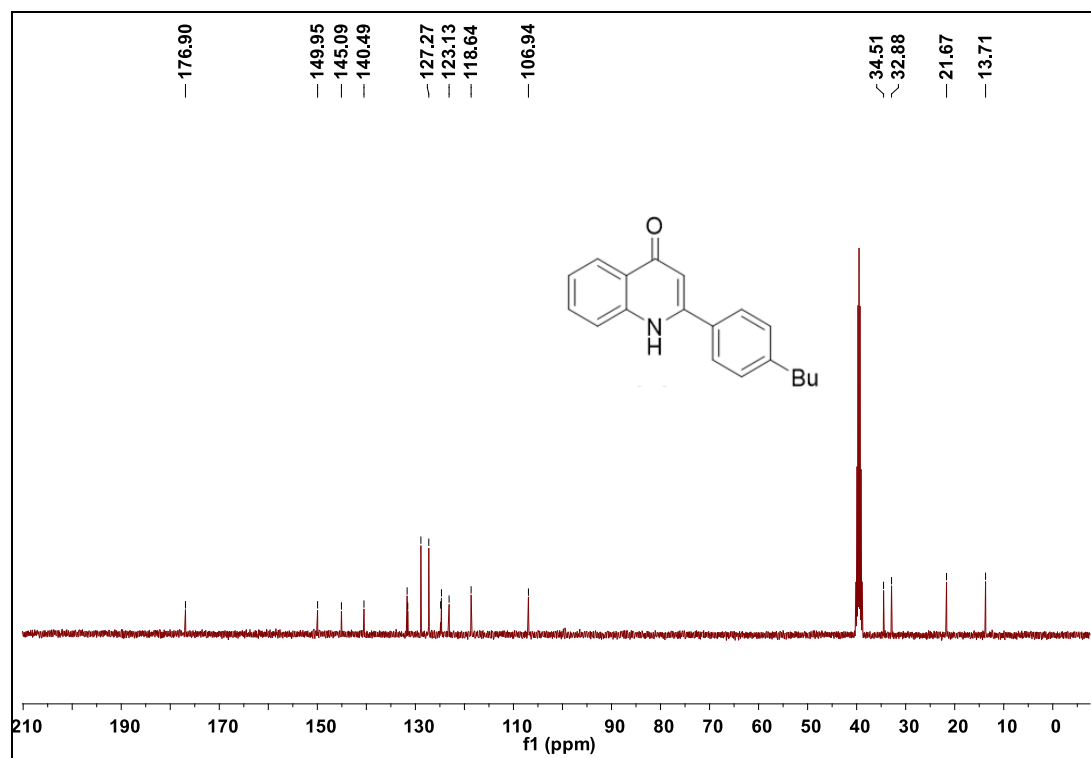
2-(p-tolyl) quinolin-4(1H)-one (4e) ^{13}C NMR



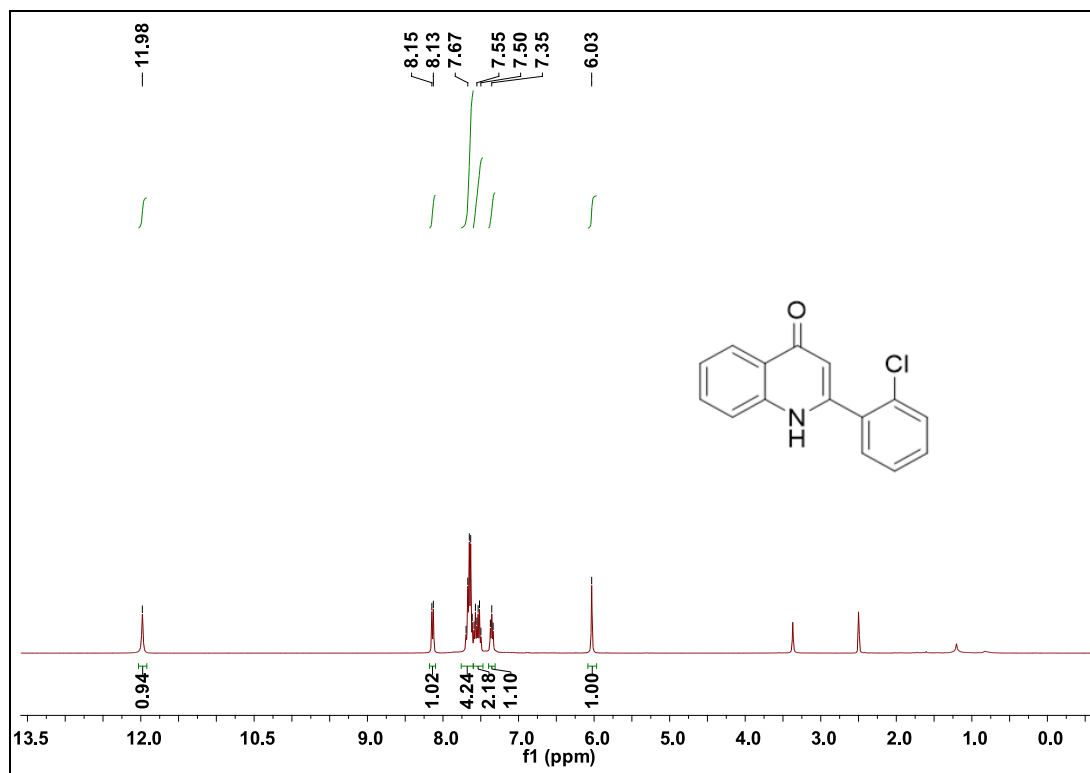
2-(4-butylphenyl) quinolin-4(1H)-one (4f) ^1H NMR



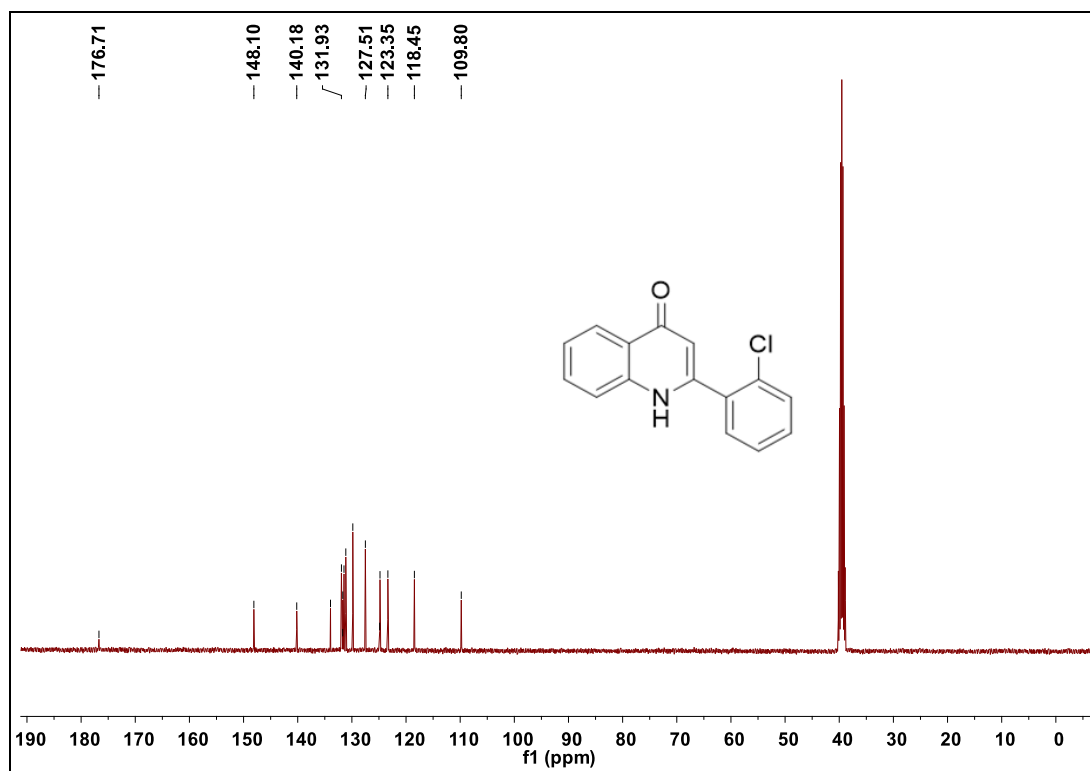
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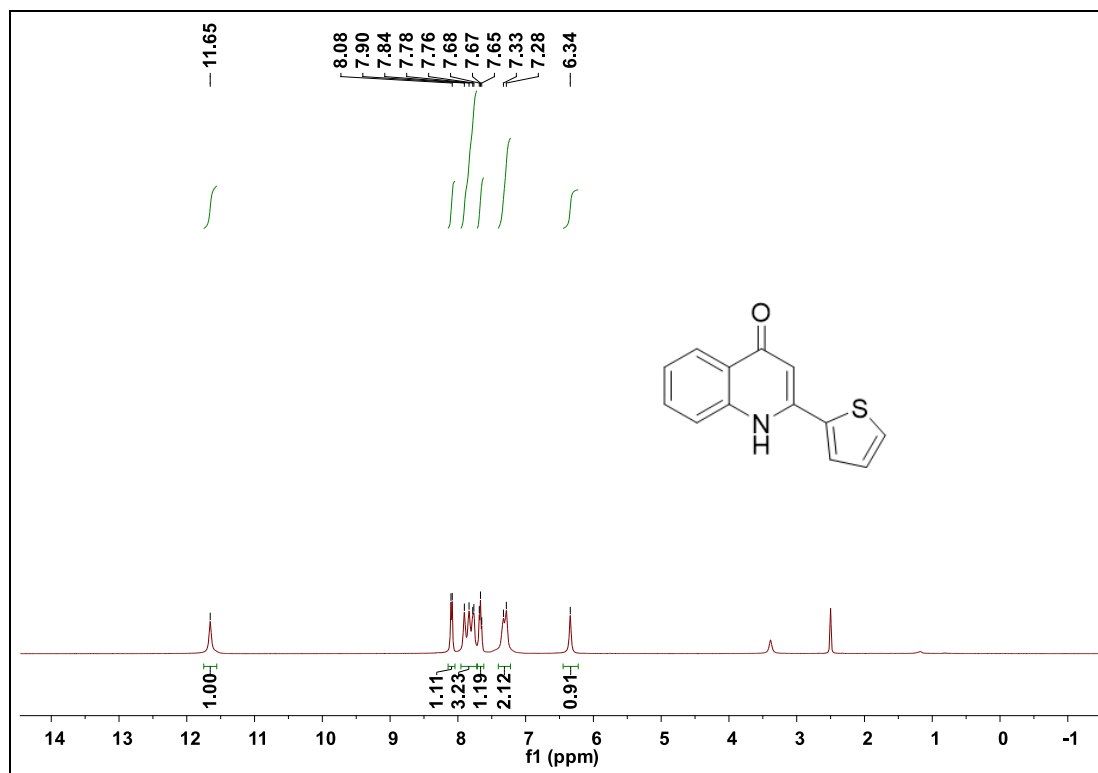
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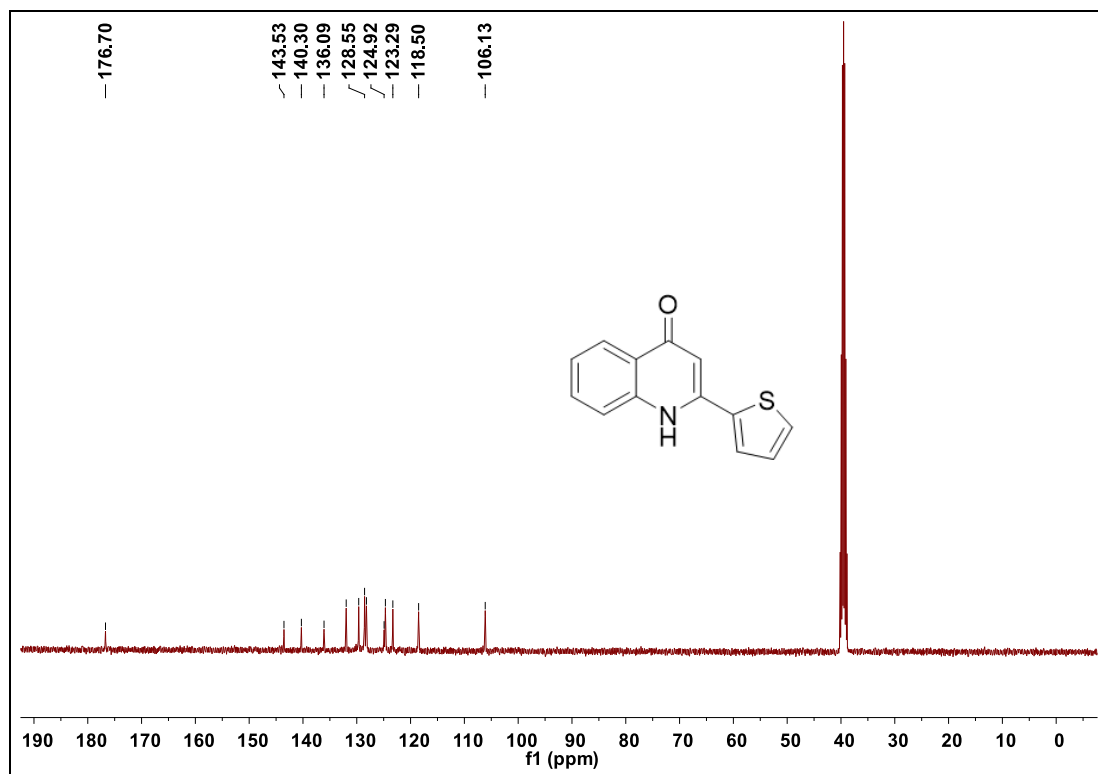
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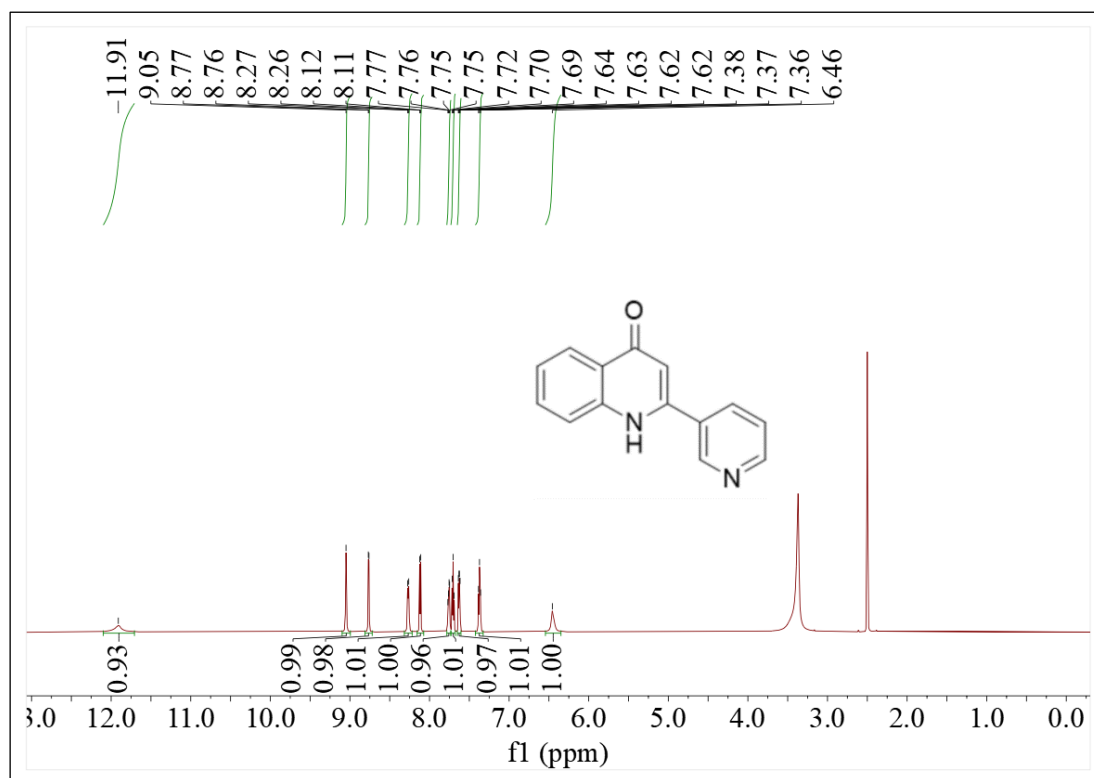
2-(thiophen-2-yl) quinolin-4(1H)-one (4h) ^1H NMR



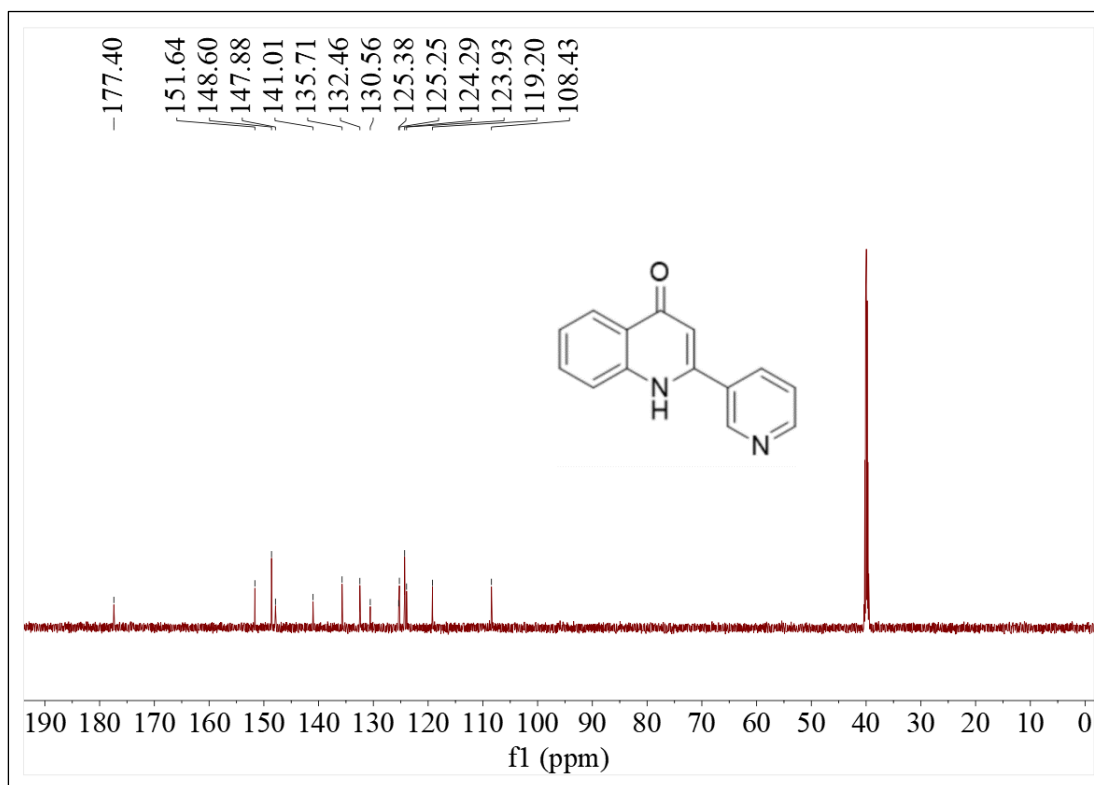
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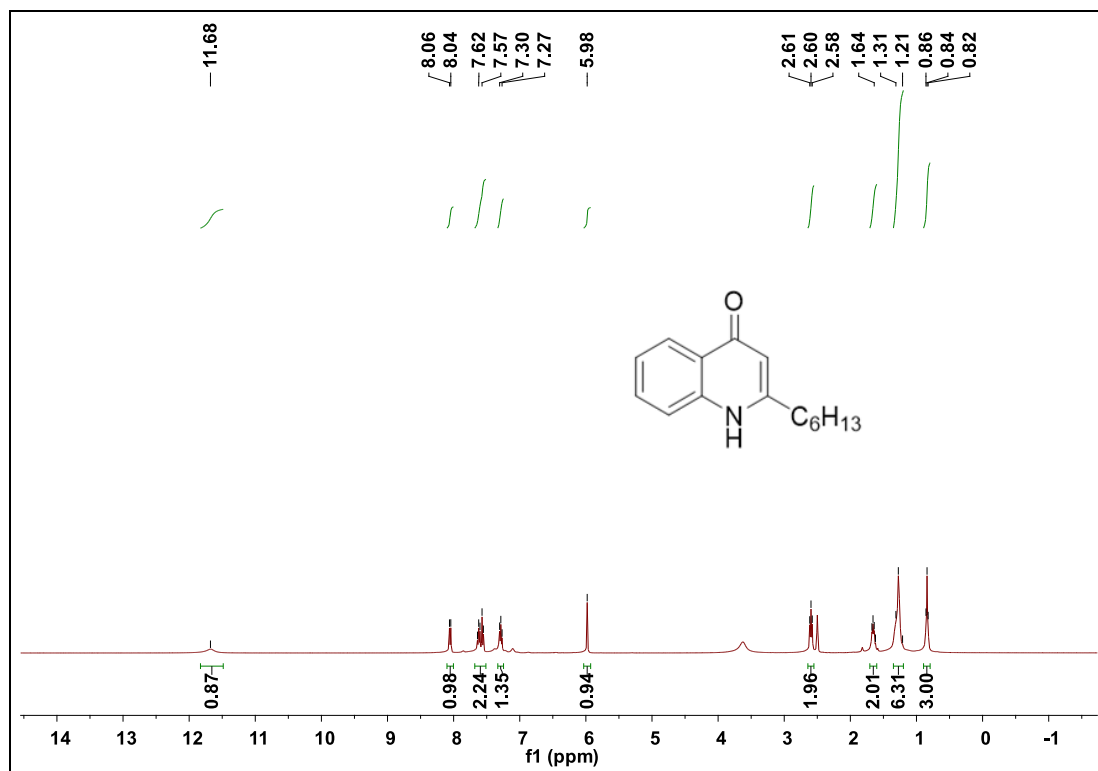
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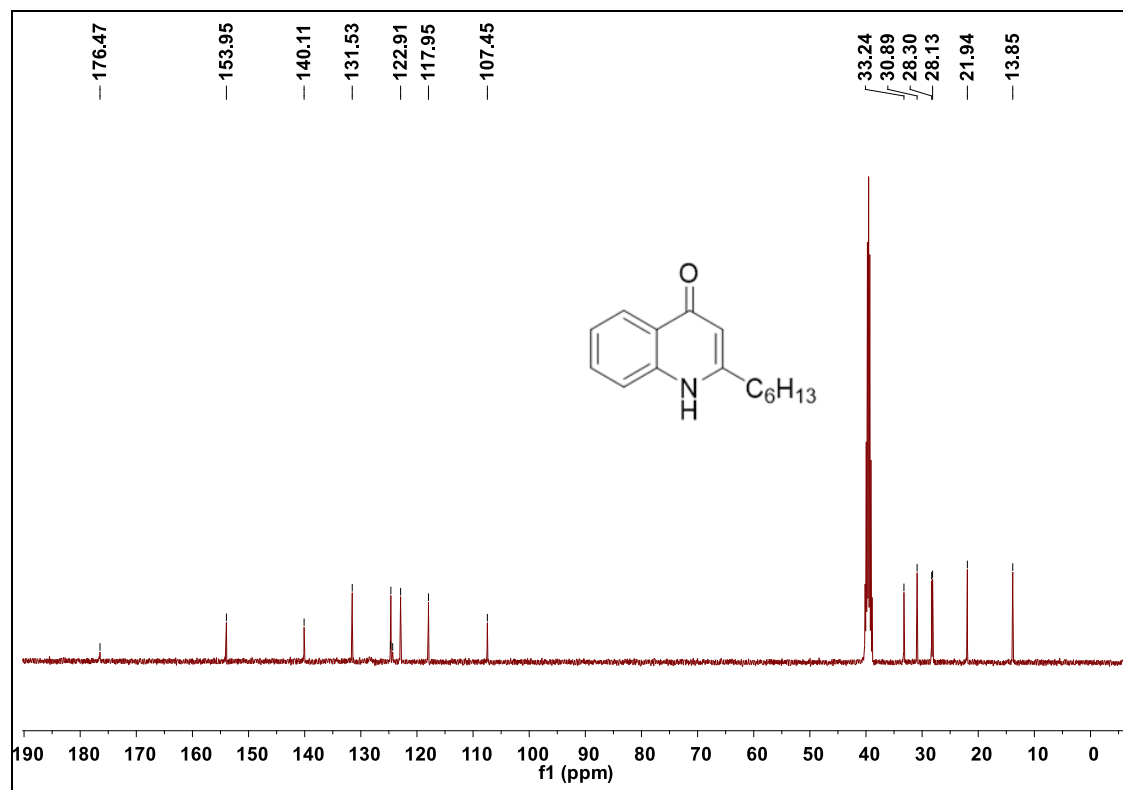
2-(pyridin-3-yl)quinolin-4(1H)-one (4i) ^{13}C NMR



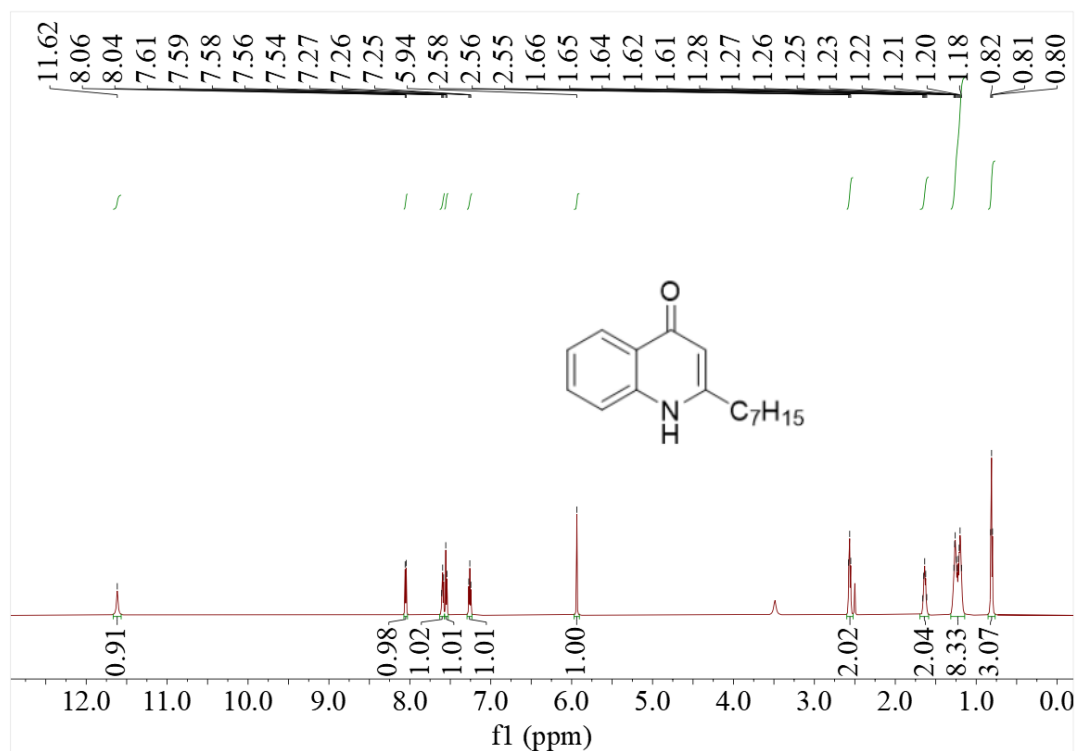
2-hexylquinolin-4(1H)-one (4j) ^1H NMR



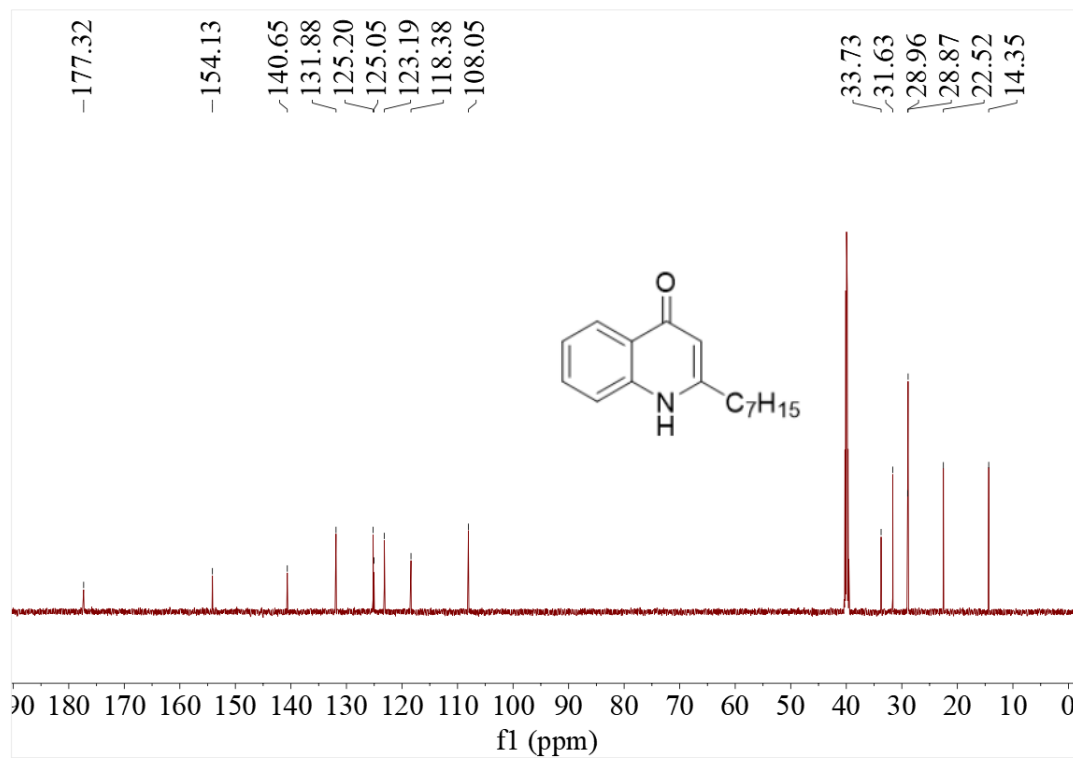
2-hexylquinolin-4(1H)-one (4j) ^{13}C NMR



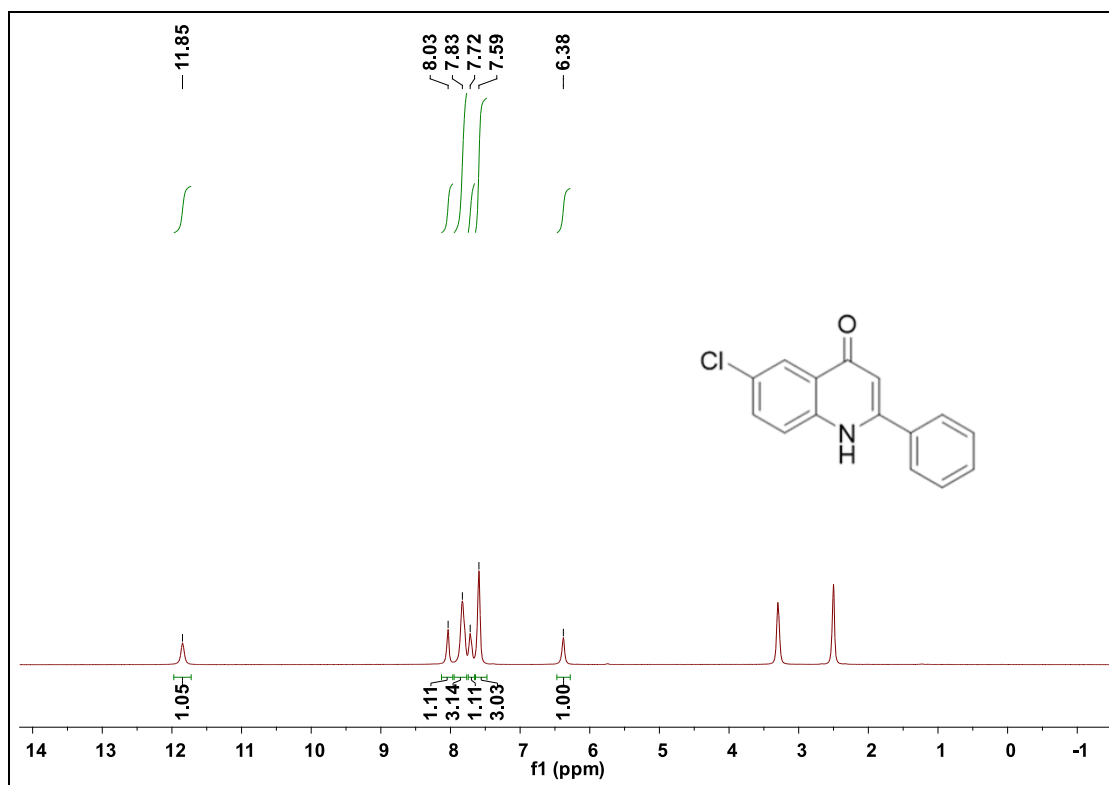
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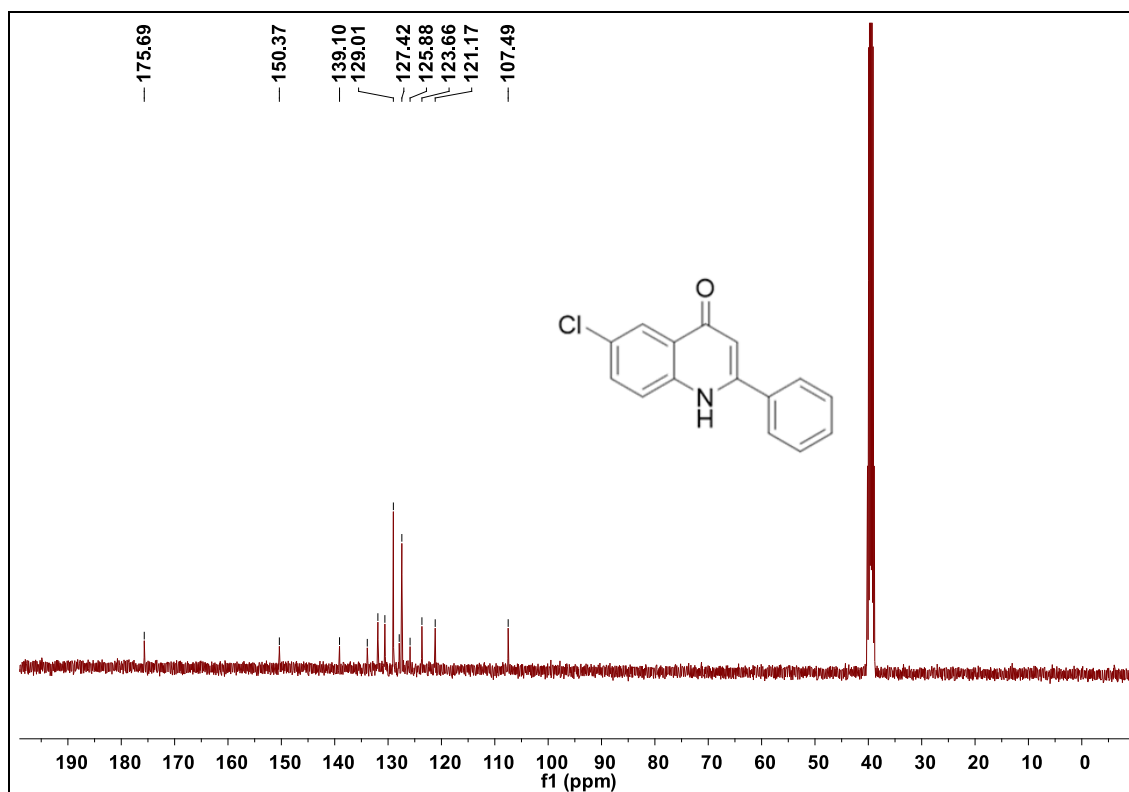
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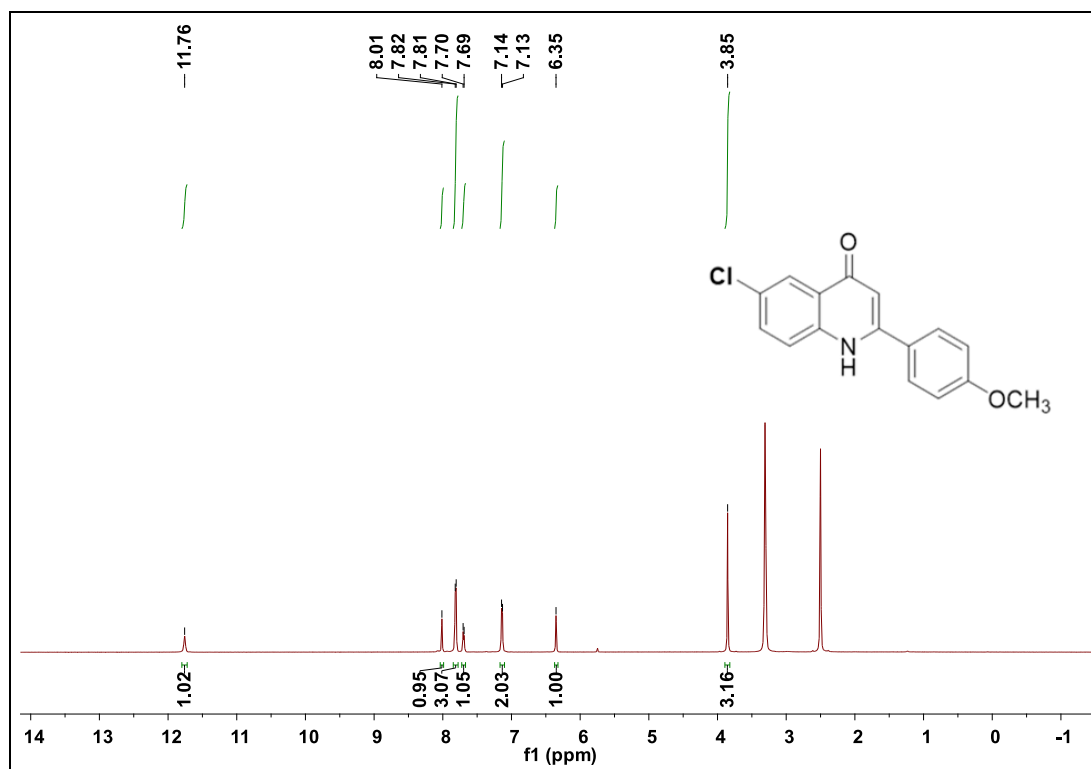
6-chloro-2-phenylquinolin-4(1H)-one (4l) ^1H NMR



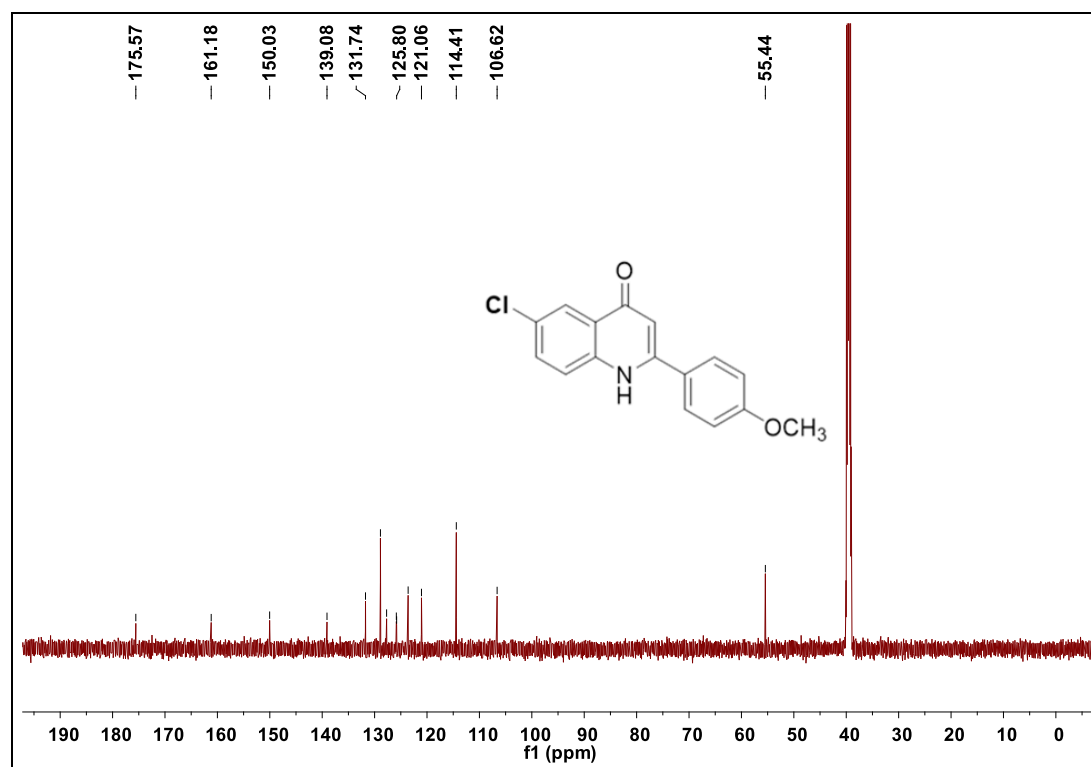
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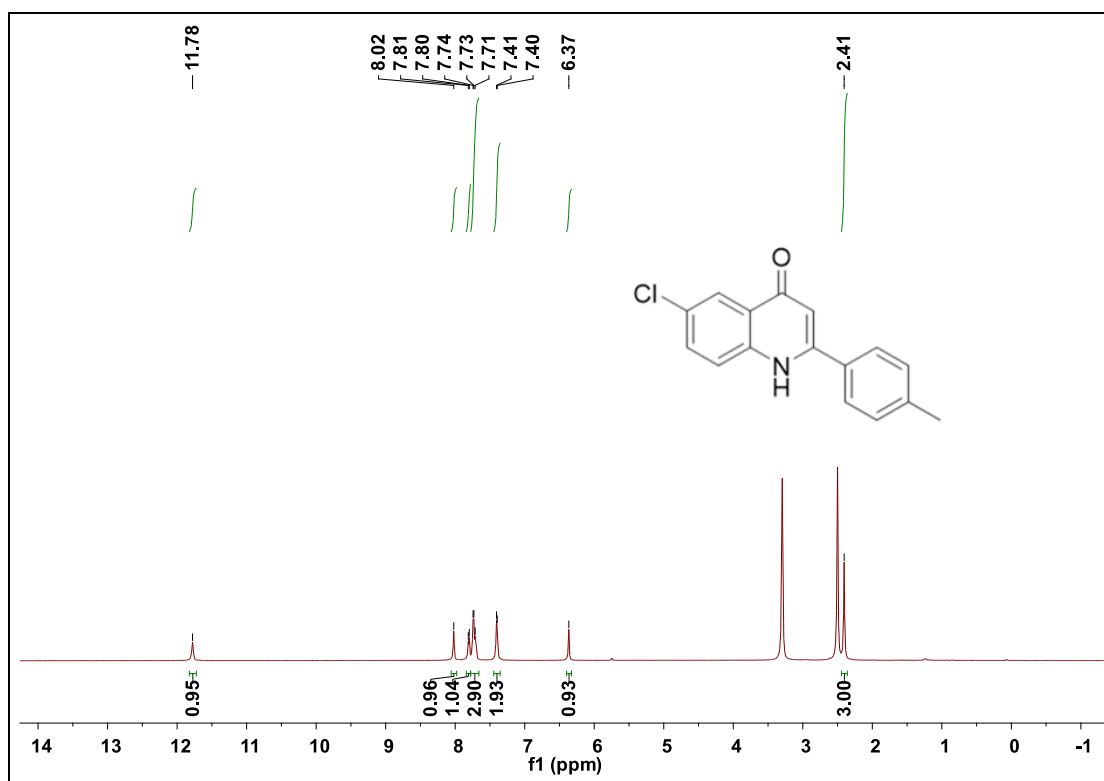
6-chloro-2-(4-methoxyphenyl) quinolin-4(1H)-one (4m) ^1H NMR



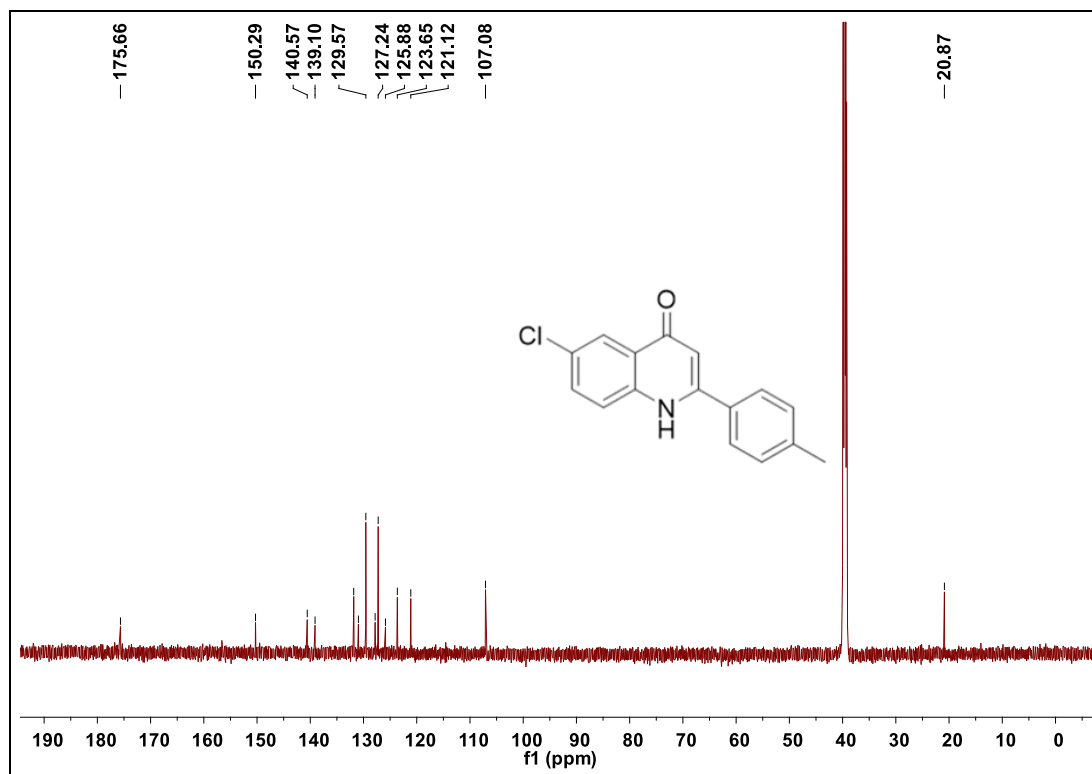
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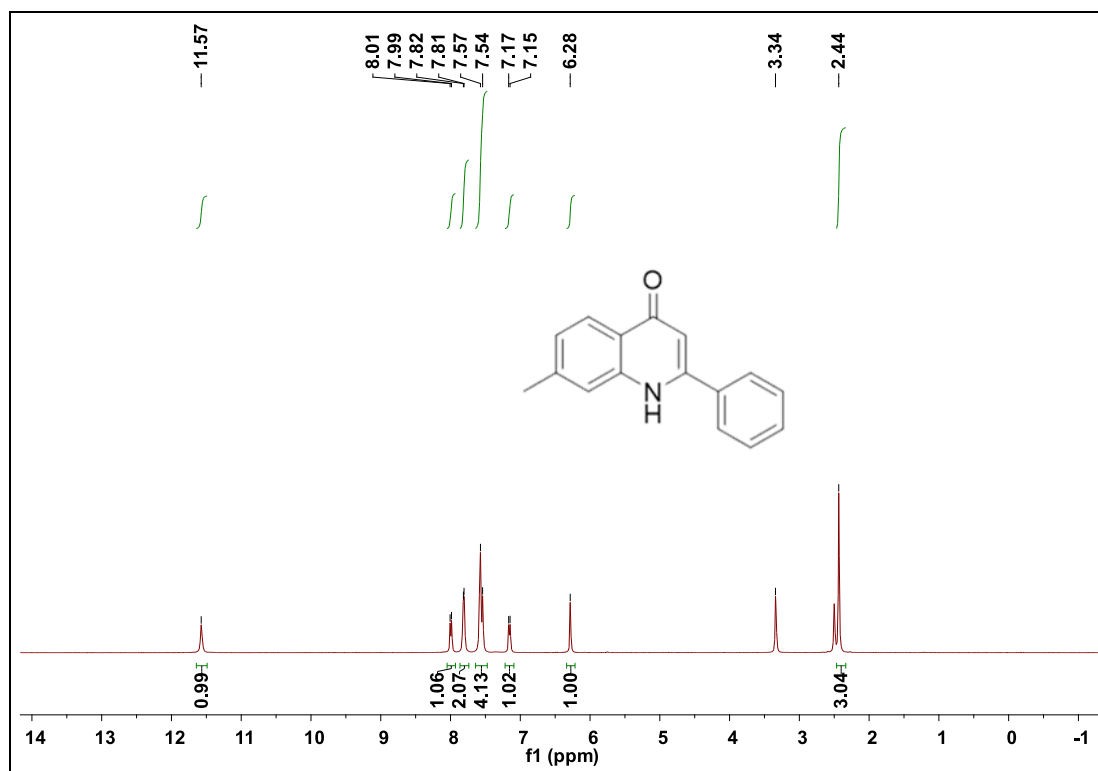
6-chloro-2-(p-tolyl) quinolin-4(1H)-one (4n) ^1H NMR



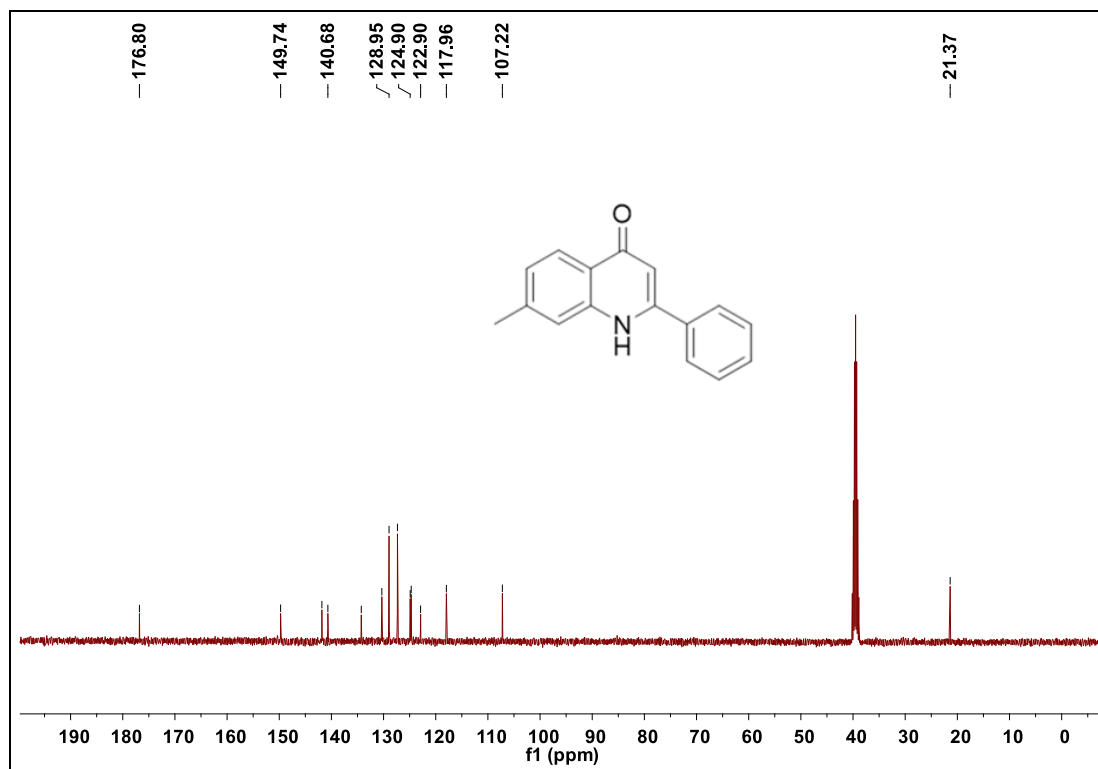
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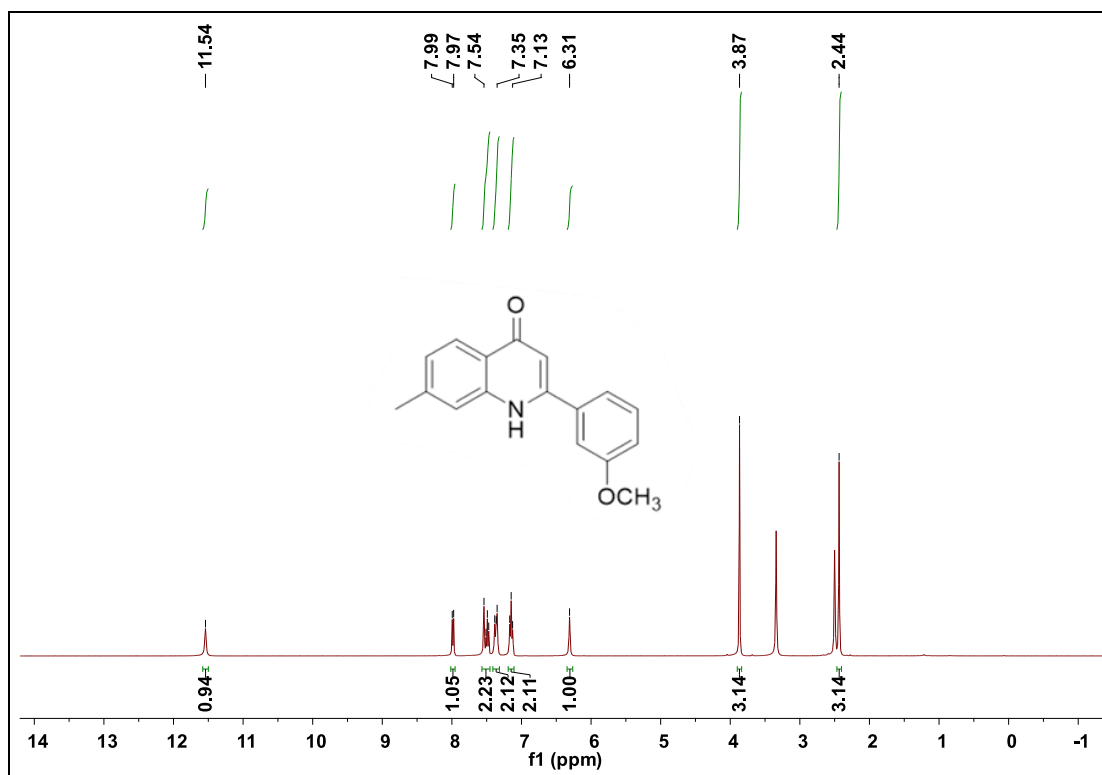
7-methyl-2-phenylquinolin-4(1H)-one (4o) ^1H NMR



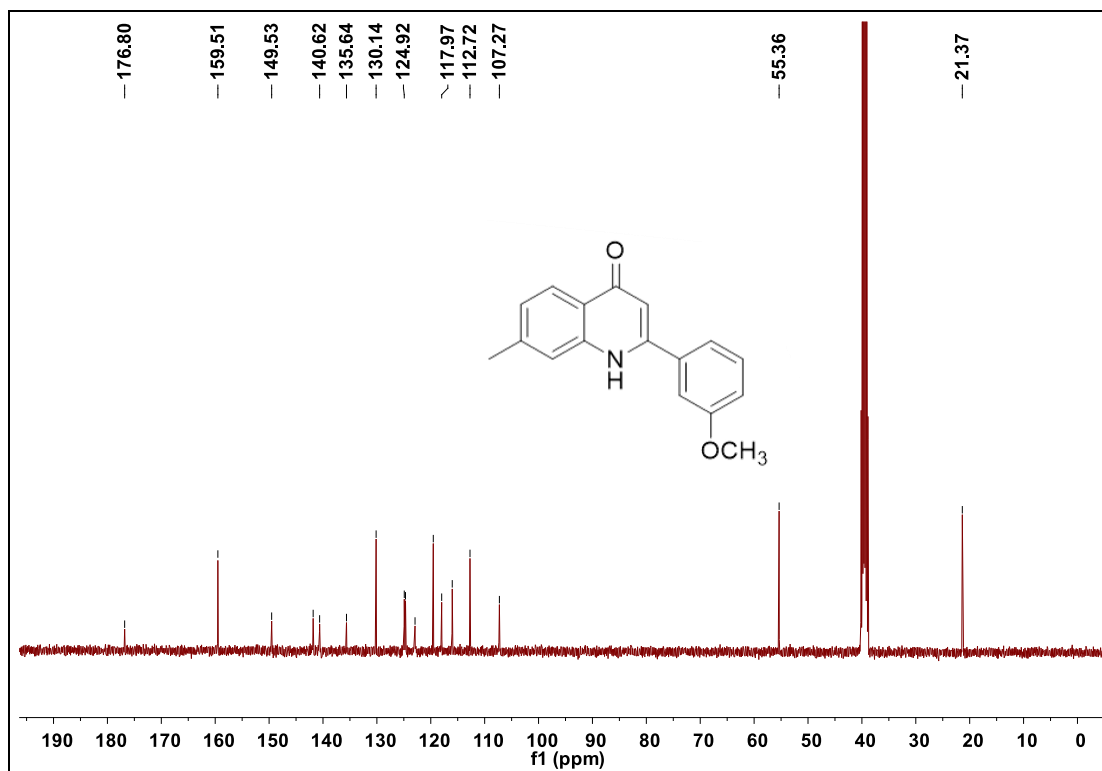
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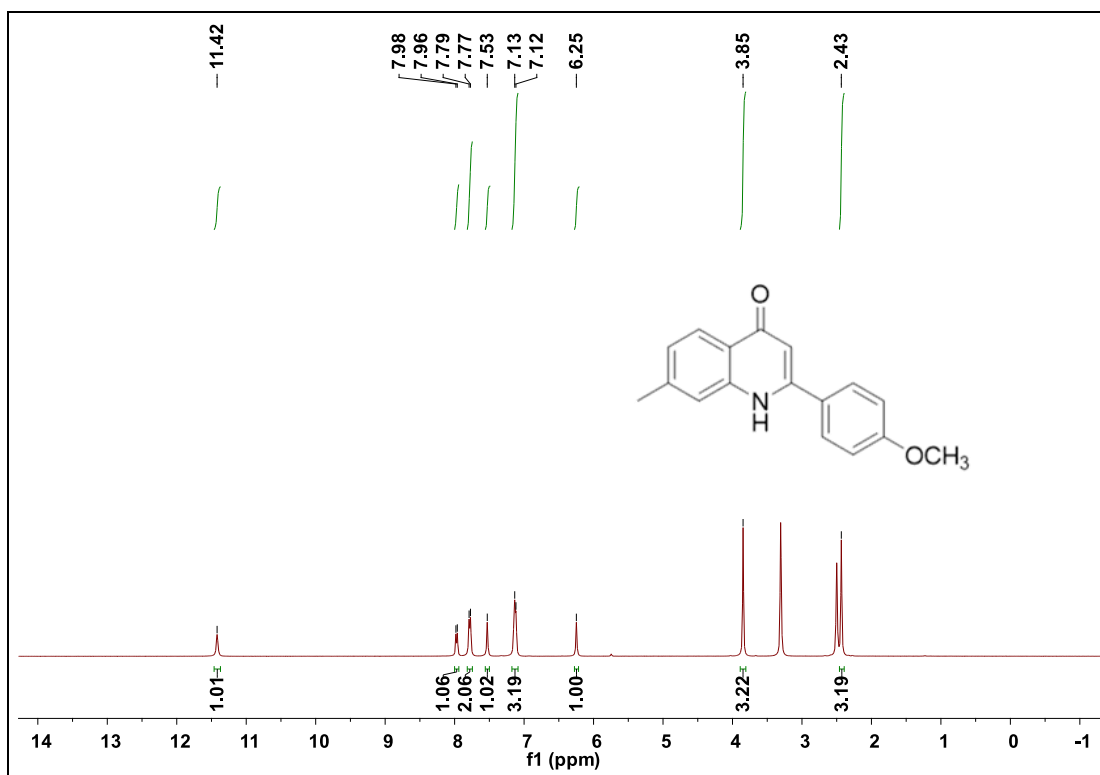
7-methyl-2-(m-methoxyphenyl) quinolin-4(1H)-one (4p) ^1H NMR



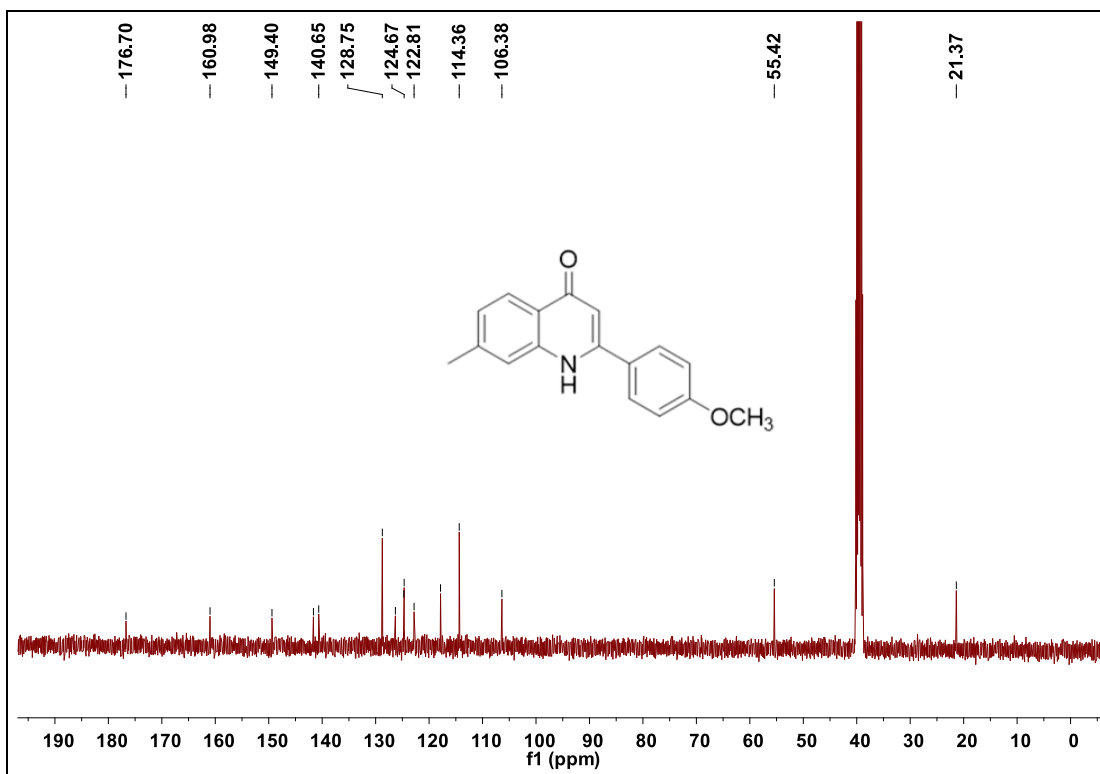
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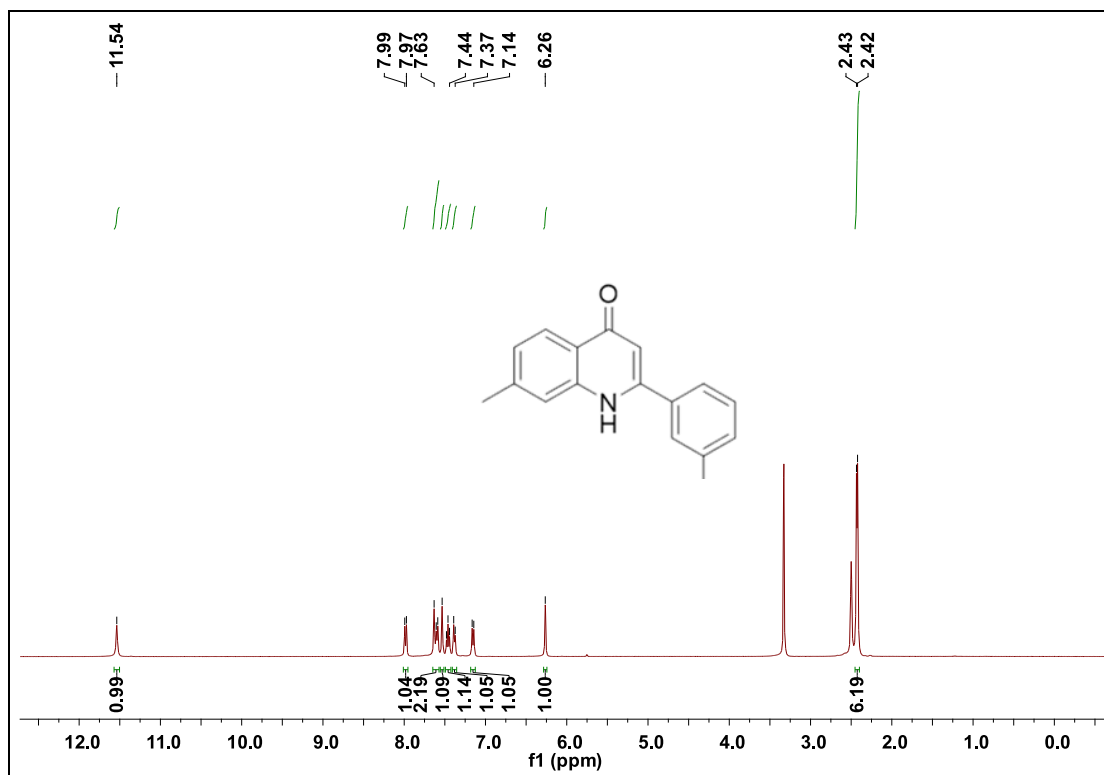
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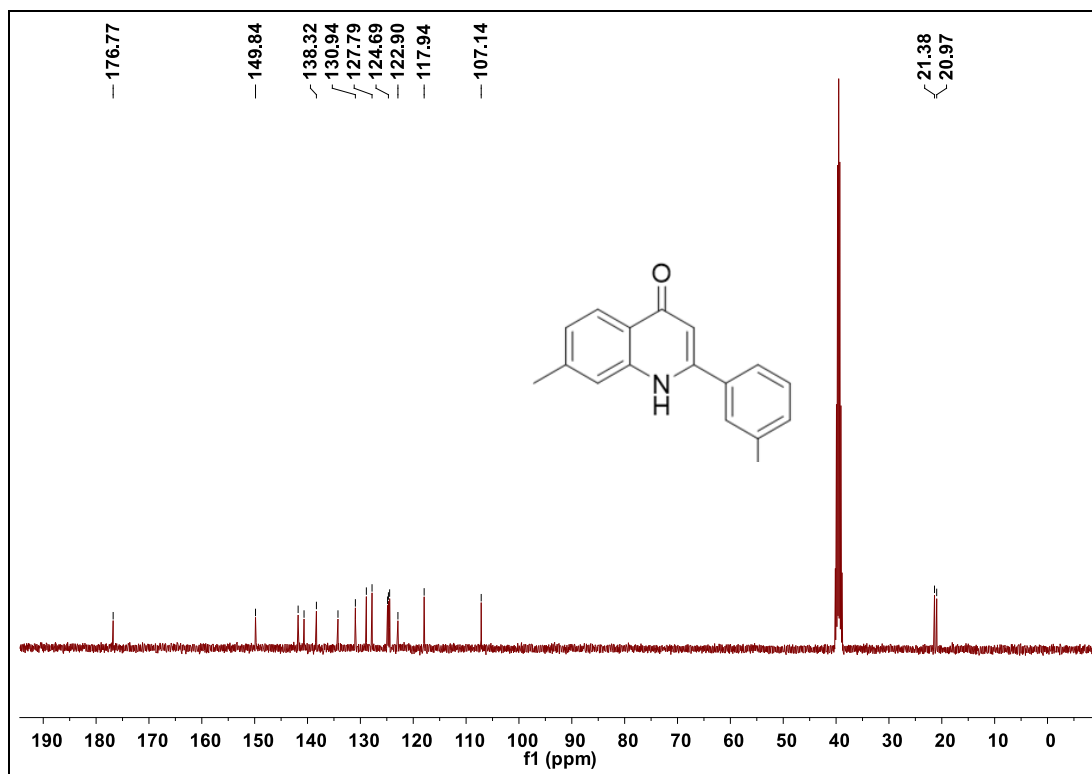
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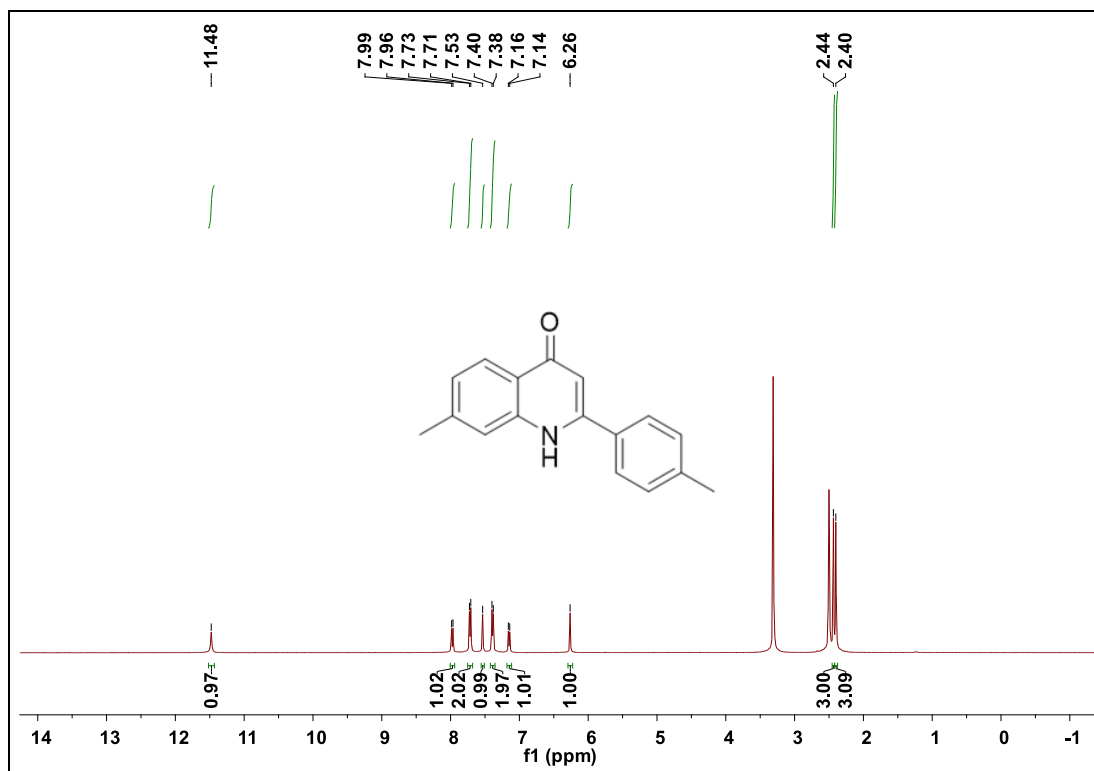
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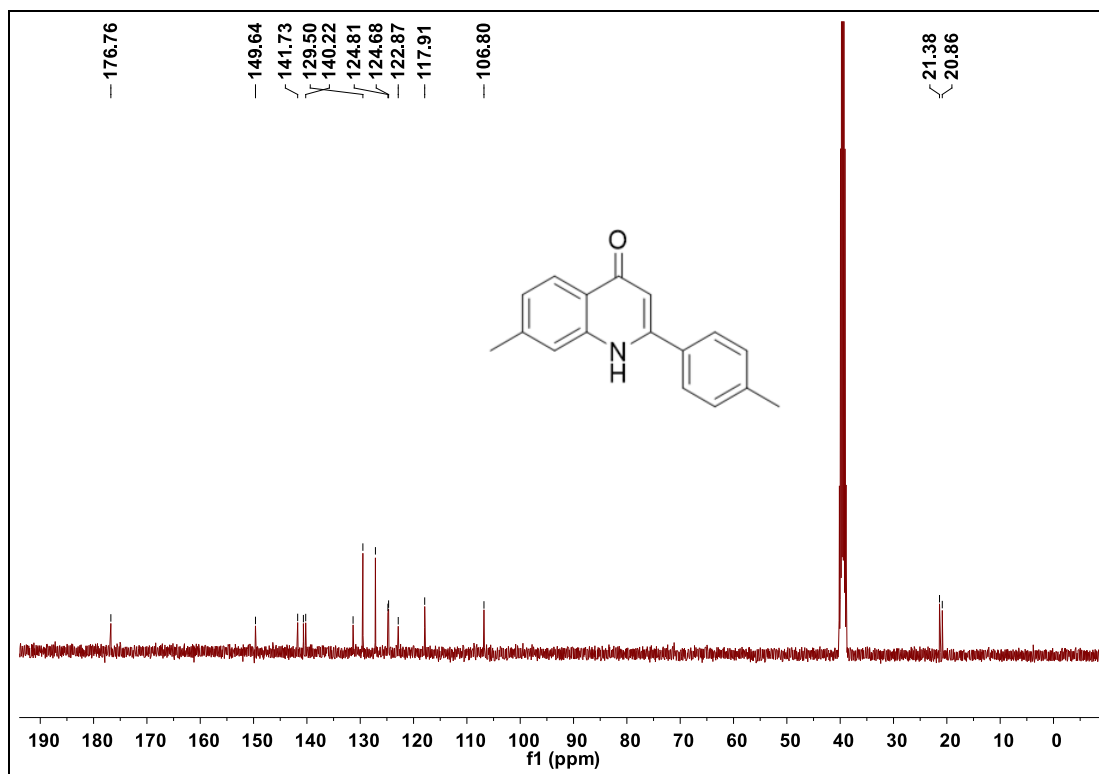
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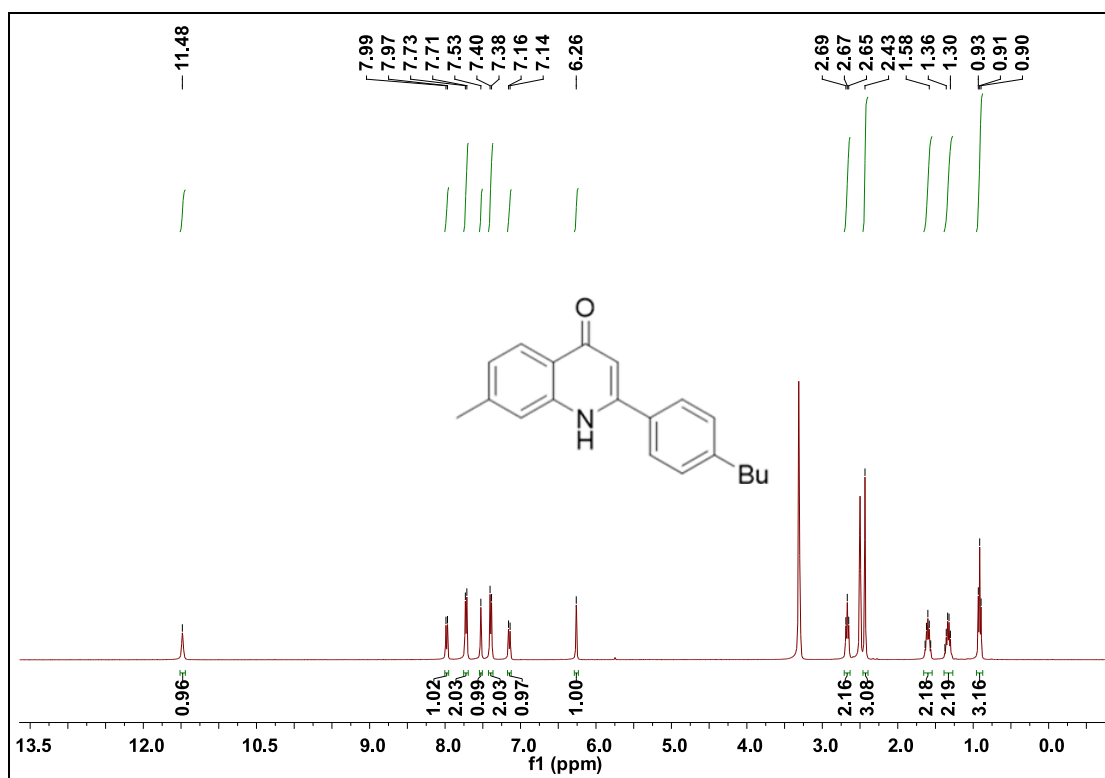
7-methyl-2-(p-tolyl) quinolin-4(1H)-one (4s) ^1H NMR



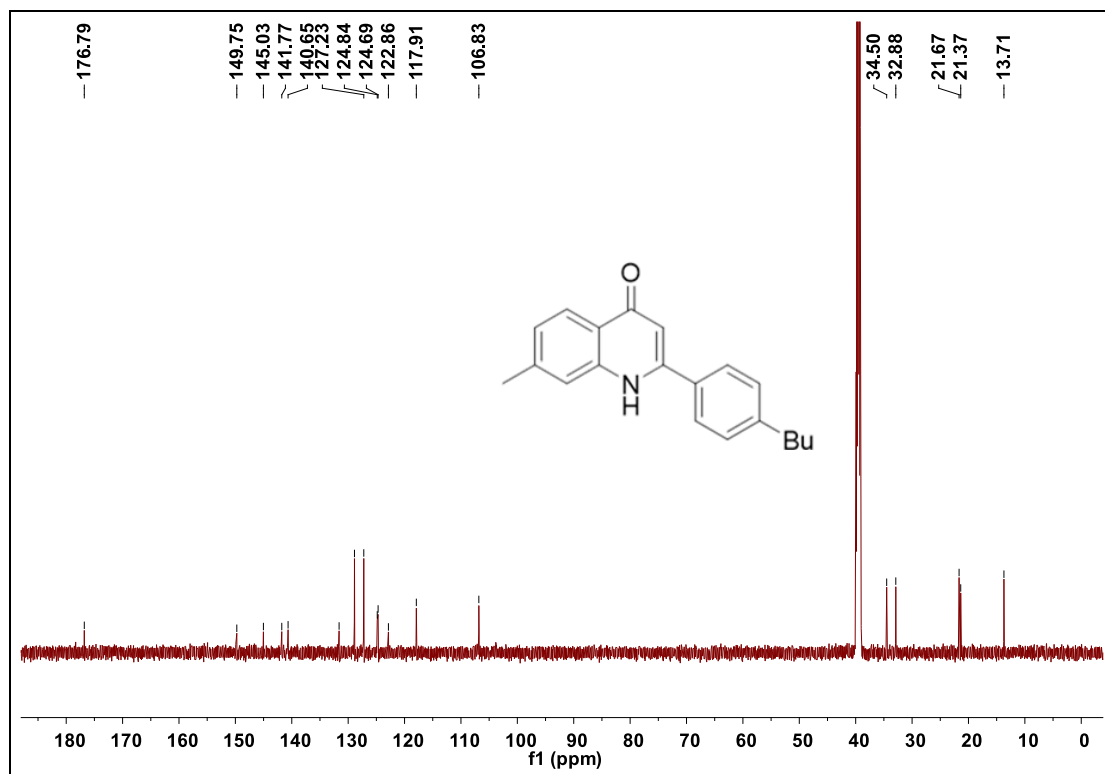
7-methyl-2-(p-tolyl) quinolin-4(1H)-one (4s) ^{13}C NMR



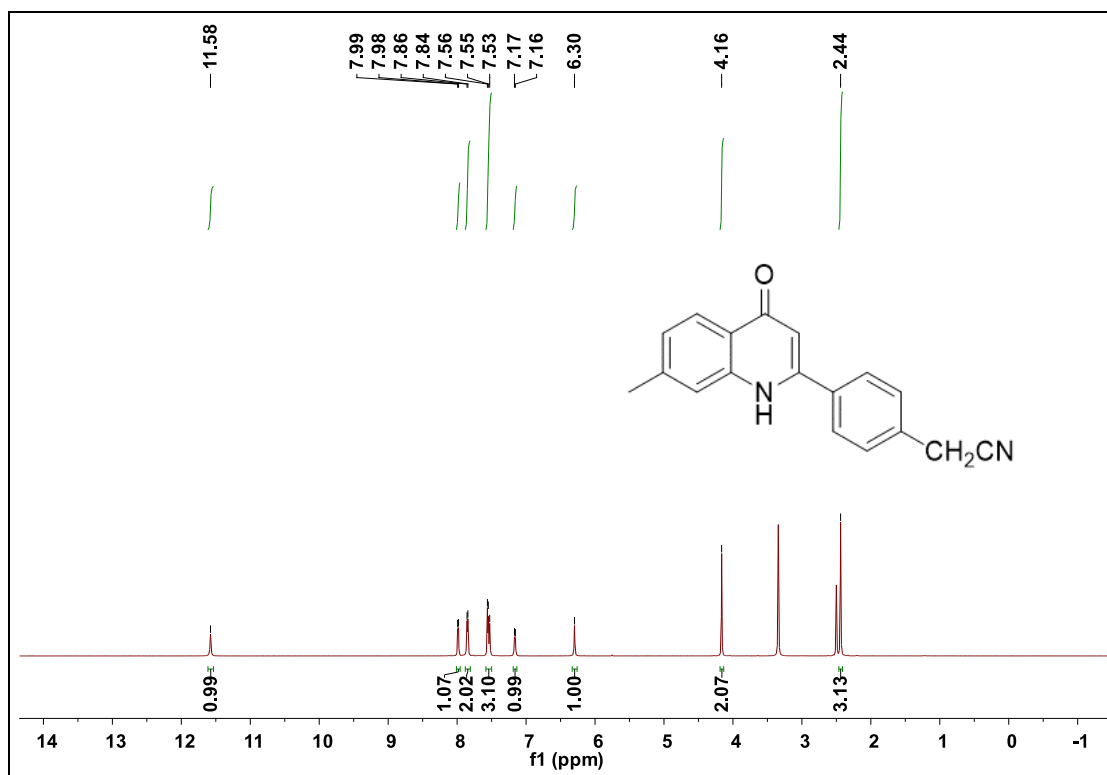
7-methyl-2-(4-butylphenyl) quinolin-4(1H)-one (4t) ^1H NMR



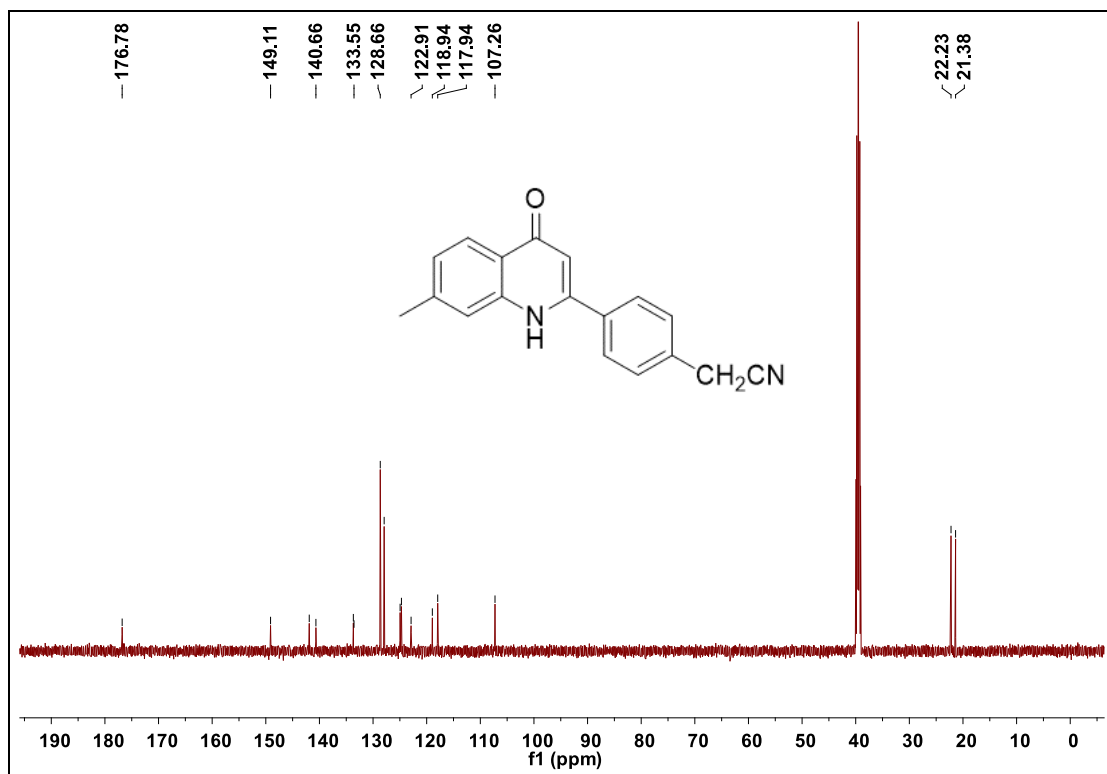
7-methyl-2-(4-butylphenyl) quinolin-4(1H)-one (4t) ^{13}C NMR



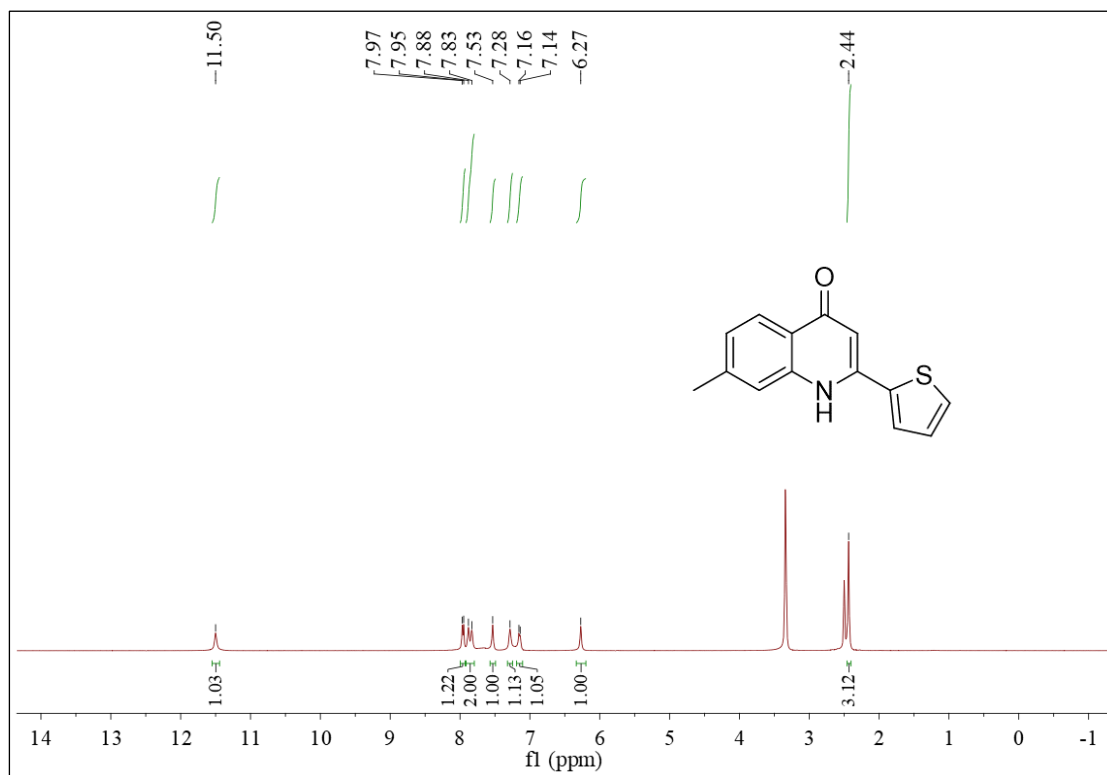
7-methyl-2-(4-(4-oxo-1,4-dihydroquinolin-2-yl)phenyl)acetonitrile (4u) ¹H NMR



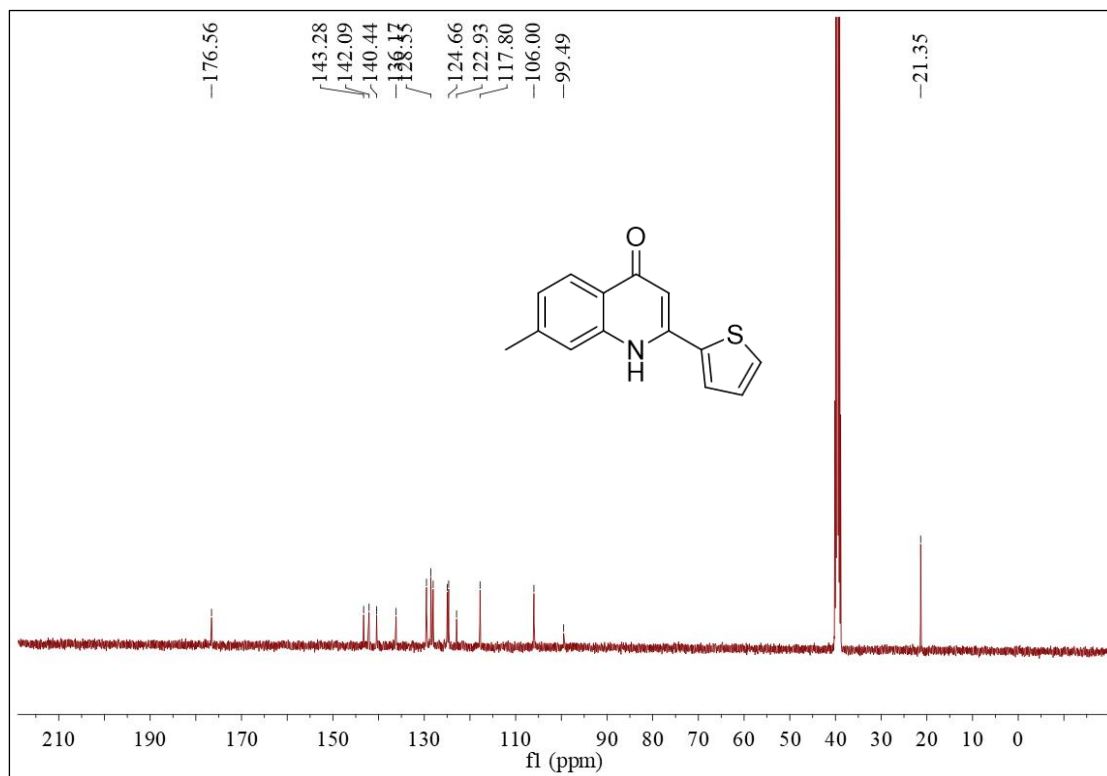
7-methyl-2-(4-(4-oxo-1,4-dihydroquinolin-2-yl)phenyl)acetonitrile (4u) ¹³C NMR



7-methyl-2-(thiophen-2-yl) quinolin-4(1H)-one (4v) ^1H NMR



7-methyl-2-(thiophen-2-yl) quinolin-4(1H)-one (4v) ^{13}C NMR



3. HRMS Spectra

Palladium complex **VI** or **VII** $[M+H]^+$

