

## Supporting Information

### **Aminocarbonylation of Aryl Halides Using Surfactant in Water- A Greener Approach**

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## 1. Experimental Section

### 1.1 Material and methods

All the commercial chemicals and reagents were purchased from Aldrich, TCI and used as such without further purification.  $^1\text{H}$  (400 MHz, 300 MHz) and  $^{13}\text{C}$  (100 MHz, 75 MHz) spectra were recorded on Bruker Avance 400 or 300 spectrometers. The chemical shifts ( $\delta$  ppm) and coupling constants (Hz) are reported in the standard fashion with reference to internal tetramethylsilane or residual chloroform or DMSO. LCMS analysis were carried out using Agilent Technologies 1200 series instrument using direct inlet mode. Analytical thin-layer chromatography (TLC) were performed on pre-coated 0.2 mm thick Merck 60 F245 silica plates and various combinations of ethyl acetate,  $\text{CH}_2\text{Cl}_2$ , MeOH and hexanes were used as eluent. Visualization of spots was accomplished by exposure to iodine vapour. All compounds were purified using Teledyne ISCO flash column chromatography and gave spectroscopic data consistent with being  $\geq 95\%$  the assigned structure.

## 2. NMR spectra of synthesized compounds

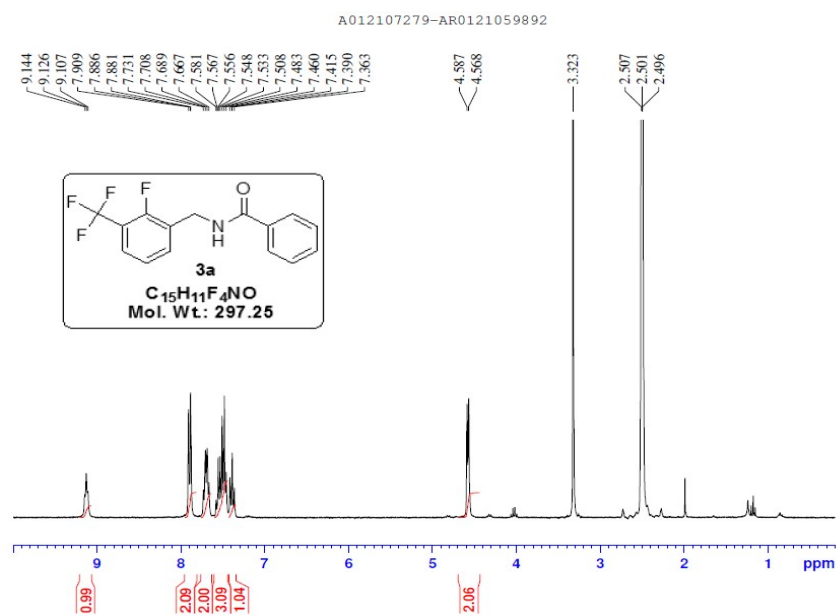


Figure S1:  $^1\text{H-NMR}$  of **3a** ( $\text{DMSO-}d_6$ )

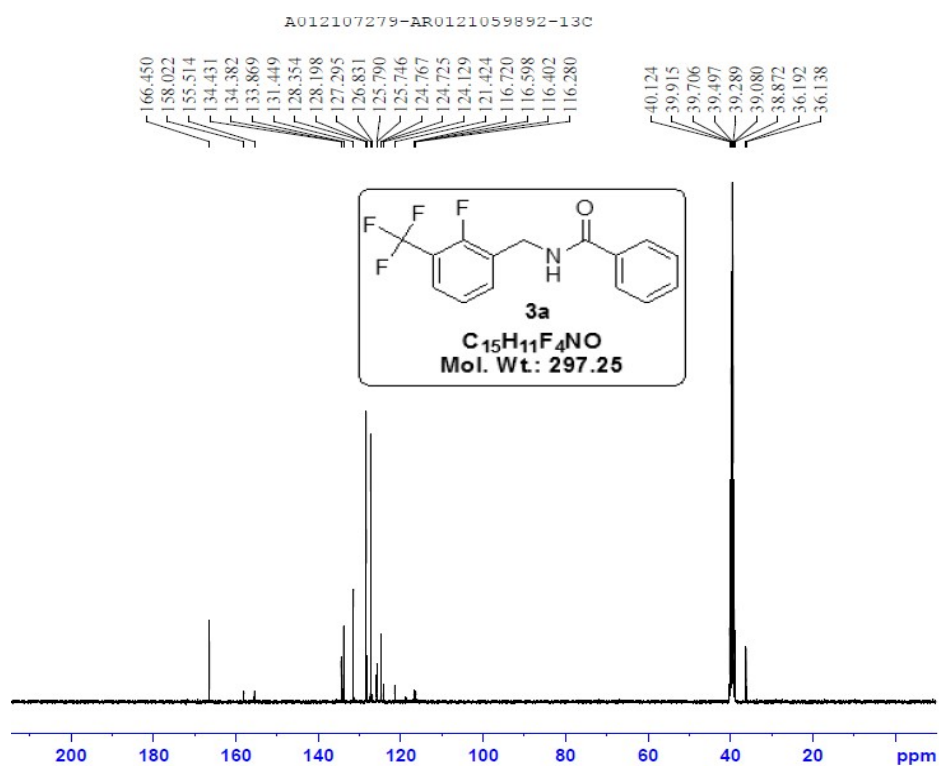


Figure S2:  $^{13}\text{C-NMR}$  of **3a** ( $\text{DMSO-}d_6$ )

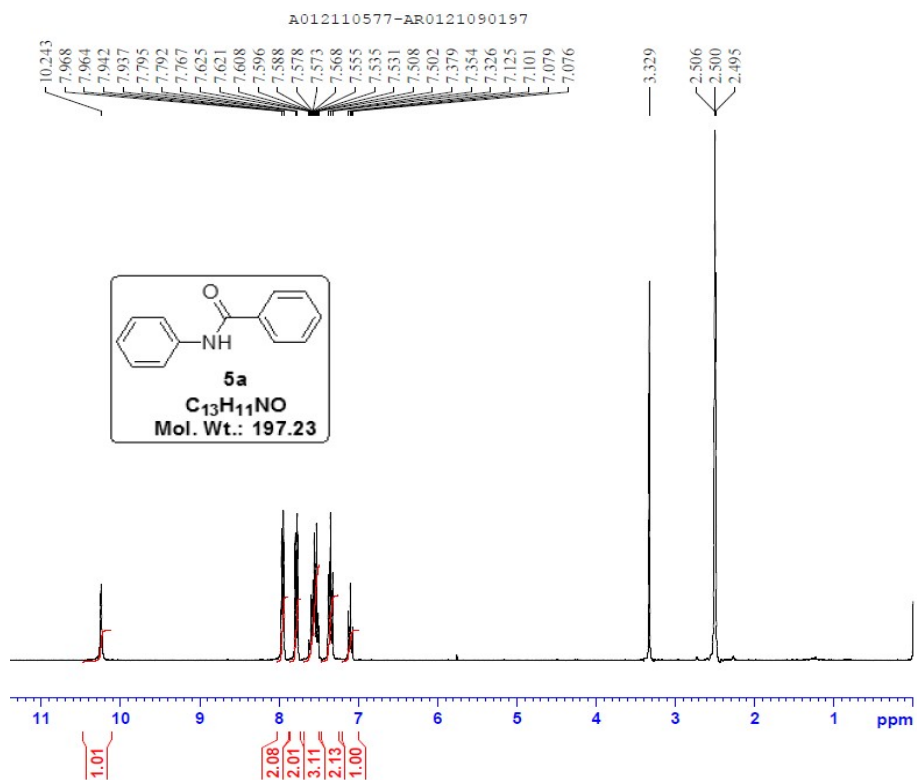


Figure S3:  $^1H$ -NMR of 5c (DMSO- $d_6$ )

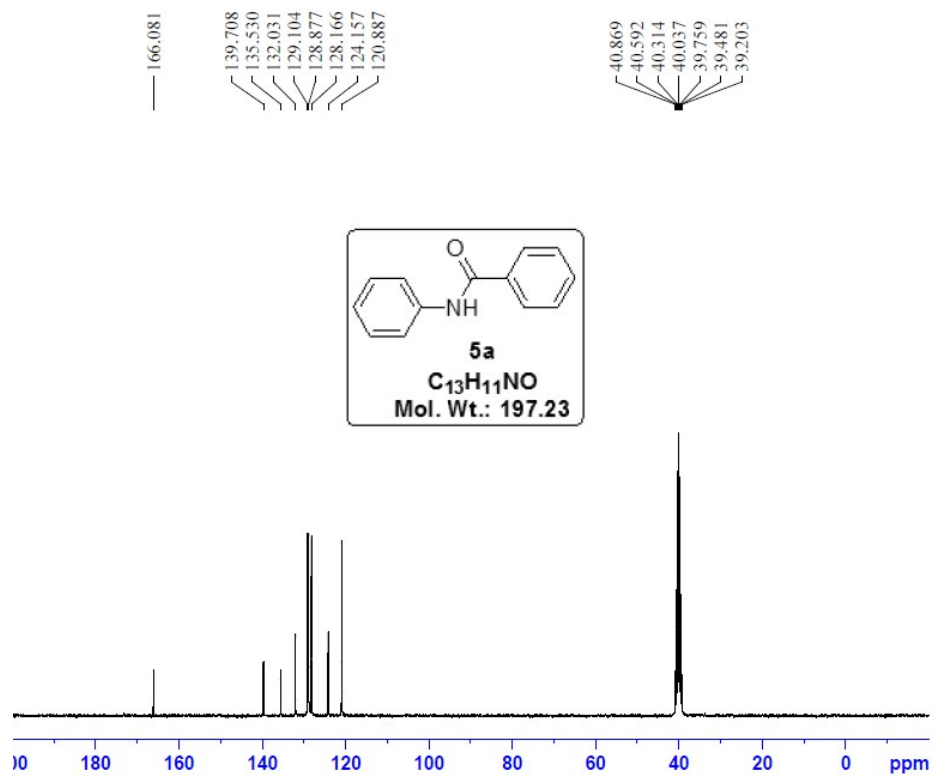


Figure S4:  $^{13}C$ -NMR of 5c (DMSO- $d_6$ )

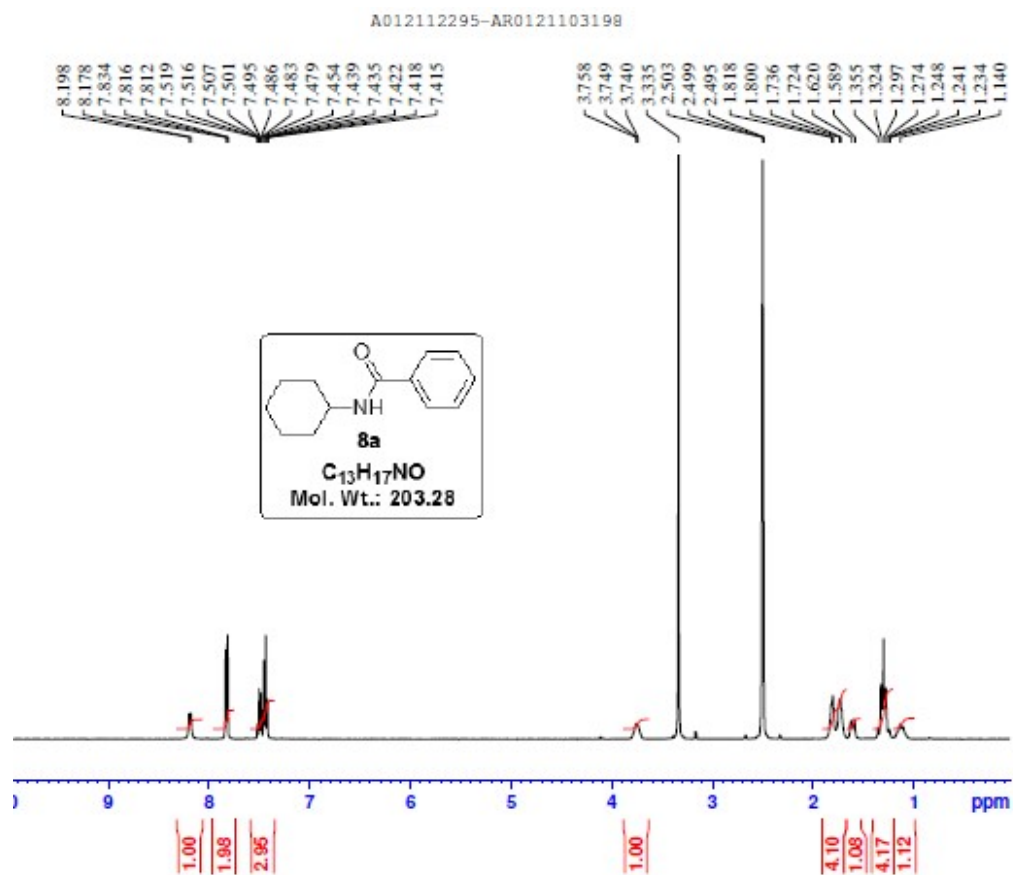


Figure S5:  $^1H$ -NMR of 8a (DMSO- $d_6$ )

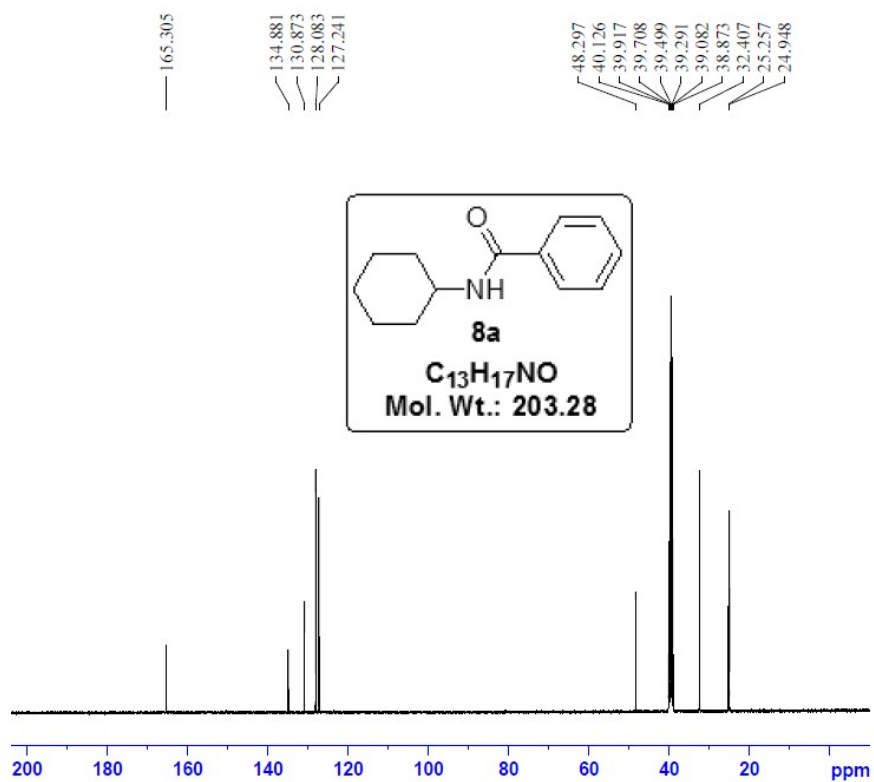


Figure S6:  $^{13}C$ -NMR of 8a (DMSO- $d_6$ )

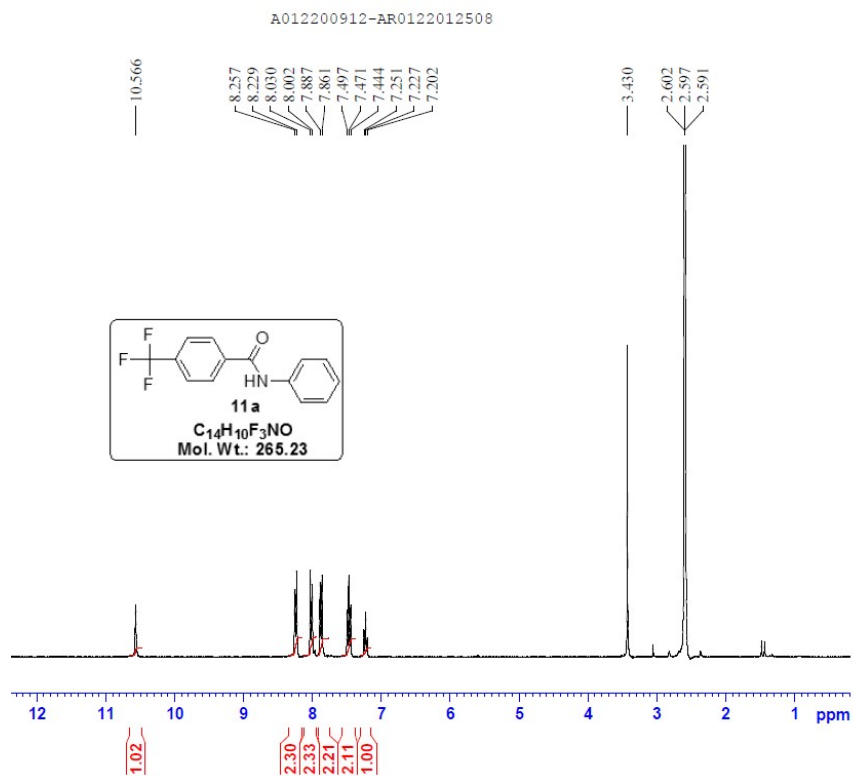


Figure S7: Figure S1:  $^1H$ -NMR of 11a ( $DMSO-d_6$ )

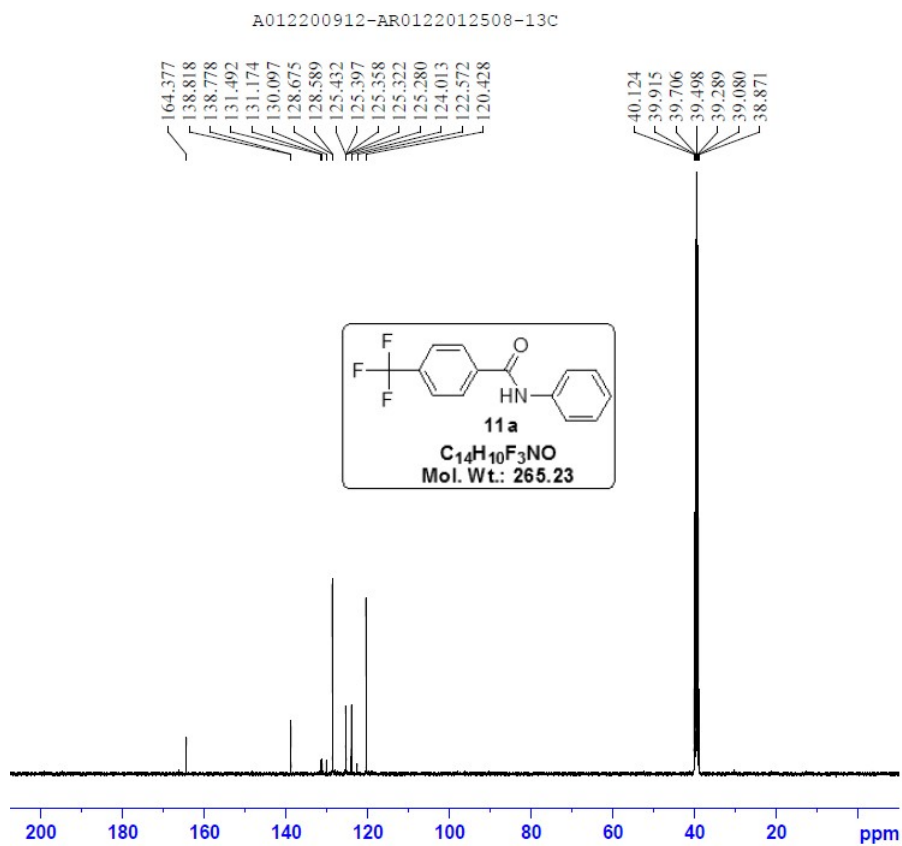


Figure S8:  $^{13}C$ -NMR of 11a ( $DMSO-d_6$ )

A012200912-AR0122012512

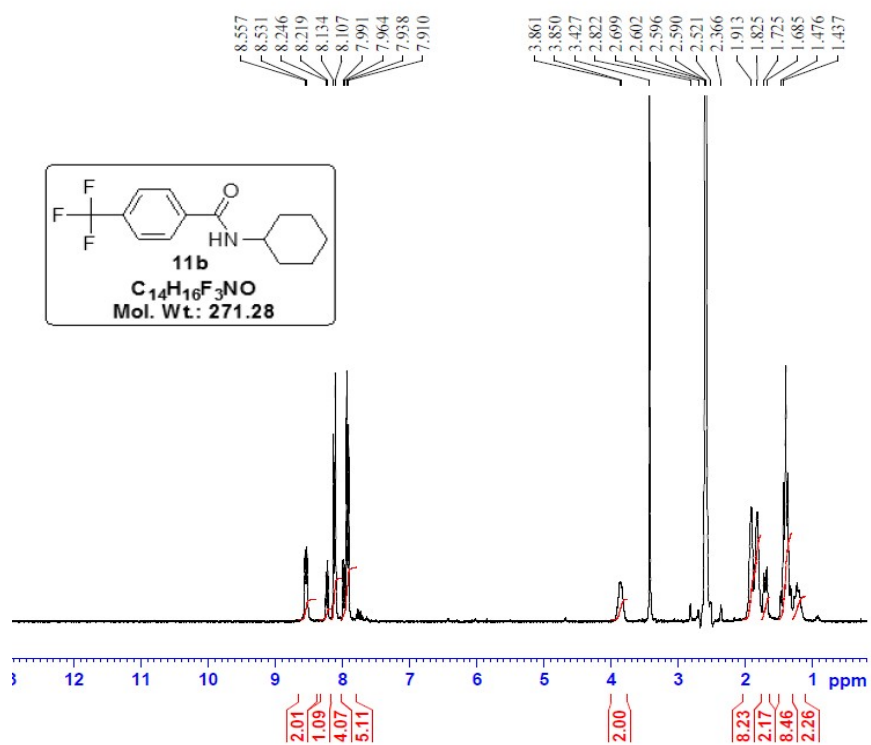


Figure S9:  $^1H$ -NMR of 11b (DMSO- $d_6$ )

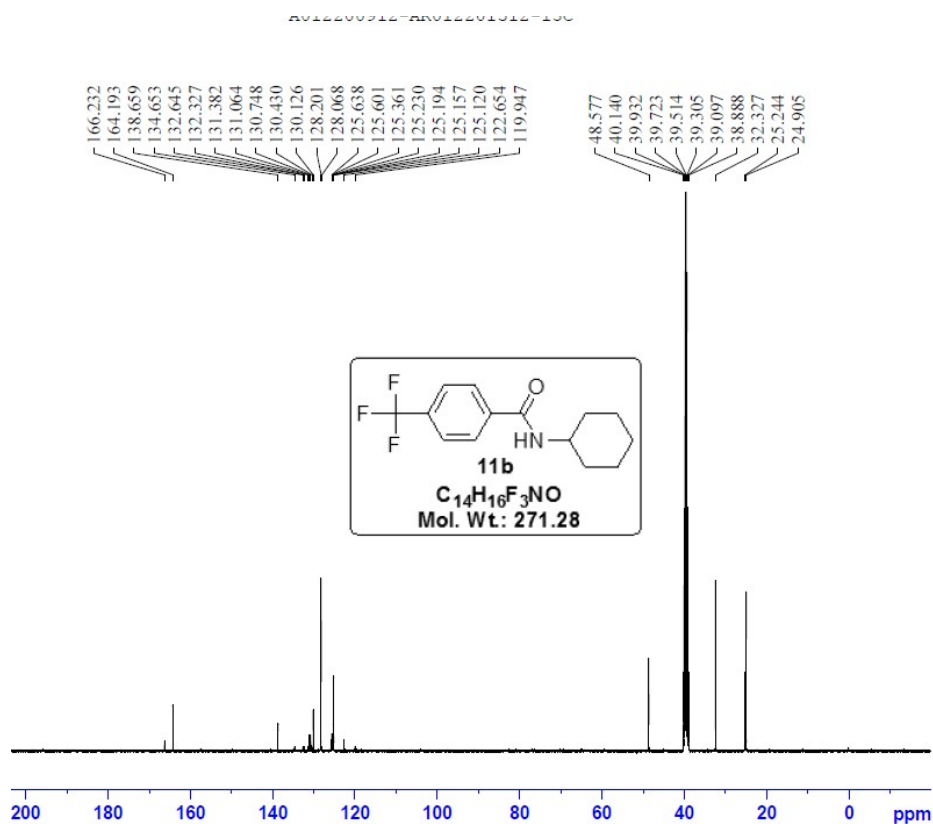


Figure S10:  $^{13}C$ -NMR of 11b (DMSO- $d_6$ )

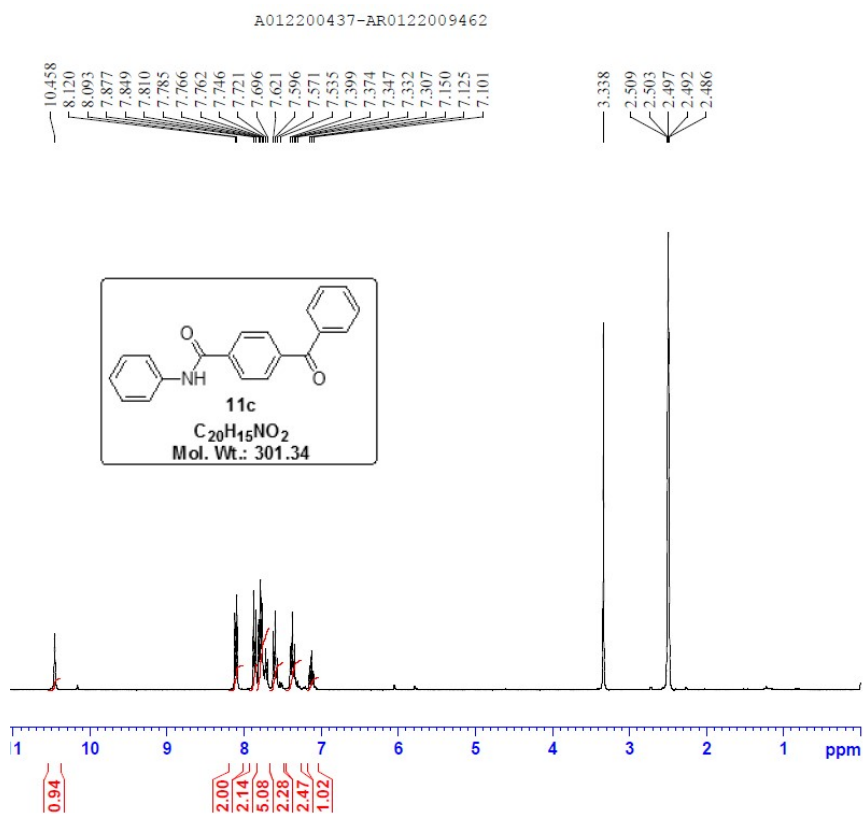


Figure S11: <sup>1</sup>H-NMR of 11c (DMSO-*d*<sub>6</sub>)

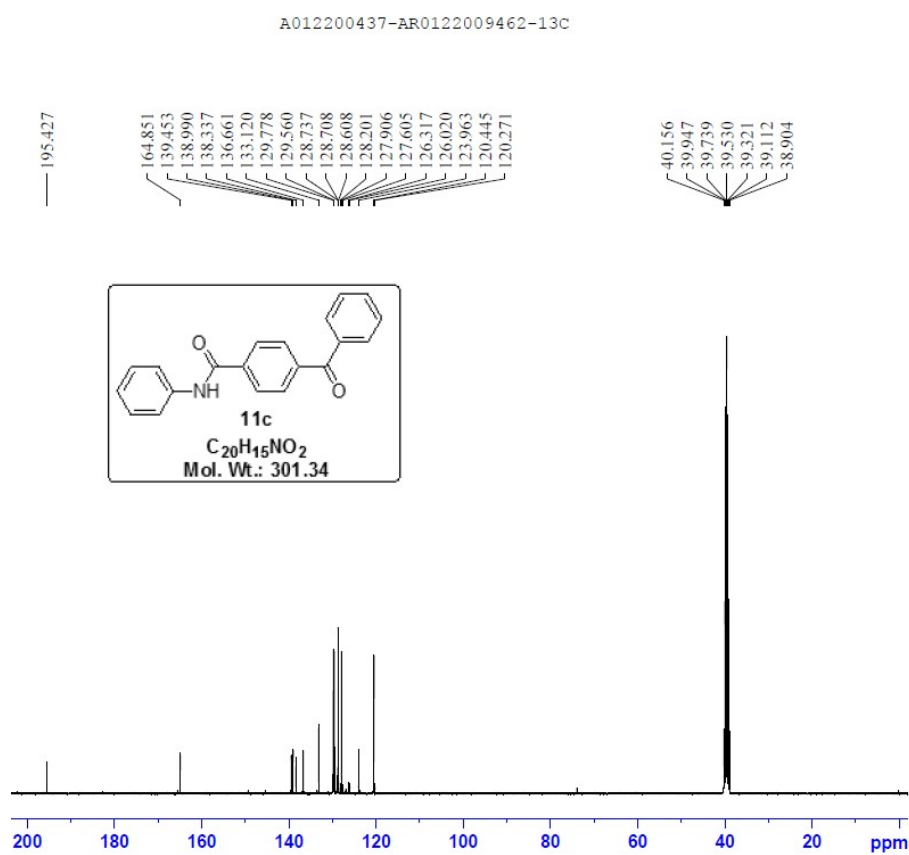


Figure S12: <sup>13</sup>C-NMR of 11c (DMSO-*d*<sub>6</sub>)



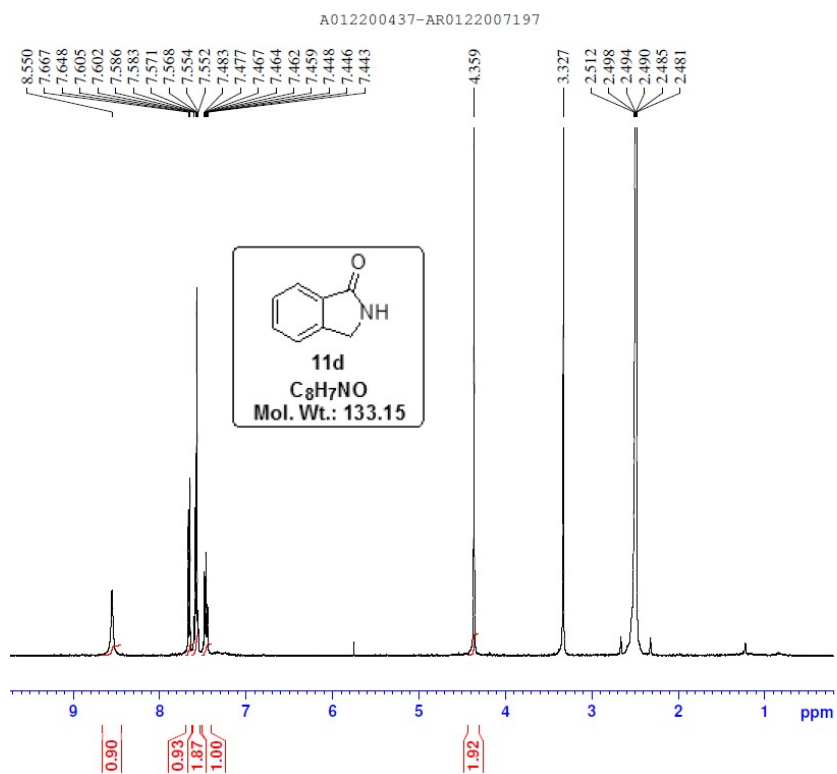


Figure S13:  $^1H$ -NMR of 11d (DMSO- $d_6$ )

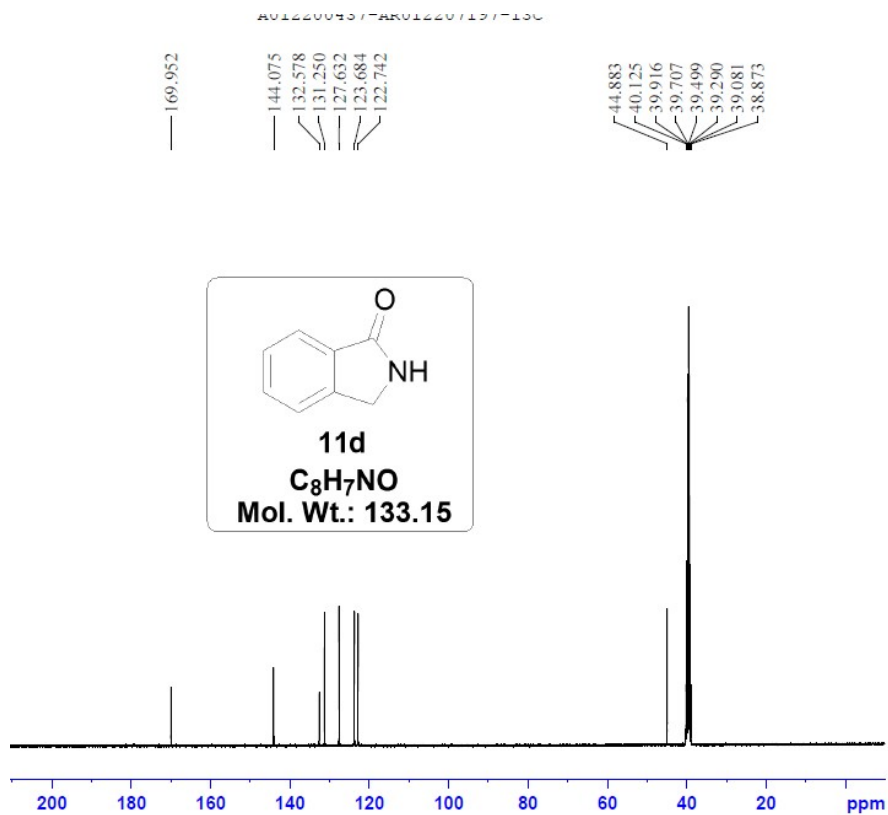


Figure S14:  $^{13}C$ -NMR of 11d (DMSO- $d_6$ )

A012200912-AR0122010671

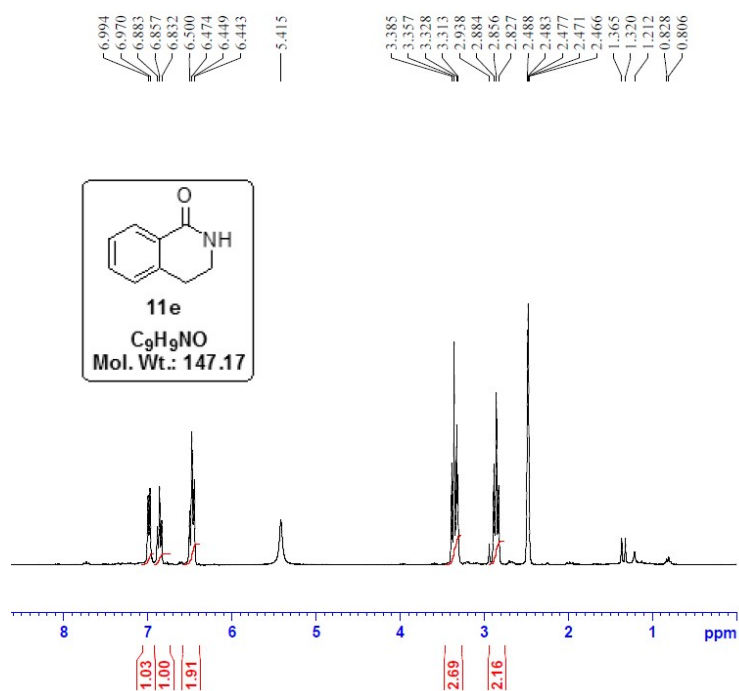


Figure S15:  $^1H$ -NMR of 11e (DMSO- $d_6$ )

A012200912-AR012200912-130

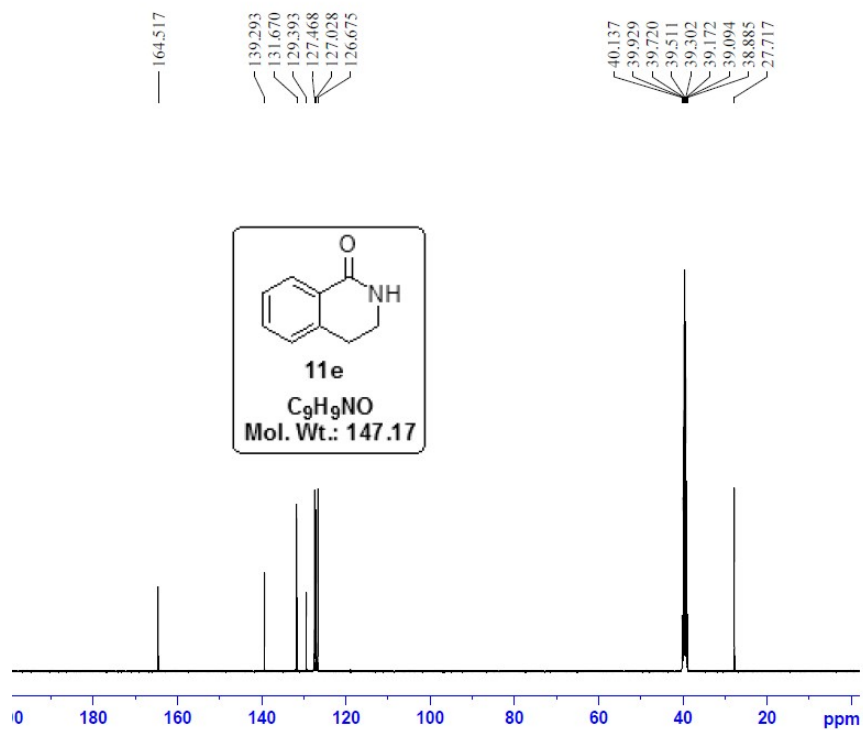


Figure S16:  $^{13}C$ -NMR of 11e (DMSO- $d_6$ )

A012200912-AR0122011594

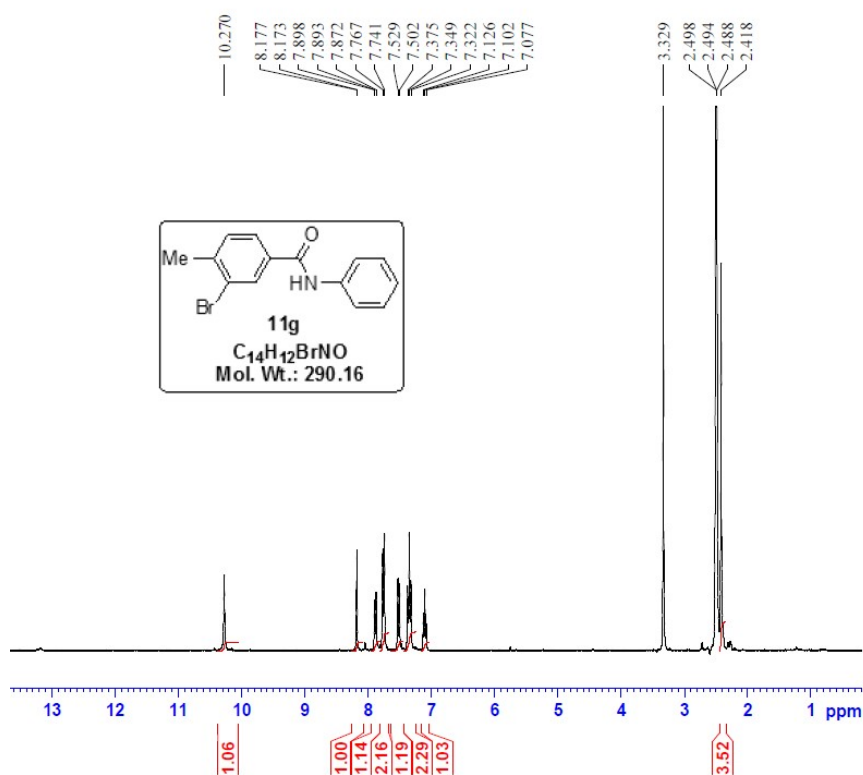


Figure S17:  $^1H$ -NMR of 11g (DMSO- $d_6$ )

A012200912-AR0122011594-13C

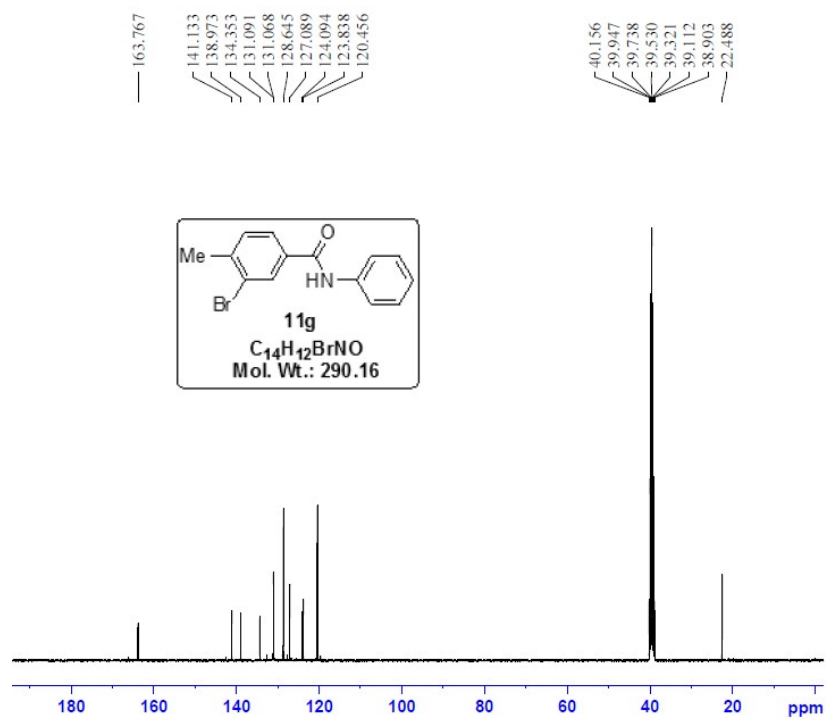


Figure S18:  $^{13}C$ -NMR of 11g (DMSO- $d_6$ )

A012200912-AR0122009102

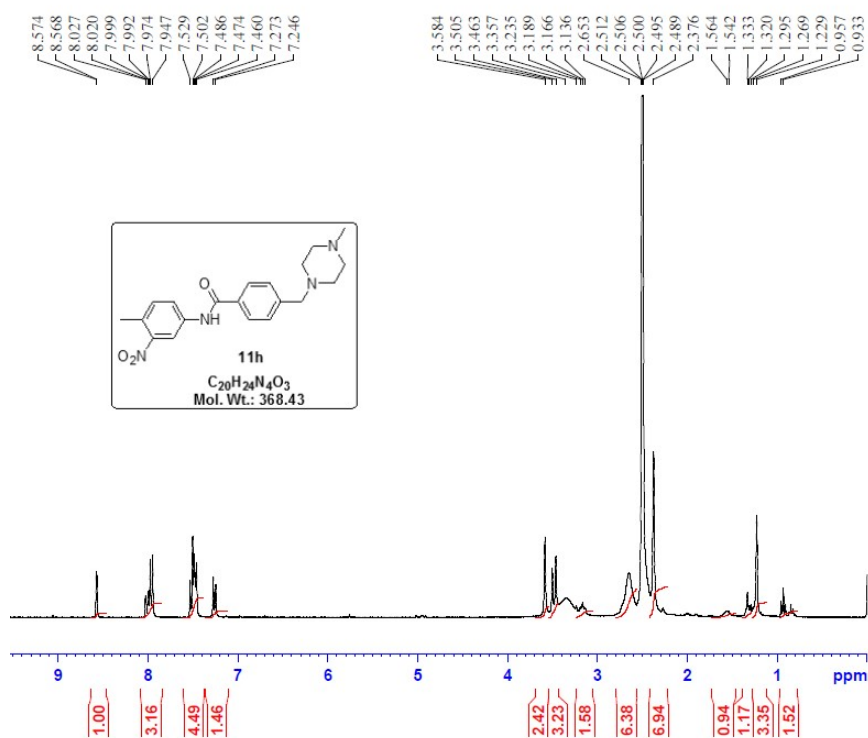


Figure S19: <sup>1</sup>H-NMR of 11h (DMSO-*d*<sub>6</sub>)

A022346934-AR0223RD0075209-13C

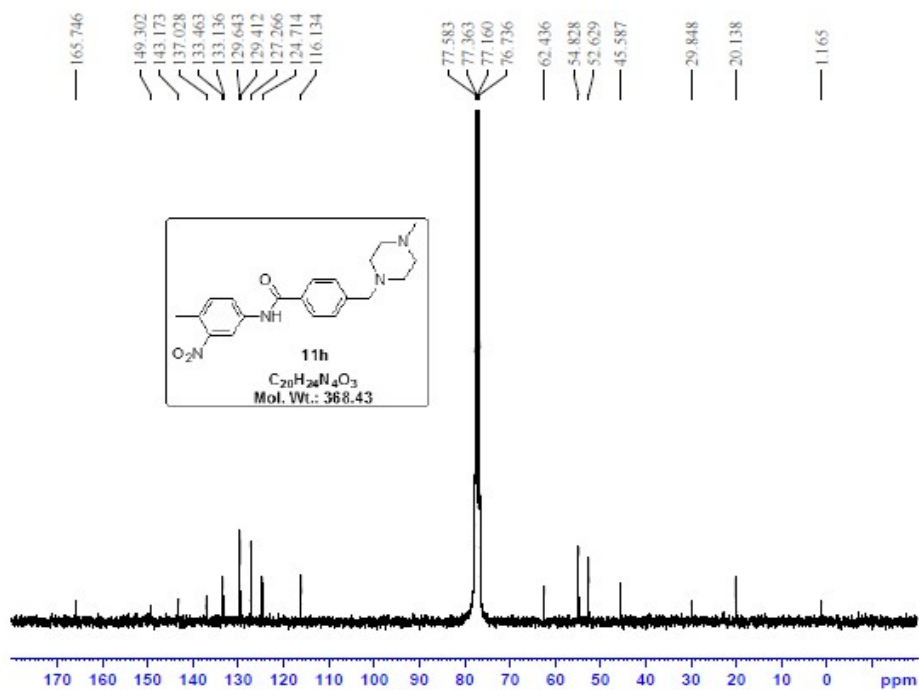


Figure S20: <sup>13</sup>C-NMR of 11h (CDCl<sub>3</sub>)

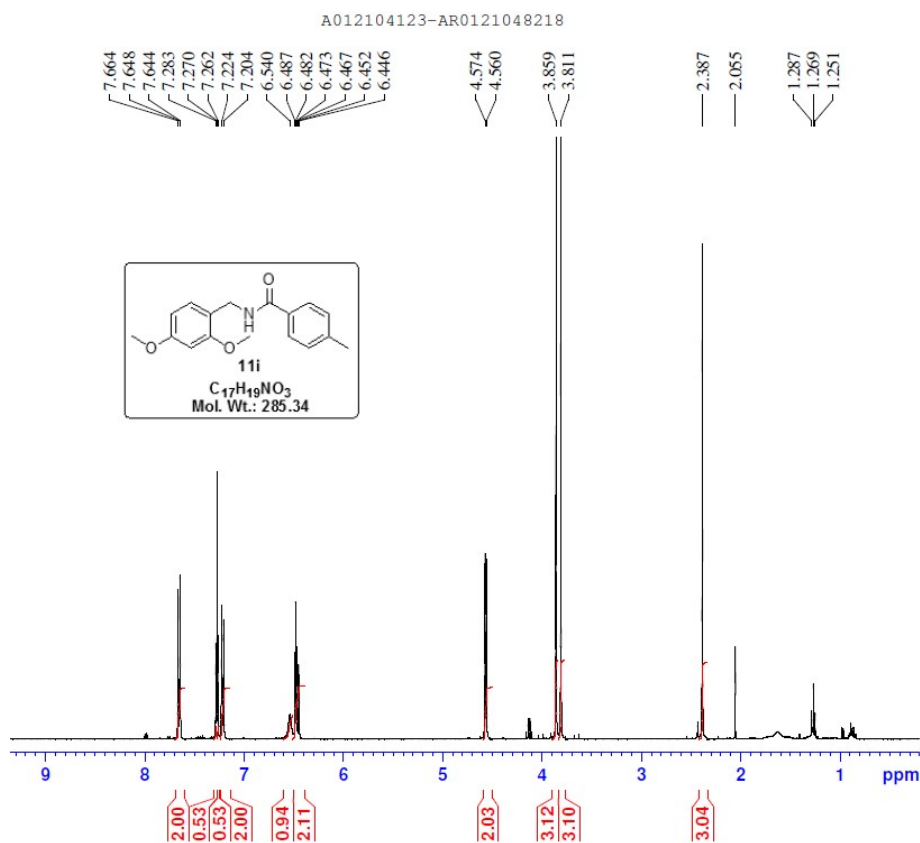


Figure S21:  $^1\text{H-NMR}$  of 11i ( $\text{CDCl}_3$ )

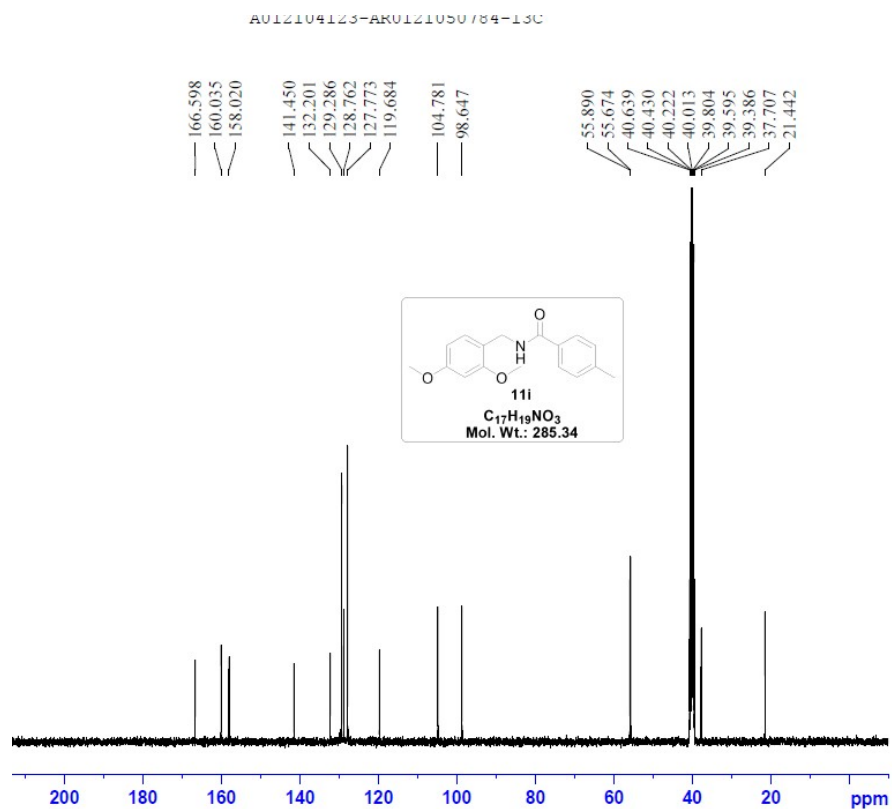


Figure S22:  $^{13}\text{C-NMR}$  of 11i ( $\text{DMSO-}d_6$ )

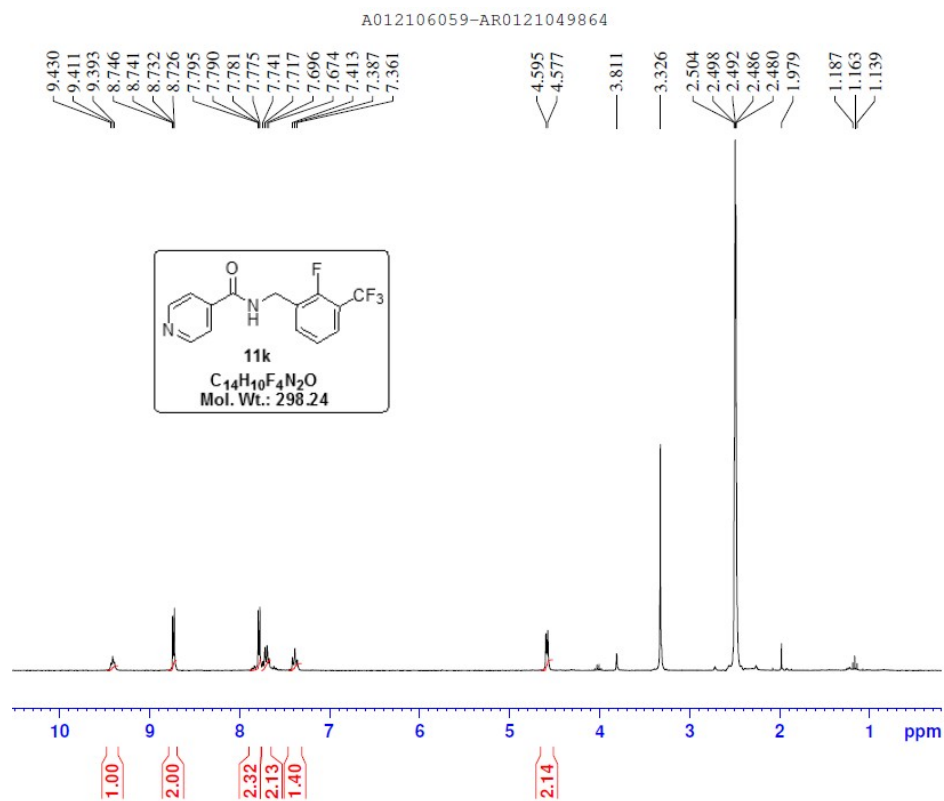


Figure S23:  $^1H$ -NMR of 11k (DMSO- $d_6$ )

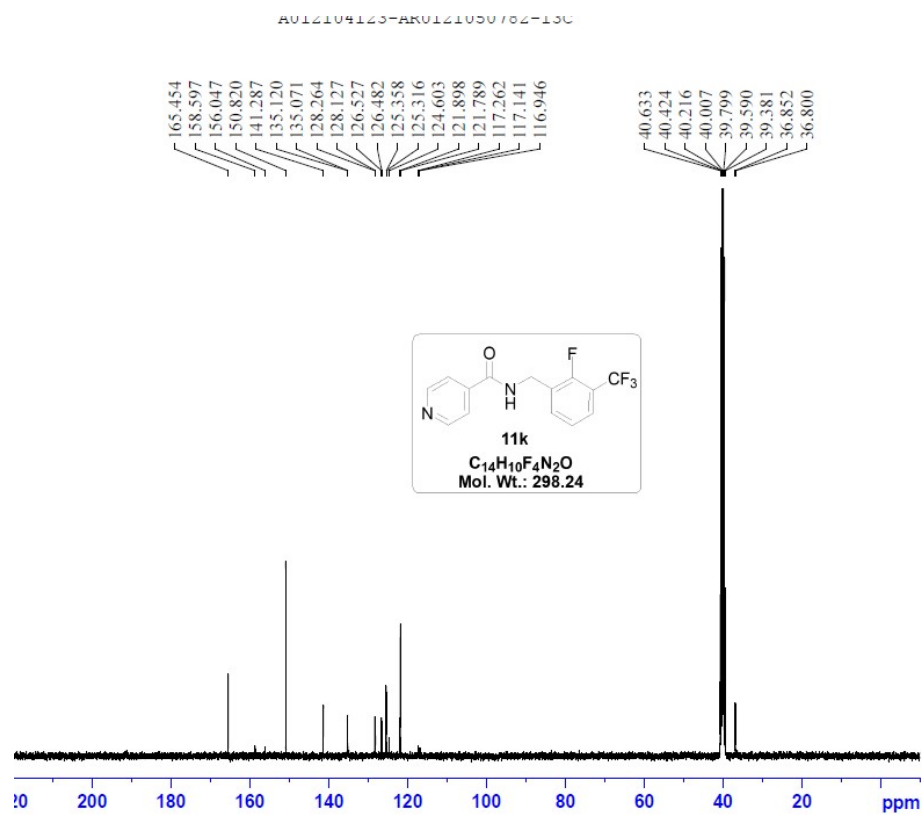


Figure S24:  $^{13}C$ -NMR of 11k (DMSO- $d_6$ )

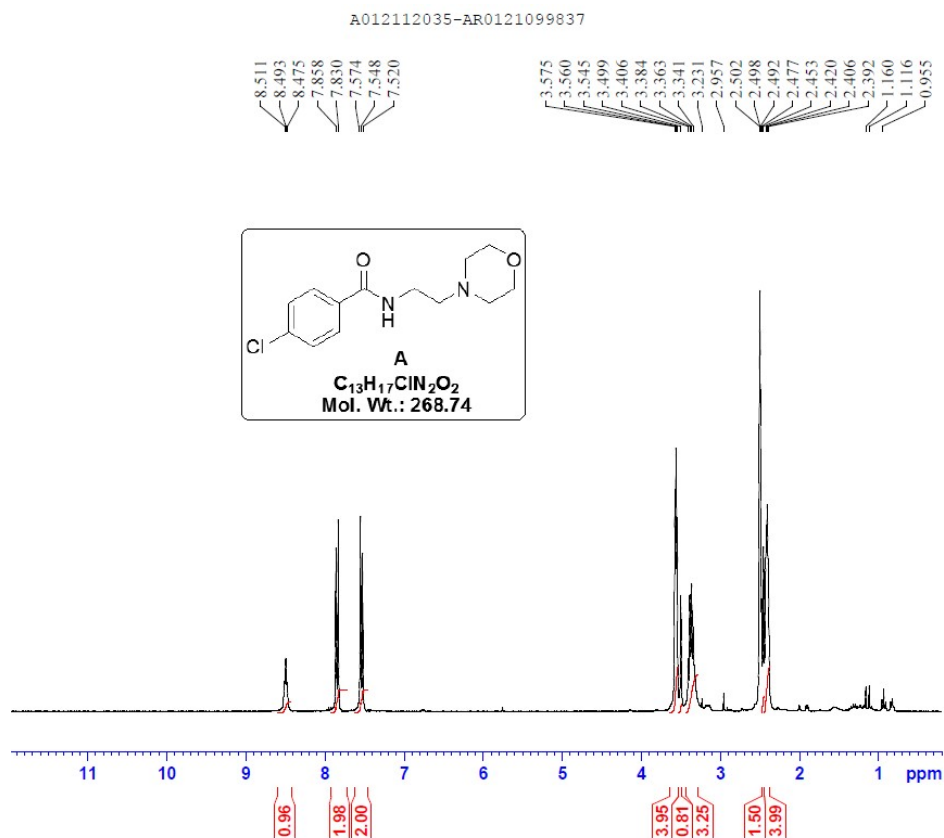


Figure S25:  $^1\text{H-NMR}$  of Moclobemide(14a) ( $\text{DMSO-}d_6$ )

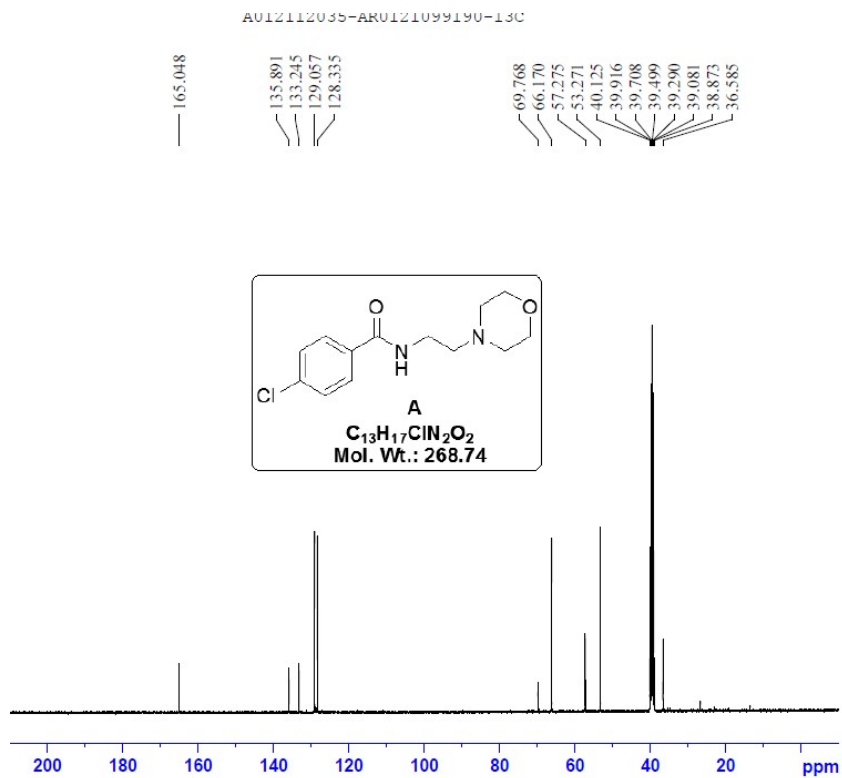


Figure S26:  $^{13}\text{C-NMR}$  of Moclobemide(14a) ( $\text{DMSO-}d_6$ )

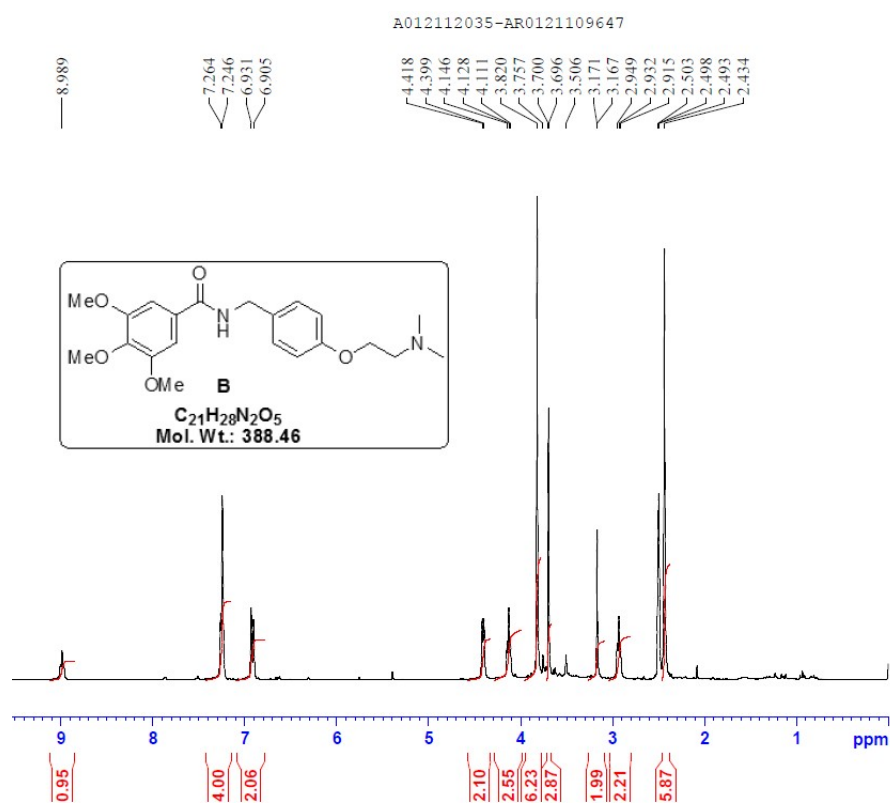


Figure S27:  $^1\text{H-NMR}$  of Tromethobenzamide (14b) ( $\text{DMSO-}d_6$ )

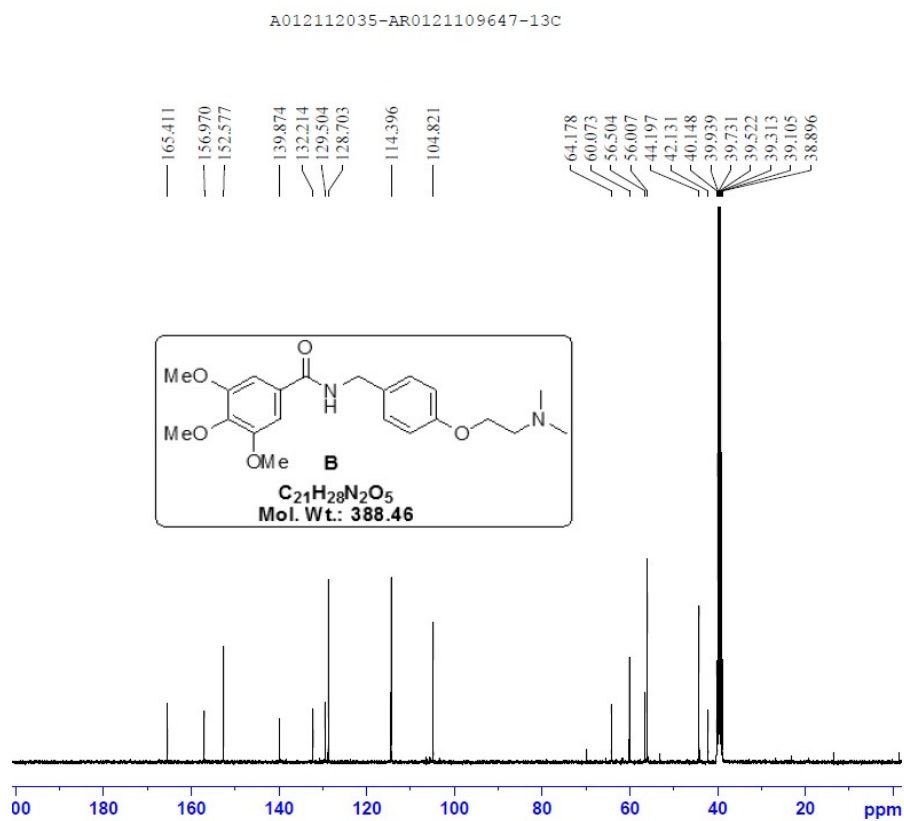


Figure S28:  $^{13}\text{C-NMR}$  of Tromethobenzamide (14b) ( $\text{DMSO-}d_6$ )



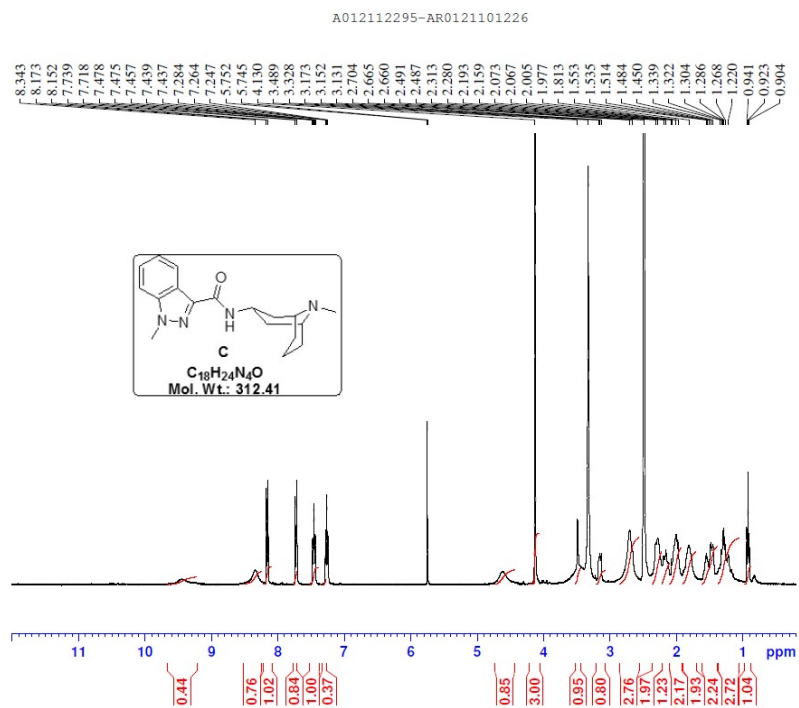


Figure S29: <sup>1</sup>H-NMR of Granisetron(14c) (DMSO-*d*<sub>6</sub>)

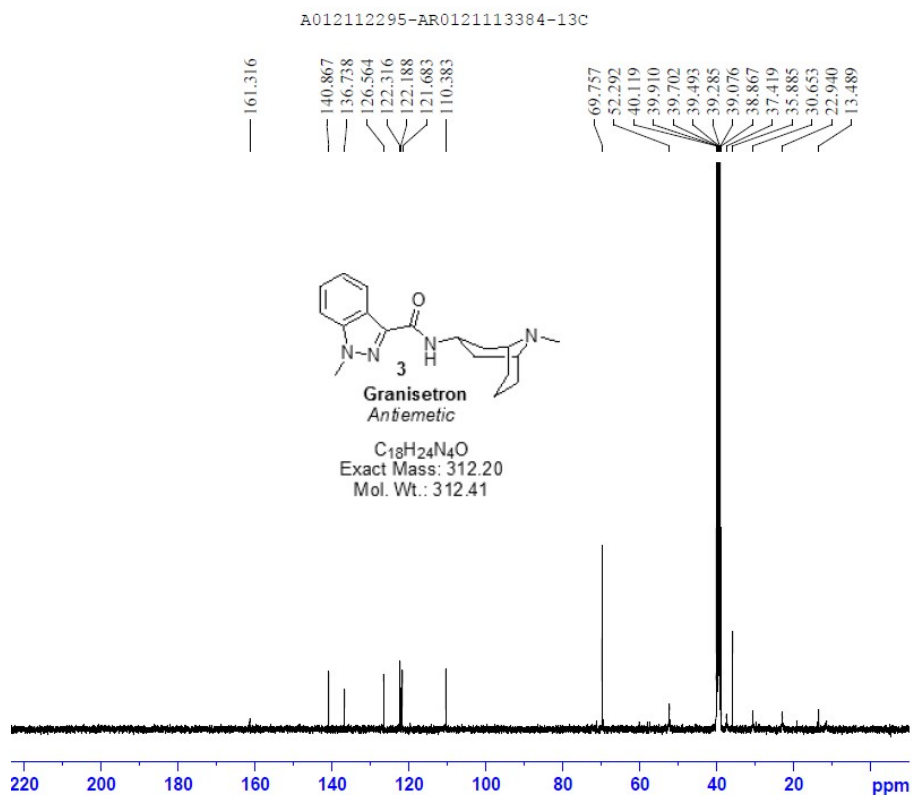


Figure S30: <sup>13</sup>C-NMR of Granisetron(14c) (DMSO-*d*<sub>6</sub>)

### 3. Synthesis of 2-(2-Bromo-ethyl)-phenylamine hydrobromide (9f):-

To a solution of **hydrobromic acid (10 mL, 48% in water)** was added 2-(2-aminophenyl)ethanol (0.1 g, 0.73 mmol) at room temperature. The resulting reaction mixture was allowed to reflux for 6 hrs. After 6 hrs, solid was filtered and dried to afford **2-(2-Bromo-ethyl)-phenylamine hydrobromide (9f)** (0.1 g, 68 %) as brown solid.

$^1\text{H NMR}$  (300 MHz,  $\text{D}_2\text{O}$ ):  $\delta$  10.24 (bs, 1H), 7.49 – 7.43 (m, 2H), 7.42 – 7.35 (m, 2H), 3.72 (t,  $J = 1.2, 6.9$  Hz, 2H), 3.27 (t,  $J = 9.2$  Hz, 2H).

LCMS (EI,  $m/z$ ): calcd for  $\text{C}_8\text{H}_{10}\text{BrN}$  [ $\text{M} + \text{H}$ ](free base): 201.10, Found: 201.9

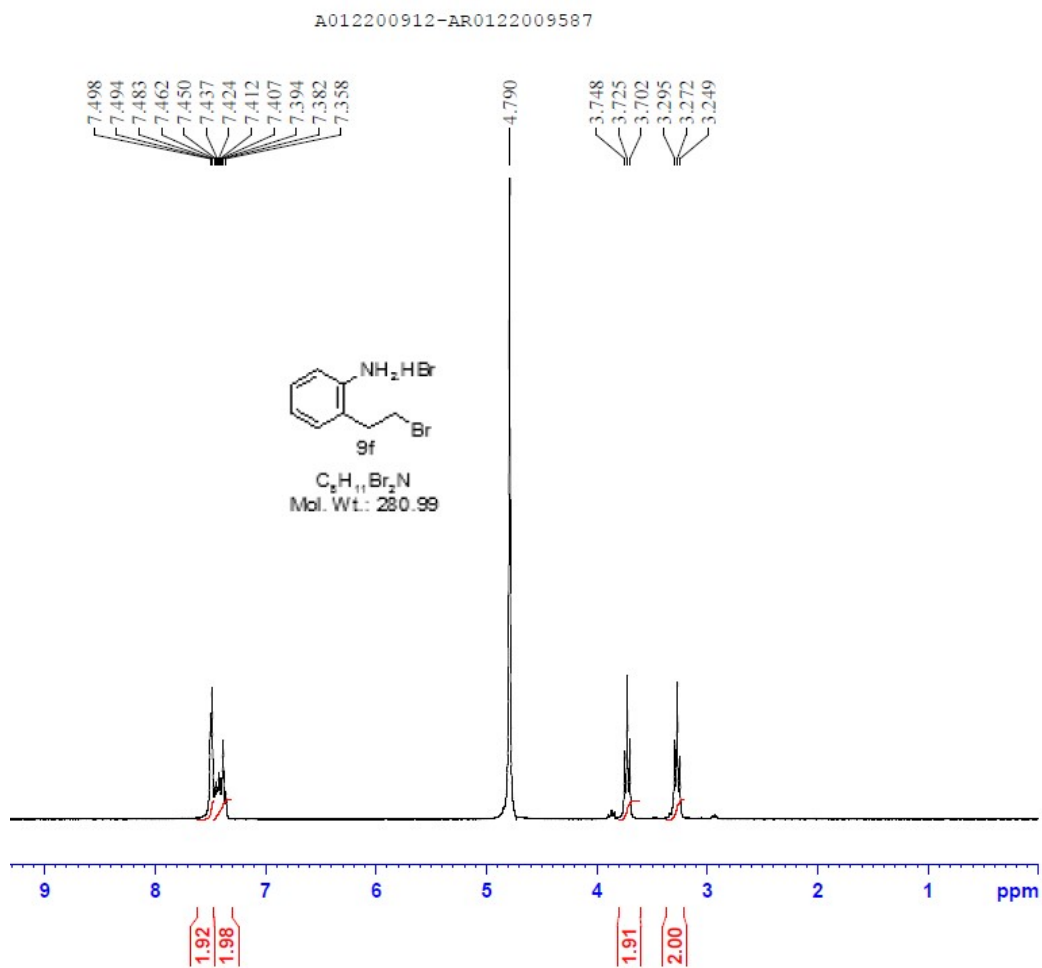


Figure S31:  $^1\text{H-NMR}$  of 9f ( $\text{D}_2\text{O}$ )

## Synthesis of N-(2-Fluoro-3-trifluoromethyl-benzyl)-benzamide (3a) on 5g scale:-

To a solution of **TPGS-750M** in water (50 mL, 2% w/w) was added 2-Fluoro-3-trifluoromethyl-benzylamine (1) (5.0 g, 25.88 mmol) and degassed for 15 mins by Argon gas at room temperature in 250 mL three neck RBF. Bromo benzene (2) (6.1 g, 38.83 mmol) was added followed by **N-tetrabutylamine hydrobromide** (0.5 g, 10% w/w), **potassium phosphate tribasic** (8.24 g, 38.83 mmol), Tungsten hexacarbonyl (9.1 g, 25.88 mmol) and **[Bis(di-tert-butyl(4-dimethylaminophenyl) phosphine)dichloropalladium(II)]** (183.2 mg, 0.2588 mmol). The resulting reaction mixture was allowed to stir at 70 °C for 16 hrs. Upon completion (TLC control, 40% EtOAc in hexanes), the reaction mixture was cooled to room temperature and diluted with water (50 mL). Grey coloured solid was filtered over Buchner funnel. Filtrate was partially concentrated and solid was filtered over Buchner funnel. Combined solid was digested with water (2 x 25 mL) at 40 °C and filtered to afford **N-(2-Fluoro-3-trifluoromethyl-benzyl)-benzamide (3a)** (6.05 g, 78 %) as off white solid.

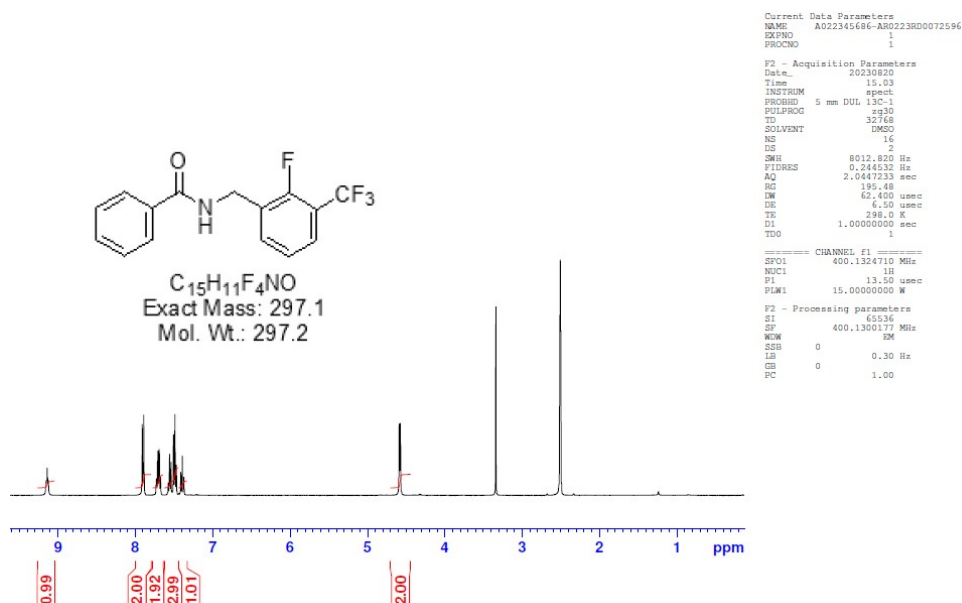


Figure S32: <sup>1</sup>H-NMR of 3a (DMSO-*d*<sub>6</sub>)

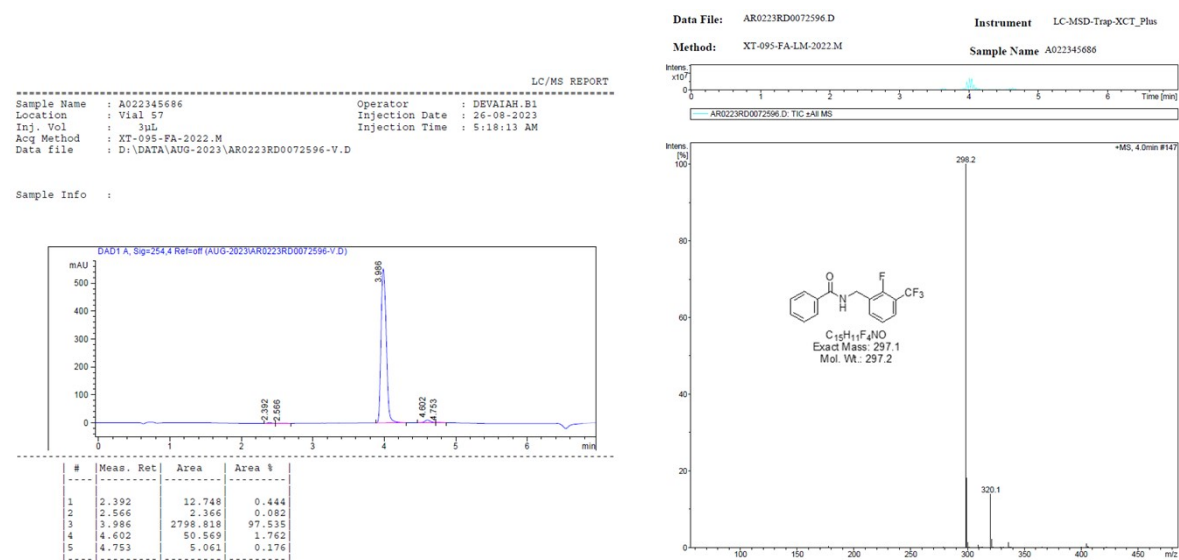


Figure S33: LCMS of 3a

**EcoScale Calculation:-**

**EcoScale** = 100 - sum of individual penalties

#	Parameters	Penalty points	Value
1.	Yield	$(100 - \%yield)/2 = 100 - 78/2$	11
2.	Price of reaction components	Expensive (> \$10 and < \$50)	03
3.	Safety	N (dangerous for environment)	05
4.	Technical setup	Common setup	00
5.	Temperature/time	Heating, > 1 h	03
6.	Workup and purification	Cooling to room temperature, Adding solvent(Water), Simple filtration, Removal of solvent with bp < 150°C	00
Total penalty points			22
<b>EcoScale = 100 - sum of individual penalties</b>			<b>100-22=78</b>

**E factor Calculation:-**

**E factor** = Raw materials- Final product/Final product

#	Reagents	Quantity
1.	2-Fluoro-3-trifluoromethyl-benzylamine	5.0 g
2.	Bromo benzene	6.1 g
3.	N-tetrabutylamine hydrobromide	0.5 g
4.	Potassium phosphate tribasic	8.3 g
5.	Tungsten hexacarbonyl	9.1 g
6.	TPGS-750M	1.0 g
7.	[Bis(di-tert-butyl(4-dimethylaminophenyl)phosphine)dichloropalladium(II)]	0.2g
Total		30.2 g
<b>E factor</b> = Raw materials- Final product/Final product = 30.2 g-6.05 g/6.05g		<b>3.99</b>