Supporting Information

Replacing $Pd(OAc)_2$ with supported palladium nanoparticles in *ortho*-directed CDC reaction of alkylbenzenes

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1. Figures S1−S2

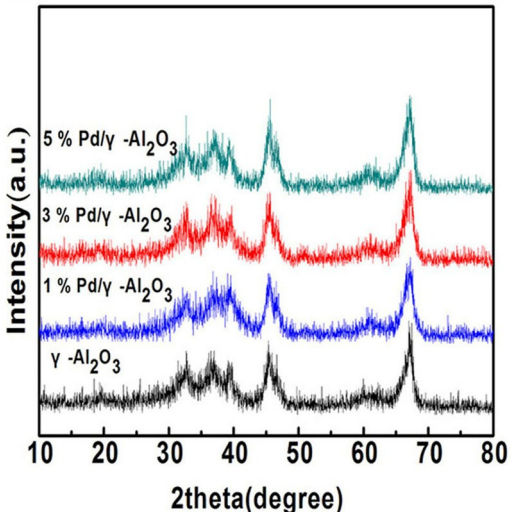


Figure S1. XRD patterns of catalysts with different loadings

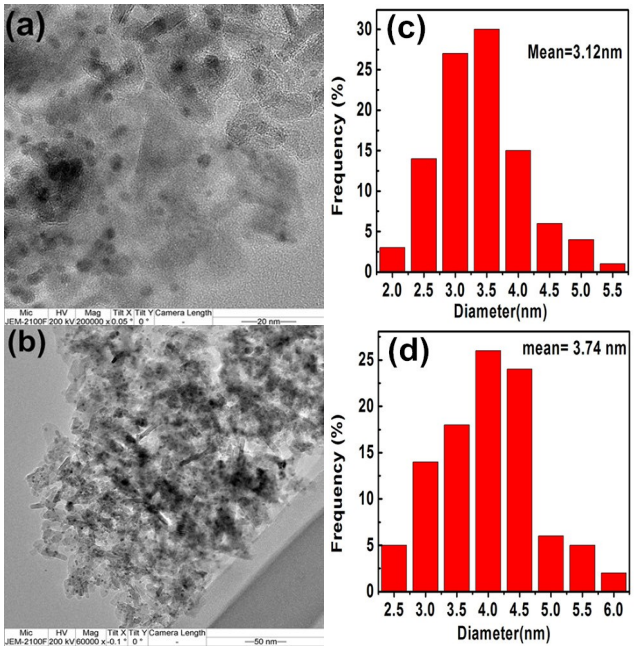
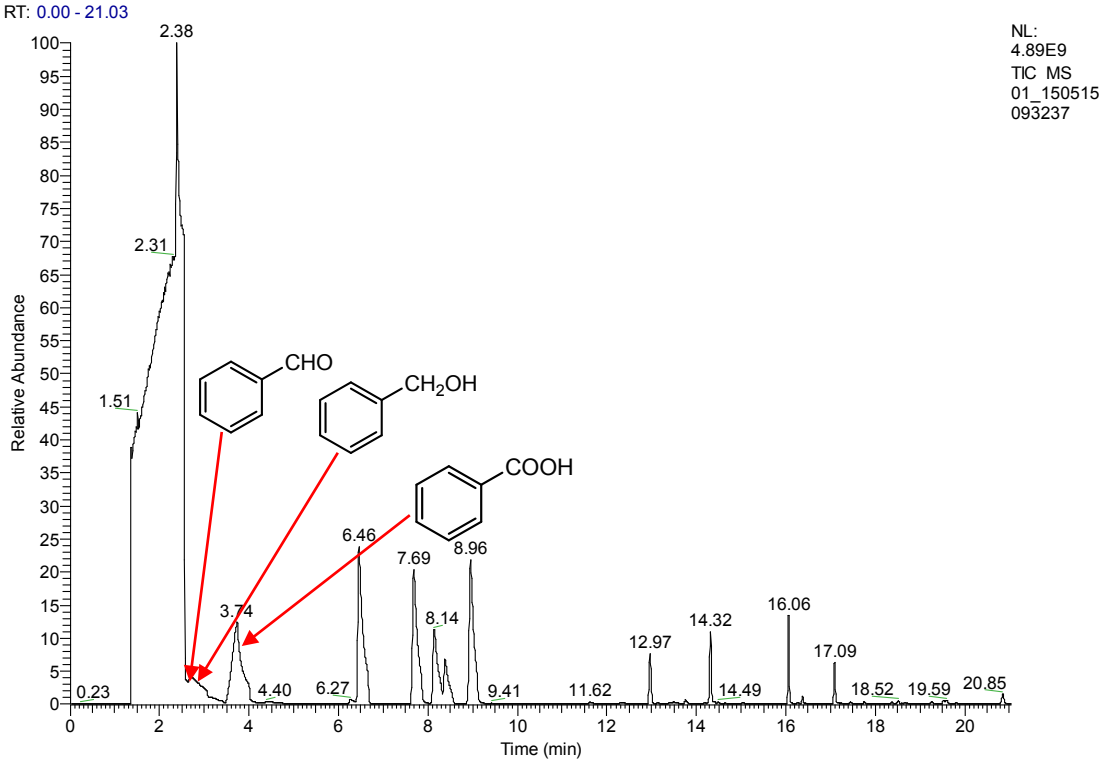
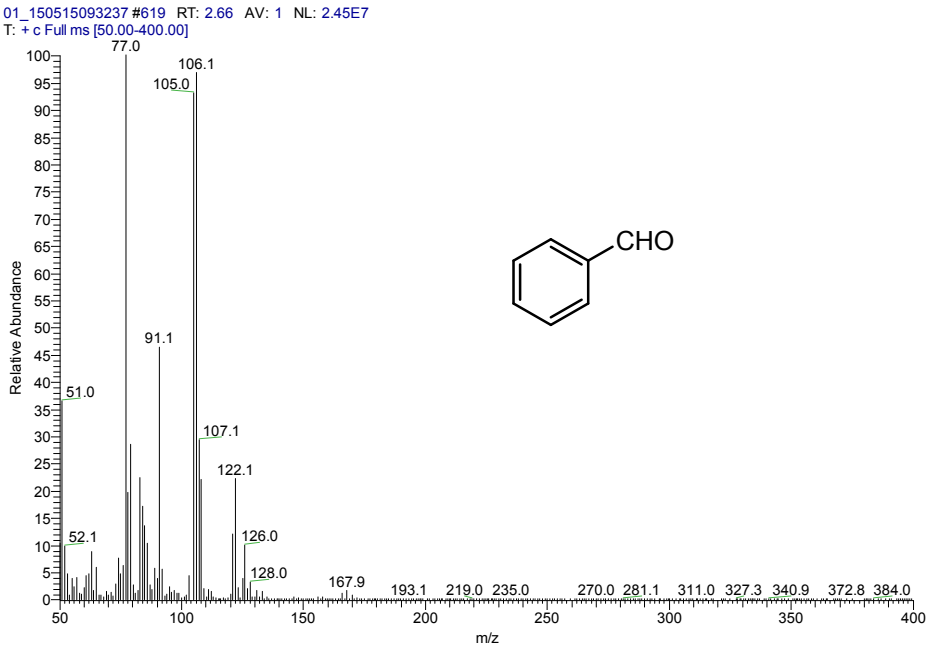


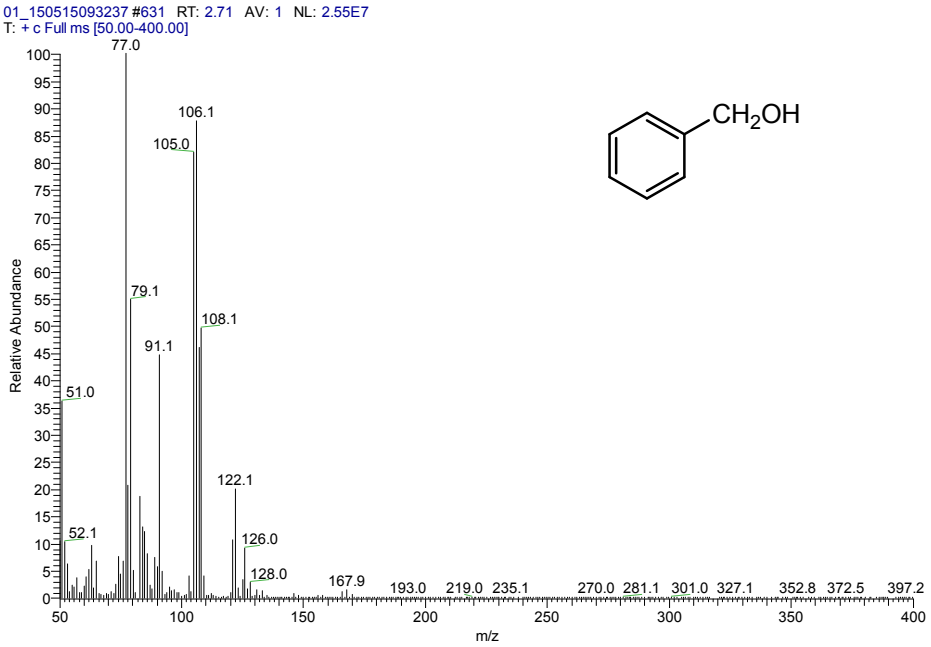
Figure S2. TEM images of catalysts: (a) 1 wt% Pd/γ-Al_2O_3 and (b) 5 wt% Pd/γ-Al_2O_3 (c, d) PdNPs size distributions of 1 wt% Pd/γ-Al_2O_3 and 5 wt% Pd/γ-Al_2O_3, respectively.

2.GC-MS Analysis of Reaction of 1a with 2a and 1a with 2e

The GC spectra of reaction solution of **1a** with **2a** :



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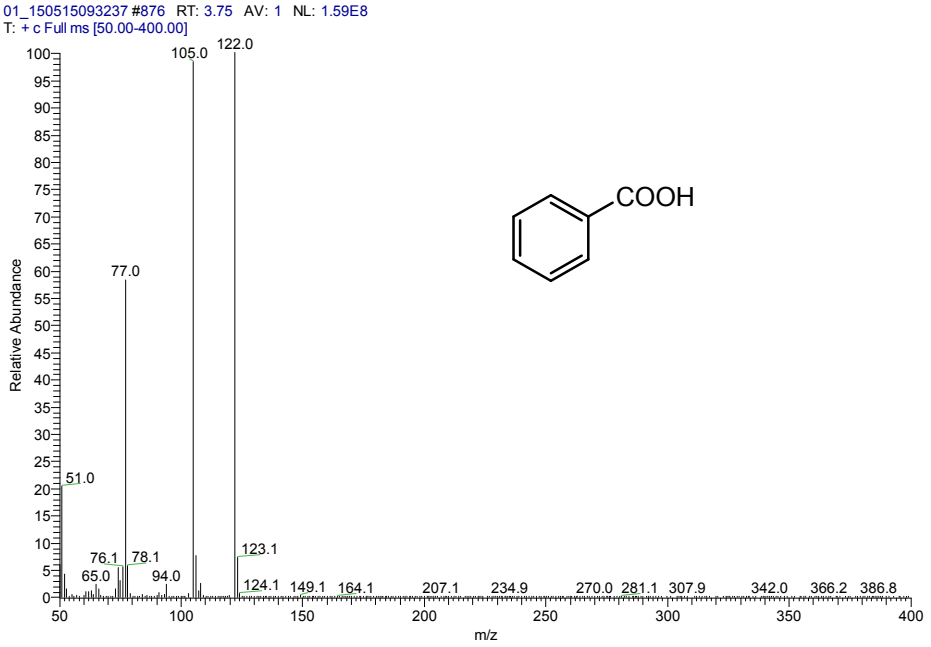
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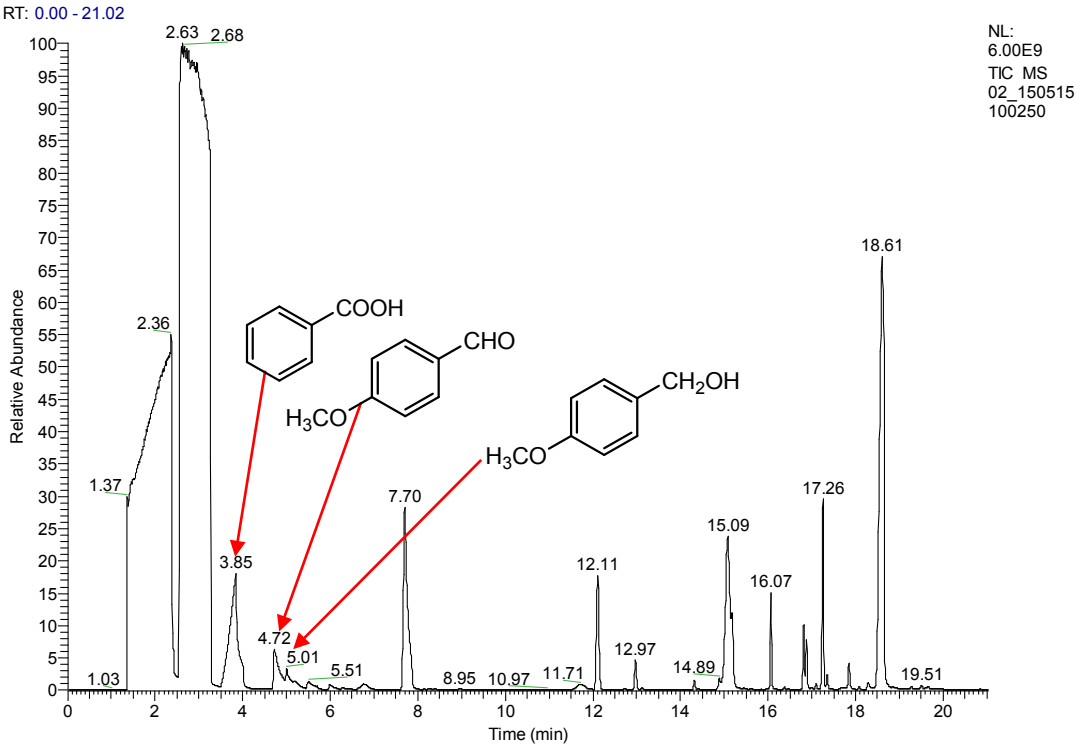
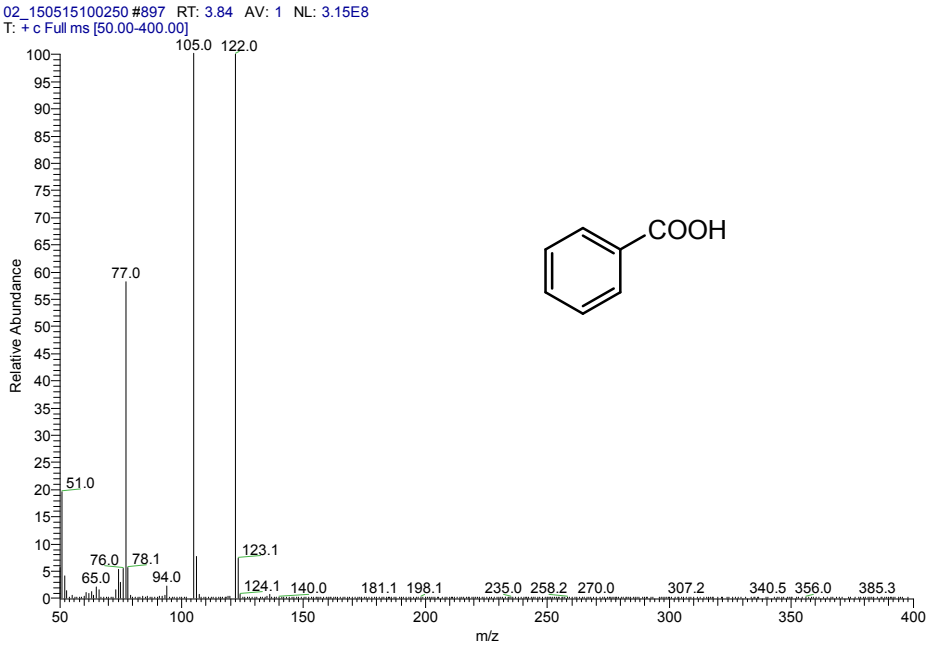
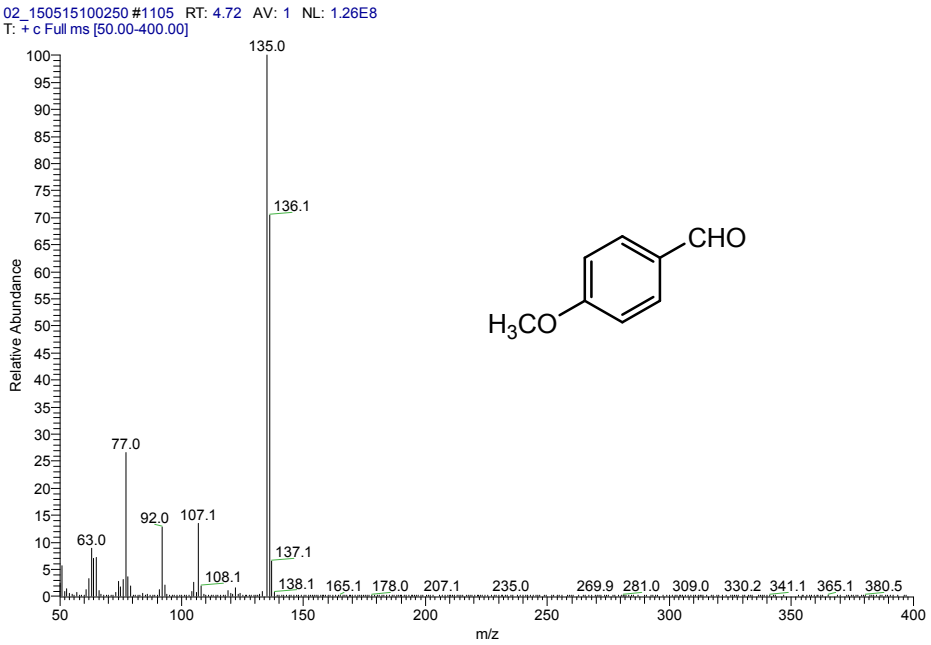
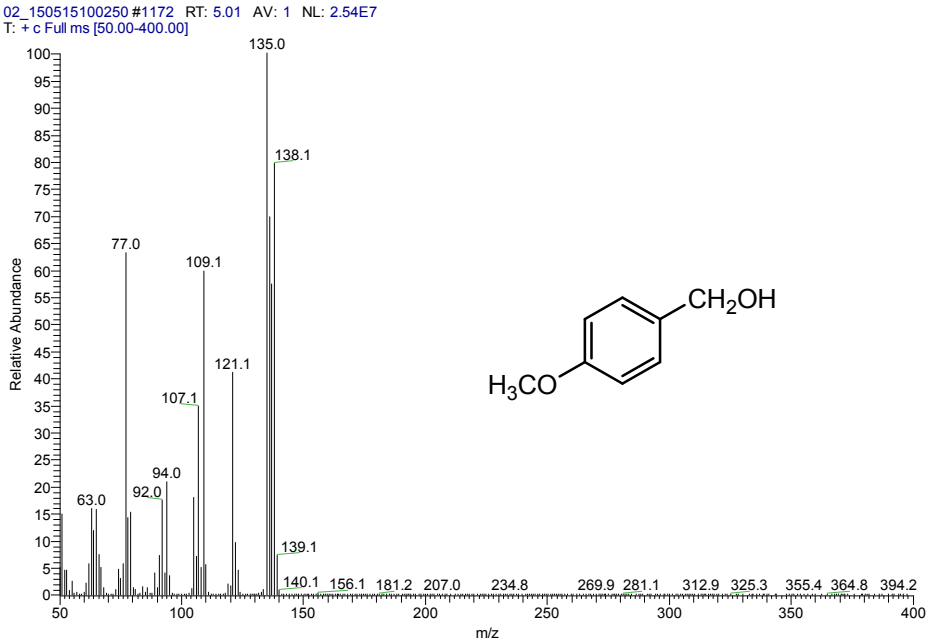
COOH

The GC spectra of reaction solution of **1a** with **2e** :









3. Characterization Data for the Products

phenyl(2-(pyridin-2-yl)phenyl)methanone **3aa.**[1] Conversion: 83% (GC). ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.39 (d, J = 4.0 Hz, 1H), 7.78 (d, J = 7.7 Hz, 1H), 7.67 (d, J = 7.5 Hz, 2H), 7.63 – 7.57 (m, 2H), 7.57 – 7.49 (m, 3H), 7.41 – 7.35 (m, J = 7.4 Hz, 1H), 7.30 – 7.24 (m, J = 7.7 Hz, 2H), 7.09 – 6.99 (m, 1H).

(2-(pyridin-2-yl)phenyl)(p-tolyl)methanone **3ab.**[1] Yield: 80% (43.7 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.40 (d, J = 4.5 Hz, 1H), 7.77 (d, J = 7.7 Hz, 1H), 7.63 – 7.54 (m, 4H), 7.52 – 7.47 (m, 3H), 7.08 (d, J = 8.0 Hz, 2H), 7.03 (dd, J = 7.1, 5.4 Hz, 1H), 2.32 (s, 3H).

(2-(pyridin-2-yl)phenyl)(*o*-tolyl)methanone **3ac.**[1] Yield: 64% (35.0 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.43 (d, J = 4.6 Hz, 1H), 7.67 – 7.50 (m, 5H), 7.41 (d, J = 7.8 Hz,

1H), 7.16 (d, *J* = 7.4 Hz, 2H), 7.08 (d, *J* = 7.6 Hz, 1H), 7.05 – 6.98 (m, 1H), 6.97 – 6.90 (m, 1H), 2.57 (s, 3H).

(2-(pyridin-2-yl) phenyl) (m-tolyl) methanone **3ad.**[2] Yield:76% (41.5 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.40 (d, *J* = 4.4 Hz, 1H), 7.77 (d, *J* = 7.7 Hz, 1H), 7.63 – 7.57 (m, 2H), 7.55 – 7.44 (m, 5H), 7.23 – 7.18 (m, 1H), 7.16 (t, *J* = 7.6 Hz, 1H), 7.08 – 7.02 (m, 1H), 2.29 (s, 3H).

(4-methoxyphenyl)(2-(pyridin-2-yl)phenyl)methanone **3ae.**[1] Yield: 81% (46.9 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.44 (d, *J* = 3.8 Hz, 1H), 7.77 (d, *J* = 7.9 Hz, 1H), 7.68 (d, *J* = 8.8 Hz, 2H), 7.62 – 7.56 (m, 2H), 7.51 (d, *J* = 4.0 Hz, 2H), 7.48 (d, *J* = 7.8 Hz, 1H), 7.10 – 7.03 (m, 1H), 6.76 (d, *J* = 8.8 Hz, 2H), 3.79 (s, 3H).

(4-chlorophenyl)(2-(pyridin-2-yl)phenyl)methanone **3af.**[1] Yield: 69% (40.5 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.35 (d, *J* = 4.4 Hz, 1H), 7.78 (d, *J* = 7.7 Hz, 1H), 7.65 – 7.57 (m, 4H), 7.56 – 7.49 (m, 3H), 7.23 (d, *J* = 8.5 Hz, 2H), 7.09 – 7.02 (m, 1H).

(2-chlorophenyl)(2-(pyridin-2-yl) phenyl)methanone **3ag.**[2] Yield: 57% (33.5 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.51 (d, *J* = 2.6 Hz, 1H), 7.75 – 7.50 (m, 5H), 7.46 (d, *J* = 6.9 Hz, 1H), 7.35 – 7.27 (m, 1H), 7.25 – 7.20 (m, 1H), 7.18 (t, *J* = 7.0 Hz, 1H), 7.11 – 6.97 (m, 2H).

(3-chlorophenyl)(2-(pyridin-2-yl)phenyl)methanone **3ah.**[3] Yield: 65% (38.2 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.37 (s, 1H), 7.79 (d, *J* = 7.7 Hz, 1H), 7.69 – 7.61 (m, 3H), 7.58 (d, *J* = 9.5 Hz, 1H), 7.56 – 7.51 (m, 3H), 7.35 (d, *J* = 7.9 Hz, 1H), 7.20 (t, *J* = 7.8 Hz, 1H), 7.11 – 7.03 (m, 1H).

(4-bromophenyl)(2-(pyridin-2-yl)phenyl)methanone **3ai.**[4] Yield: 63% (42.6 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.37 (s, 1H), 7.78 (d, *J* = 7.6 Hz, 1H), 7.66 – 7.59 (m, 2H), 7.58 – 7.50 (m, 5H), 7.41 (d, *J* = 8.5 Hz, 2H), 7.11 – 7.05 (m, 1H).

(3-bromophenyl)(2-(pyridin-2-yl)phenyl)methanone **3aj.**[3] Yield: 68% (46.0 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.34 (d, *J* = 4.1 Hz, 1H), 7.82 (s, 1H), 7.78 (d, *J* = 7.7 Hz, 1H), 7.62 (t, *J* = 6.8 Hz, 2H), 7.59 – 7.51 (m, 5H), 7.49 (d, *J* = 7.9 Hz, 1H), 7.13 (t, *J* = 7.8 Hz, 1H), 7.06 – 7.00 (m, 1H).

benzo[*h*]quinolin-10-yl(phenyl)methanone **3ba.**[1] Yield: 84% (47.6 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.51 (dd, *J* = 4.4, 1.7 Hz, 1H), 8.11 (dd, *J* = 8.0, 1.7 Hz, 1H), 8.06 (dd, *J* = 8.0, 0.9 Hz, 1H), 7.91 (d, *J* = 8.8 Hz, 1H), 7.83 – 7.73 (m, 4H), 7.63 (dd, *J* = 7.2, 1.1 Hz, 1H), 7.45 – 7.39 (m, 1H), 7.34 (dd, *J* = 8.0, 4.4 Hz, 1H), 7.30 (t, *J* = 7.7 Hz, 2H).

(2-(1H-pyrazol-1-yl)phenyl)(phenyl)methanone **3ca.**[5] Yield: 70% (34.7 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.69 – 7.60 (m, 5H), 7.60 – 7.56 (m, 1H), 7.51 – 7.47 (m, 1H), 7.45 – 7.41 (m, 1H), 7.40 (d, *J* = 1.6 Hz, 1H), 7.32 – 7.27 (m, 2H), 6.21 – 6.14 (m, 1H).

(5-methyl-2-(pyridin-2-yl)phenyl)(phenyl)methanone **3da.**[1] Yield: 81% (44.3 mg). ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.36 (d, *J* = 4.8 Hz, 1H), 7.73 – 7.67 (m, 3H), 7.58 – 7.53 (m, 1H), 7.49 (d, *J* = 7.9 Hz, 1H), 7.45 – 7.36 (m, 3H), 7.29 – 7.25 (m, 2H), 7.00 (dd, *J* = 6.9, 5.4 Hz, 1H), 2.47 (s, 3H).

References

(1) Zhou, W.; Li, H. J.; Wang, L. Direct Carbo-Acylation Reactions of 2-Arylpyridines with α-Diketones via Pd-Catalyzed C-H Activation and Selective C(sp^2)-C(sp^2) Cleavage. *Org. Lett.*, **2012**, *14*, 4594-4597.

(2) Xiao, F. H.; Qi, S.; Zhao, F.; Baslé, O.; Deng, G. J.; Li, C.-J. Palladium-Catalyzed Oxidative sp^2 C-H Bond Acylation with Alcohols. *Org. Lett.* **2011**, *13*, 1614-1617.

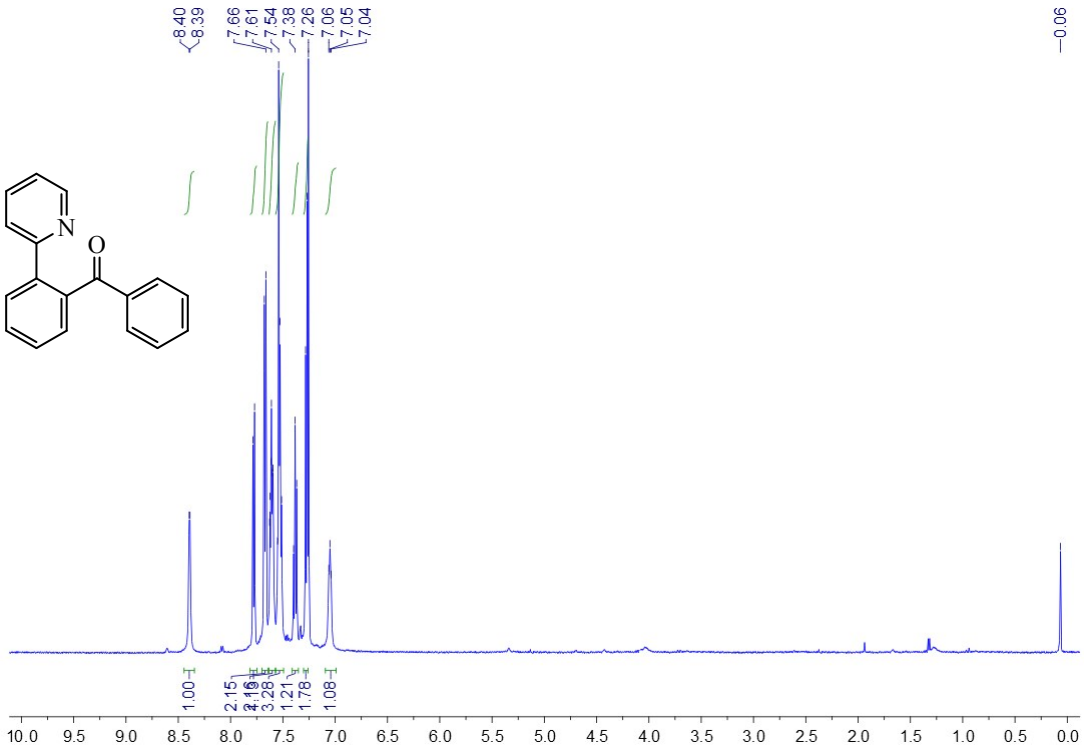
(3) Khemnar, A. B.; Bhanage, B. M. Palladium-Catalyzed Oxidative Synthesis of Aromatic Ketones Using Olefins as Acyl Equivalents through Selective *ortho* Aromatic C–H Bond Activation. *Eur. J. Org. Chem.* **2014**, *2014*, 6746-6752.

(4) Jia, X. F.; Zhang, S. H.; Wang, W. H.; Luo, F.; Cheng, J. Palladium-Catalyzed Acylation of sp^2 C-H Bond: Direct Access to Ketones from Aldehydes. *Org. Lett.* **2009**, *11*, 3120-3123.

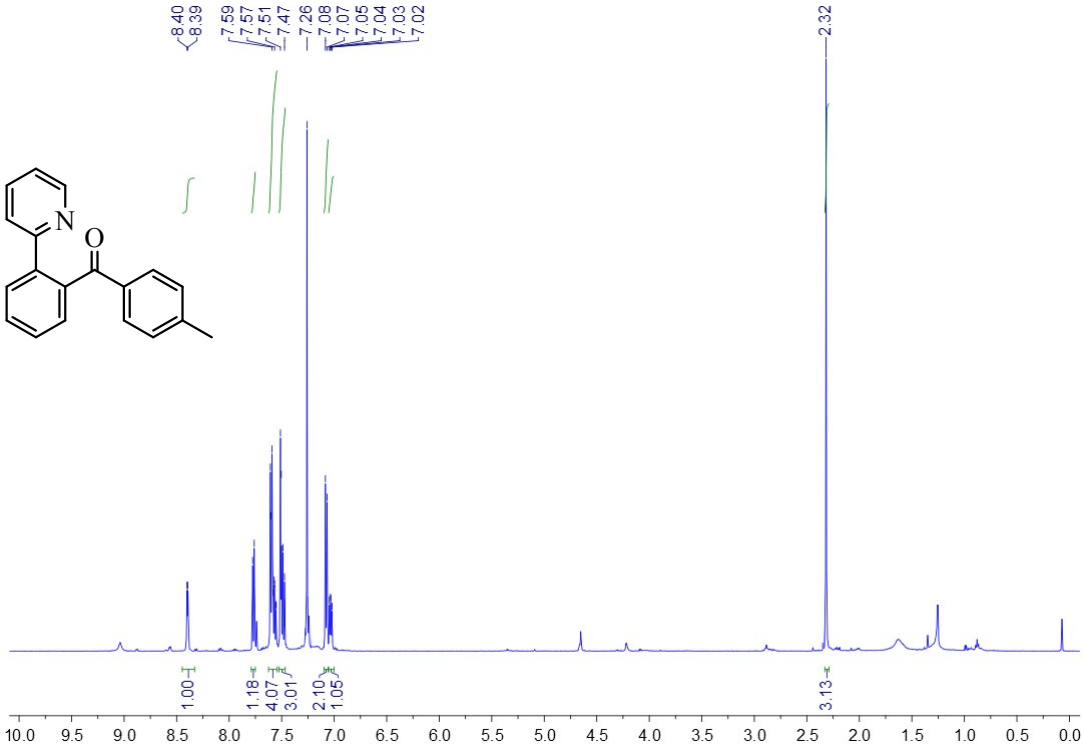
(5) Ashok, B. K.; Bhalchandra, M. B. Palladium-Catalyzed Oxidative Synthesis of Aromatic Ketones Using Olefins as Acyl Equivalents through Selective ortho Aromatic C–H Bond Activation. *Eur. J. Org. Chem.* **2014**, 6746–6752.

4. ^{1}H NMR and ^{13}C NMR Spectra of the Products

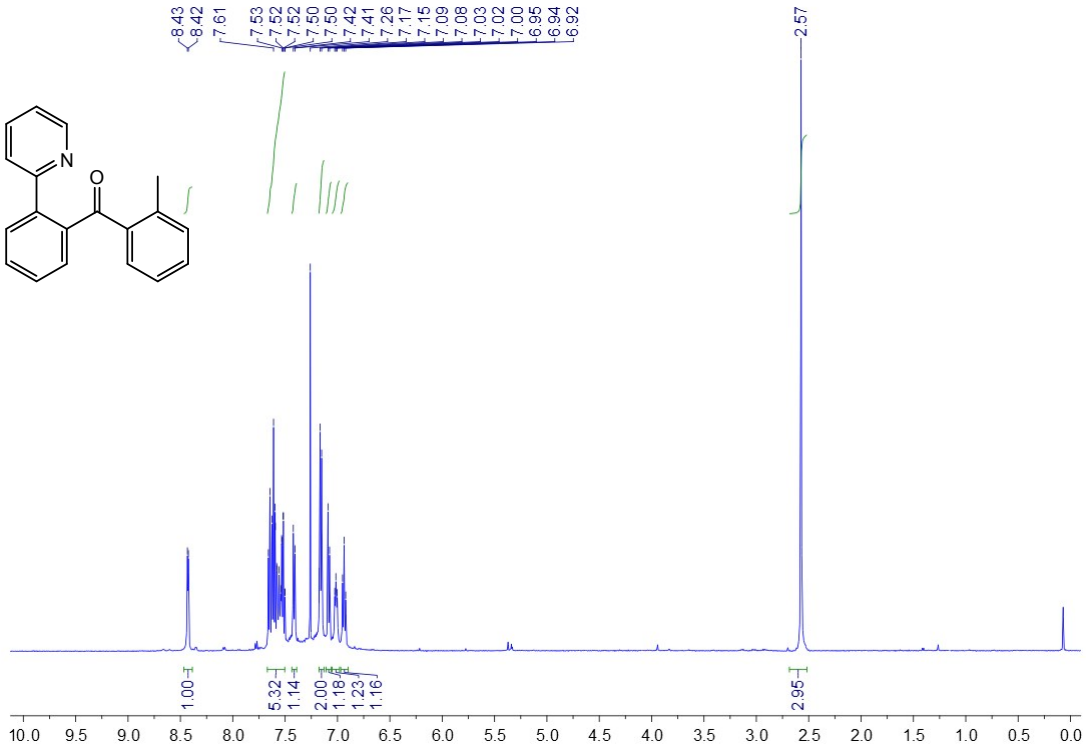
^{1}H NMR of phenyl(2-(pyridin-2-yl)phenyl)methanone **3aa**



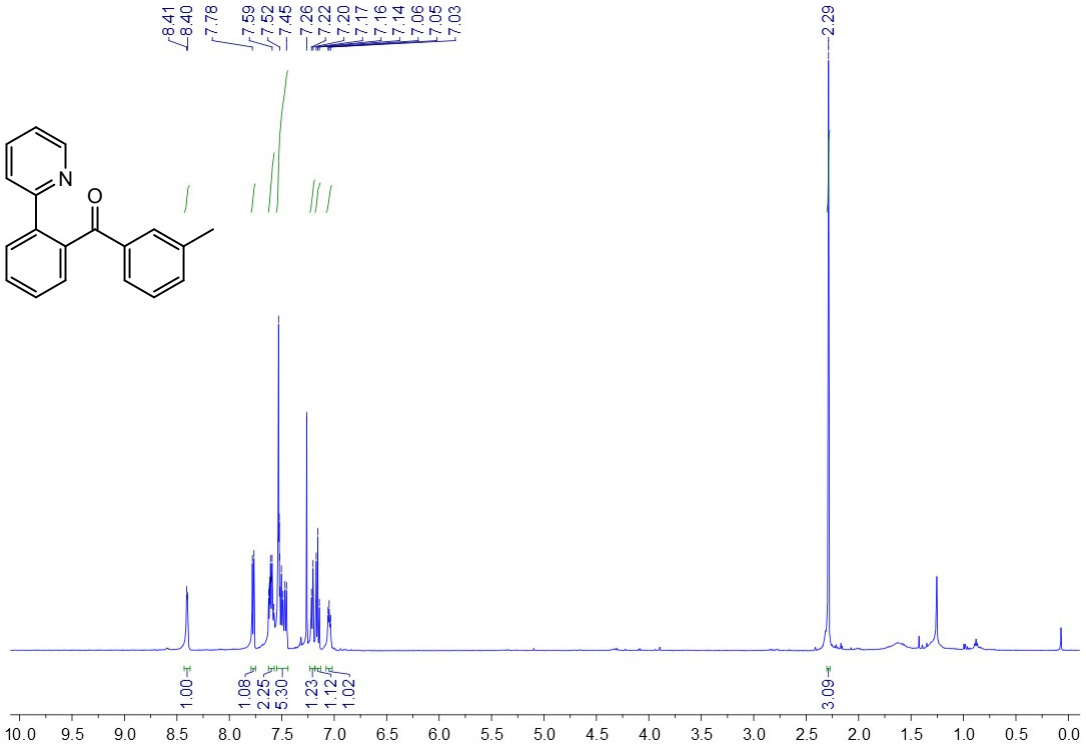
^{1}H NMR of (2-(pyridin-2-yl)phenyl)(p-tolyl)methanone **3ab**



^{1}H NMR of (2-(pyridin-2-yl)phenyl)(*o*-tolyl)methanone **3ac**



^{1}H NMR of (2-(pyridin-2-yl) phenyl) (m-tolyl) methanone **3ad**



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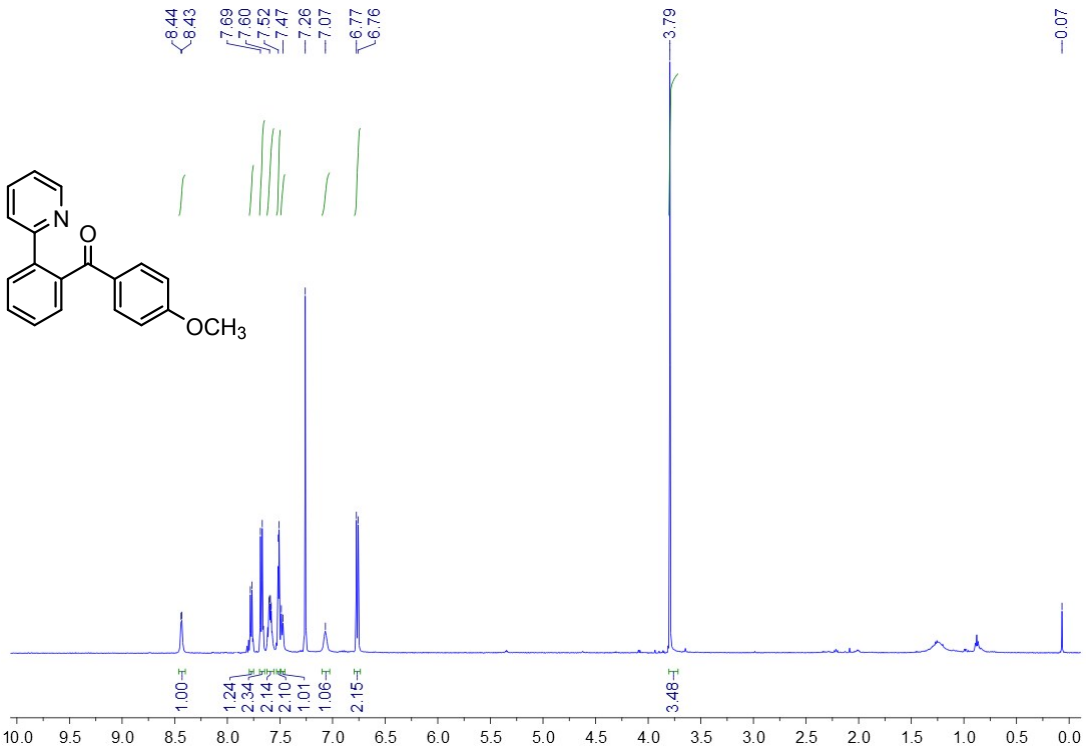

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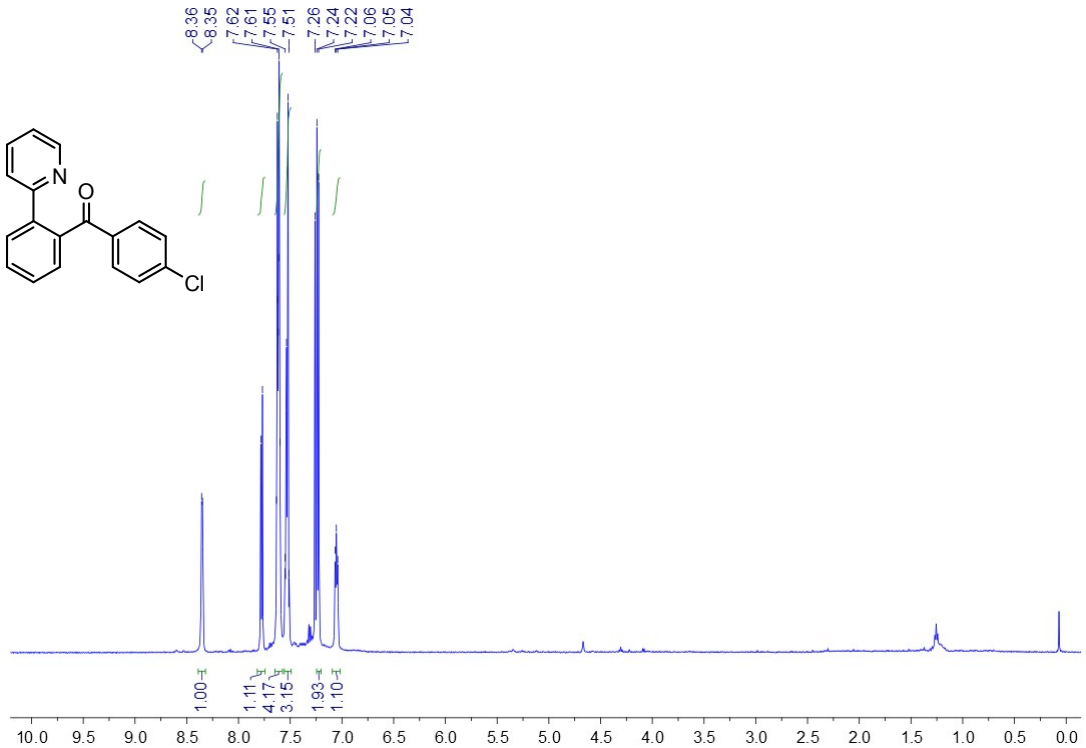

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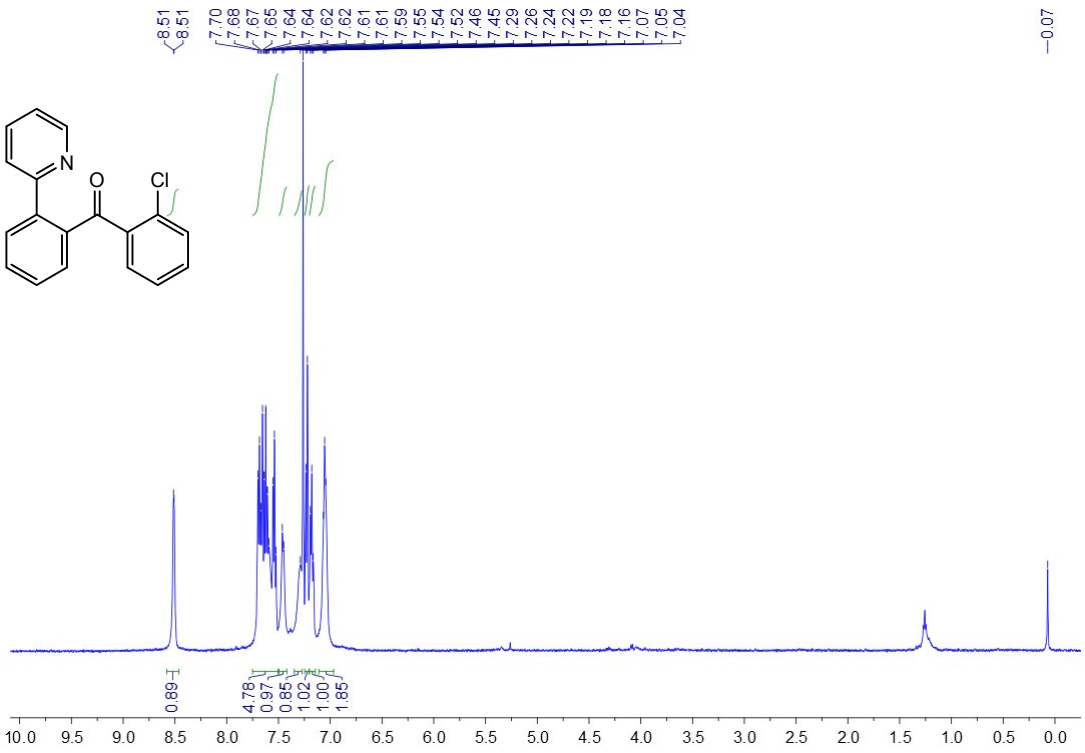

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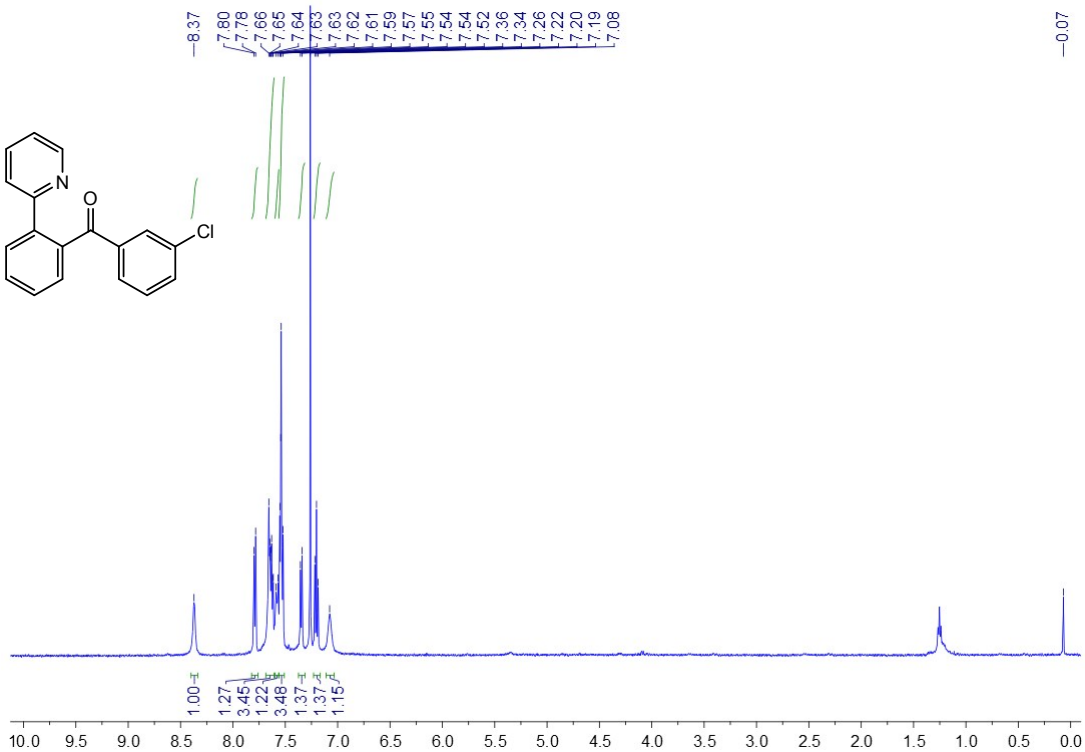

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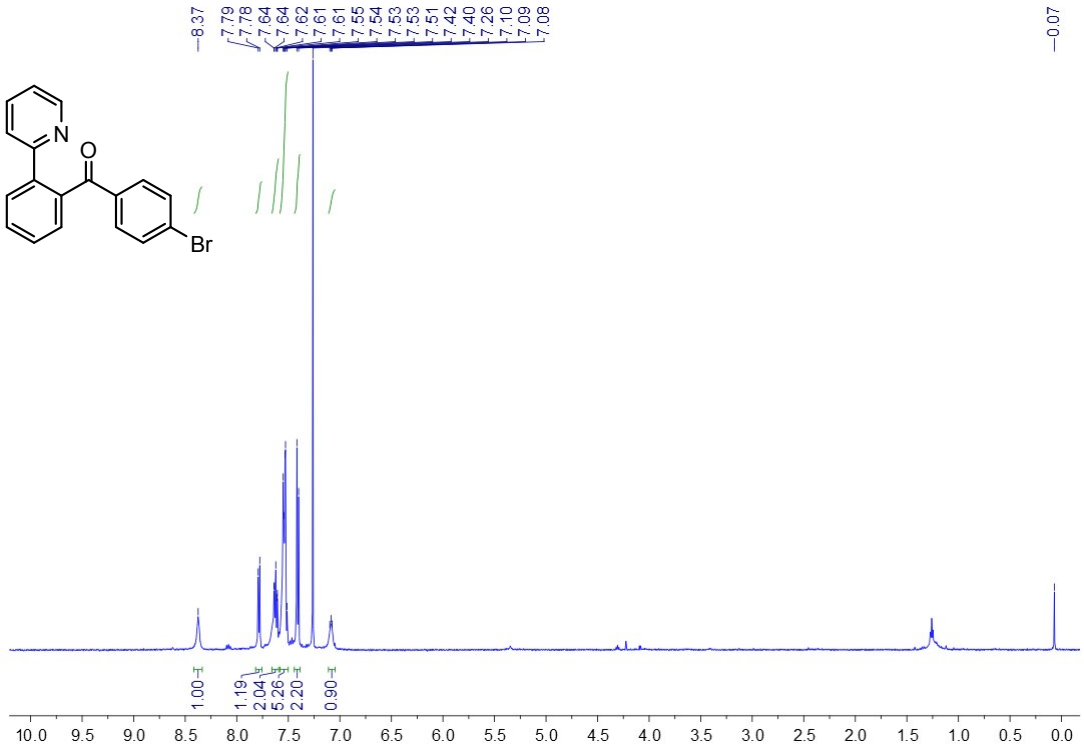

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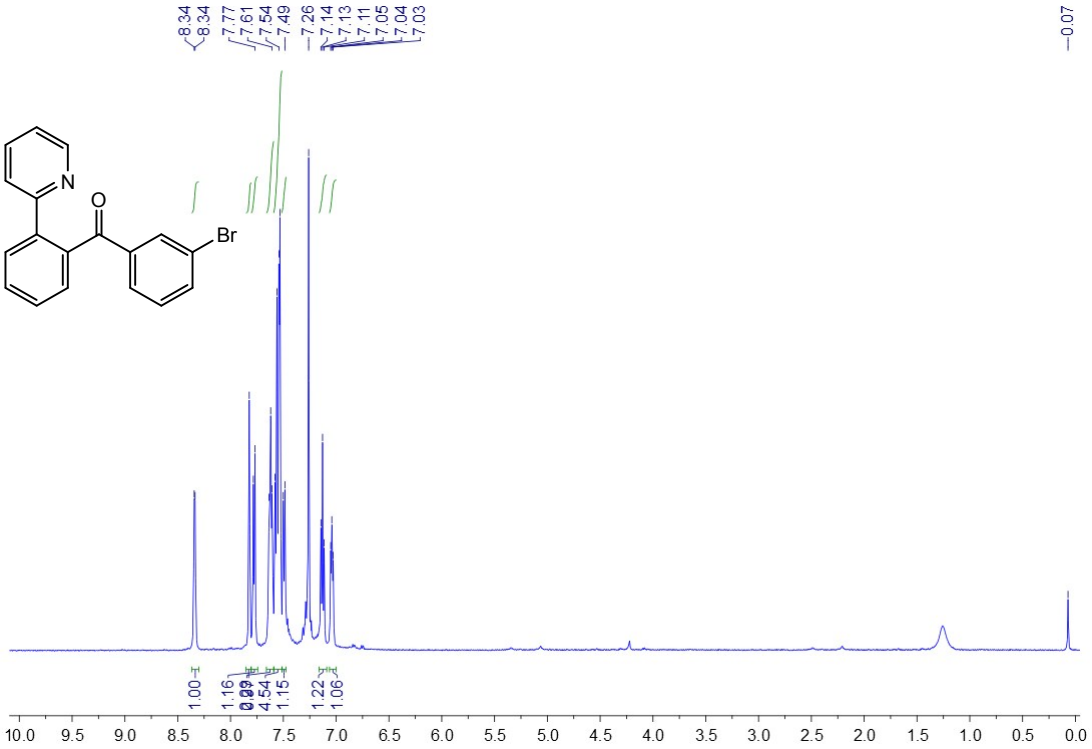

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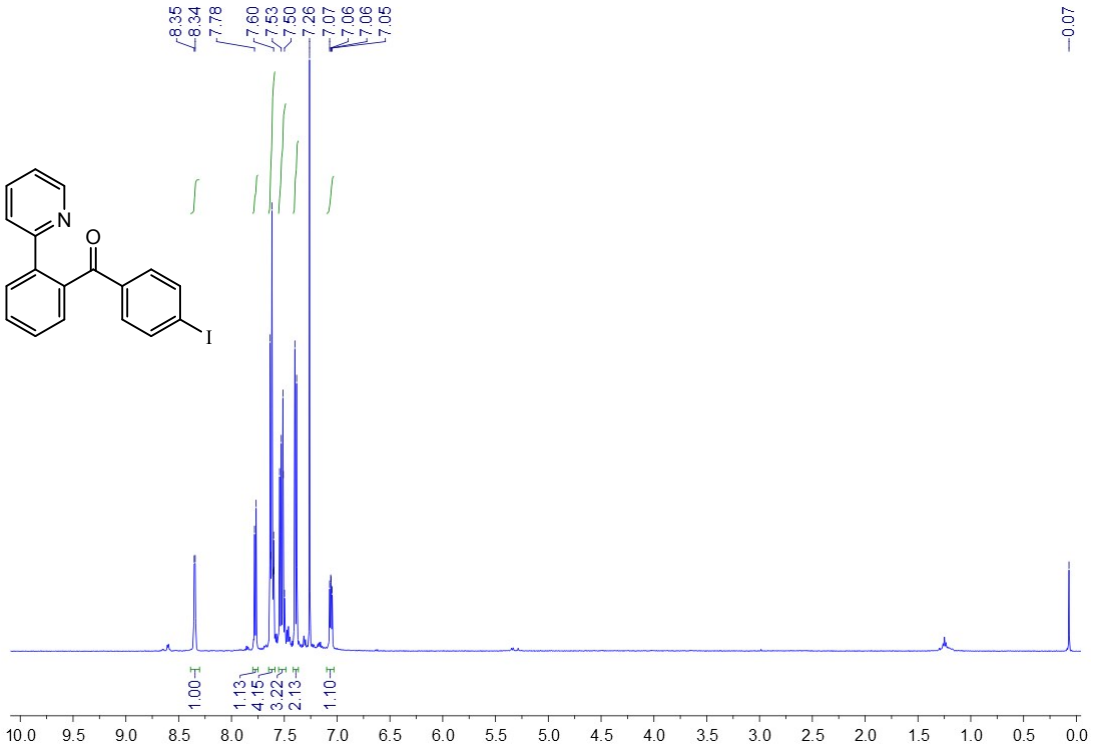
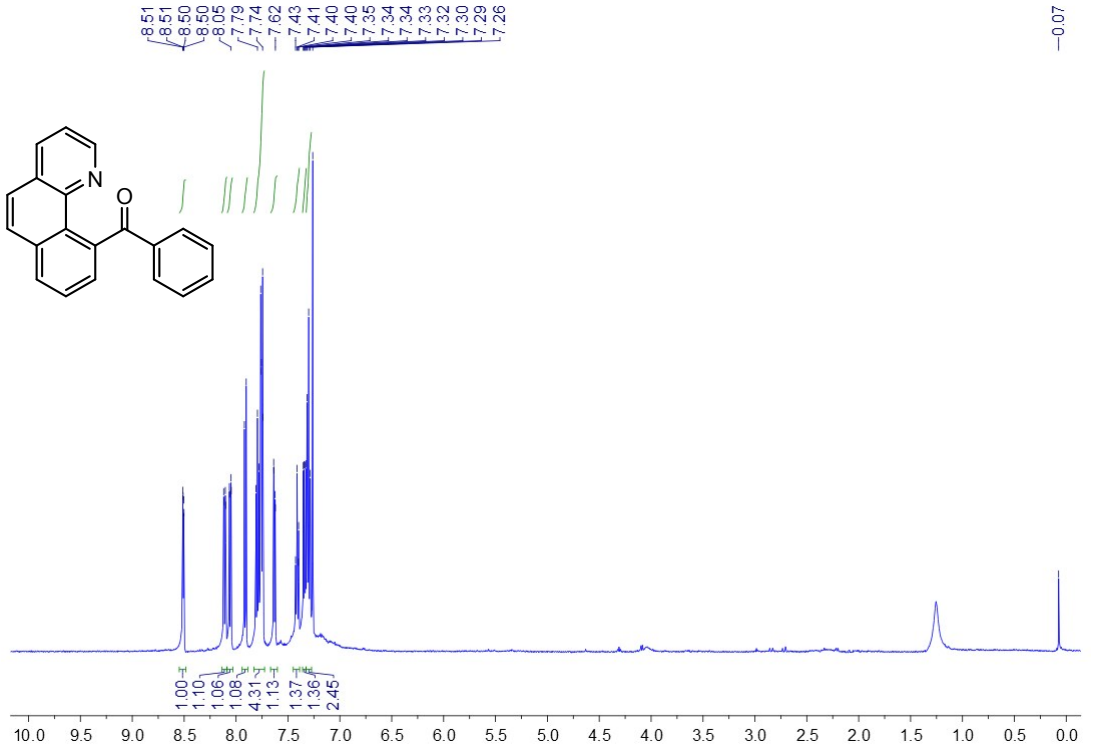
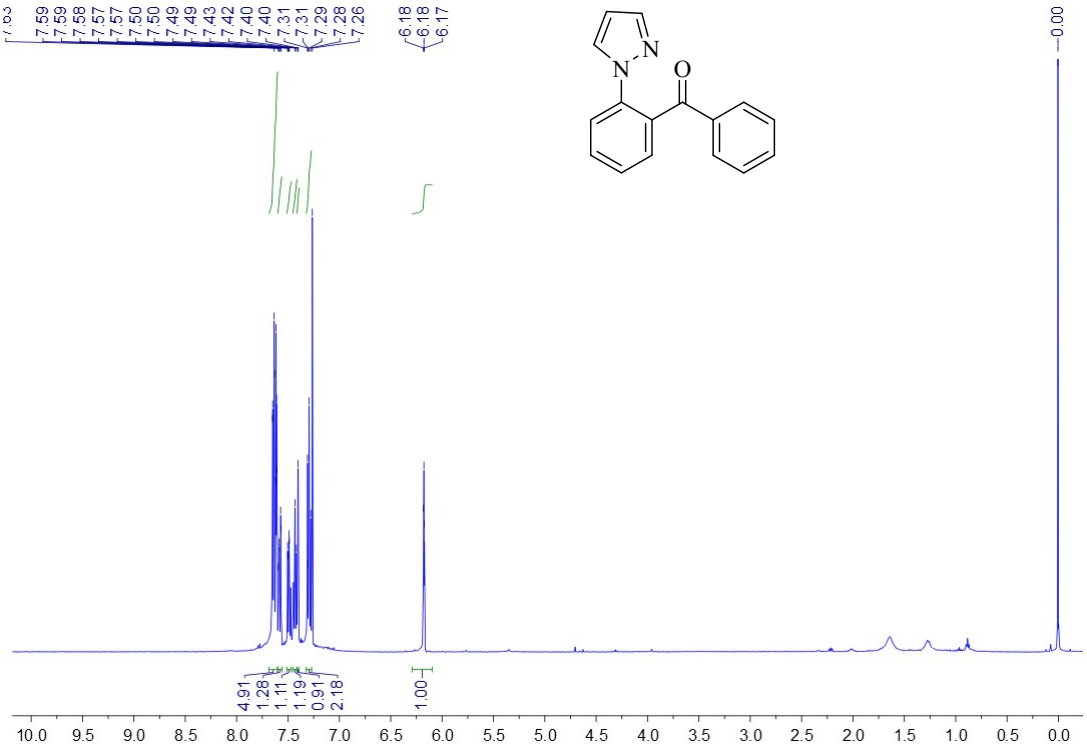


^{1}H NMR of benzo[*h*]quinolin-10-yl(phenyl)methanone **3ba**



^{1}H NMR of (2-(1H-pyrazol-1-yl)phenyl)(phenyl)methanone **3ca**



^{1}H NMR of (5-methyl-2-(pyridin-2-yl)phenyl)(phenyl)methanone **3da**