

## *Chemical Communications*

# Supporting Information

### Enhanced Reactivity and Selectivity of Asymmetric oxa-Michael addition of 2'-Hydroxychalcone in Carbon Confined Space

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## 1. Experimental section:

**Characterization Techniques:** Transmission electron microscopy (TEM) studies of the particles were carried out at an accelerated voltage of 197 kV using a Philips CM200 TEM equipped with a LaB<sub>6</sub> source. The X-ray diffraction (XRD) patterns were recorded on a Shimadzu XD-3A X-ray diffractometer operating at 20 kV using Cu K $\alpha$  radiation ( $\lambda = 0.1542$  nm) for CNTs and its composites. For ferrites, Cr K $\alpha$  radiation ( $\lambda = 0.2$  nm) radiation source was used. X-ray photoelectron spectroscopic analysis (XPS) was performed using an ESCALAB250 instrument by Thermo VG Scientific. Unless stated otherwise, monochromatic Al K $\alpha$ -radiation was used (15kV, 150W,  $\sim 500$   $\mu\text{m}$  spot diameter) with the transmission function of the analyzer having been calibrated using a standard copper sample; when necessary, charge compensation was achieved using a "Flood-Gun" ( $\sim 6\text{eV}/0.05\text{mA}$ ). Spectra were recorded with pass energy of 80 eV for survey spectra, and 30 eV for core level spectra. For non-magnetic samples, a magnetic lens was used to enhance the signal/noise ratio. Infrared spectra were recorded on a Varian Associated FT-IR 3100 Excalibur with ATR unit. The wave numbers ( $\nu$ ) of recorded IR-signals are quoted in  $\text{cm}^{-1}$ . Enantiomeric excess (ee) was determined using HPLC, Shimadzu with UV-detector using chiralcel AD-H column with flow rate of 1.2 mL/min and 5% isopropanol: hexane system. The ACME silica gel (100-200 mesh) was used for column chromatography and thin layer chromatography was performed on Merck precoated silica gel 60-F<sub>254</sub> plates.

**2. Synthesis of MNPs (Fe<sub>3</sub>O<sub>4</sub>):** The MNPs were prepared by the so called wet-impregnation method as reported in literature. The ultra-fine MNPs were prepared by co-precipitating aqueous solutions of ferrous ammonium sulphate (NH<sub>4</sub>)<sub>2</sub>Fe(SO<sub>4</sub>)<sub>2</sub> 6H<sub>2</sub>O and ferric chloride (FeCl<sub>3</sub>) mixture, respectively, in alkaline medium. Ferrous ammonium sulphate 0.98g (2.5 mmol) was added to 0.81 g (5 mmol) of ferric chloride in 200 mL of water (*i.e.*, stoichiometry ratio Fe<sup>2+</sup>:Fe<sup>3+</sup> = 1: 2) and the resultant mixture was kept at 80 °C for 30 min

under inert atmosphere. To this solution, 0.02N  $\text{NH}_4\text{OH}$  was added drop by drop till the complete precipitation occurs under constant stirring. Magnetite formed by conversion of metal chloride into hydroxides (which takes place immediately), and hydroxides into ferrites. The resultant solution was maintained at 80 °C for another 2h. Then the brown colour precipitate, obtained is washed several times with distilled water. The precipitate is then separated with the help of external magnet and is kept for drying at 80 °C. Finally thus prepared MNPs were calcinated at 400°C for 2h to get free flowing powder.

### **2.1. Synthesis of CPA (L1) modified MNPs (Chiral Solid):**

In a typical experiment, magnetite (0.1 g) was added into the round bottom flask containing toluene (3.0 mL) and (*R*)-(-)-1,1'-Binaphthyl-2,2'-diyl hydrogen phosphate (0.02 mmol, 7.0 mg) was sonicated for 1 h at 80 °C. Then chiral magnetite nanoparticles (MNP/L1) collected via magnetic decantation was directly used in asymmetric cyclization of 2'-hydroxychalcone. Various concentrations of L1 (5, 7.5, 10, 15 mol % of L 1) on MNPs were prepared. Similarly MNP/L2 was synthesized using L2 ligand.

### **2.2 Synthesis of CNPs ( $\text{CoFe}_2\text{O}_4$ ):**

Cobalt ferrite nanoparticles were synthesized similar to that of MNPs, using cobalt chloride 0.59g (2.5 mmol) ( $\text{CoCl}_2 \cdot 6\text{H}_2\text{O}$ ) instead of ferrous ammonium sulphate. The samples were designated as CNP/L1 with ligand L1 and CNP/L2 with ligand L2 respectively.

### **2.3 Preparation of MNP-L1-CNT (inside the CNT channel):**

The pristine CNTs, present a specific surface area  $40\text{m}^2/\text{g}$ , a mesoporous volume of  $0.15\text{ cm}^3/\text{g}$ , a mean pore diameter of 14 nm, an average external diameter of 60 nm and internal diameter of 40 nm were purchased from UNITECH, Bangalore. Pure CNTs (250 mg) (CNT) were dispersed in xylene (10.0 mL) and ultra sonicated for 30 min at room temperature. To the resultant suspension, MNP/L1 (30 mg, dispersed in 15.0 mL of xylene) were added and

further sonicated for 6 h. Then the suspension was washed several times thoroughly with ethanol (20 mL) and finally with water till the neutral pH is attained and dried at 50 °C overnight to get the functionalized CNTs (M/CNT-L1). Similarly M/CNT-L2 and (C/CNT-L1; C/CNT-L2) were prepared.

#### **2.4 Preparation of MNP/L1-CNT (out) Catalyst:**

Pure CNTs (5.0 g) were dispersed in a solution of conc. HNO<sub>3</sub> (4.0 mL) and conc. H<sub>2</sub>SO<sub>4</sub> (16.0 mL). The suspension was ultra sonicated for 3 h at room temperature. Later pure water (100 mL) was added and further sonicated for 10 min. Then the suspension was washed several times thoroughly with water till the neutral pH is attained and dried at 50 °C overnight to get the –COOH functionalized CNTs. (Z. Wang, M. D. Shirley, S. T. Meikle, R. L. D. Whitby, S. V. Mikhalovsky, *Carbon*, 2009, 47, 73-79. And B. Scheibe, E. B.- Palen, R. J. Kalenczuk, *J. Mat. Char*, 2010, 61, 185-191.) Thus prepared acid functionalized CNTs (360 mg) were dispersed in 200 ml DMF-water mixture [DMF/water: 20/80 (v/v)]. To this dispersed solution, MNP-L1 (50.0 mg) in toluene (3.0 mL of H<sub>2</sub>O) were added slowly and sonicated for further 12 h. The resultant mixture was washed thoroughly with water, followed by methanol and dried at 80 °C for 24 h to get the magnetite functionalized CNTs.

#### **2.5 Asymmetric cyclization of 2'-hydroxychalcone to flavanone:**

In an oven dried flask, 2'-hydroxychalcone (0.5 mmol) were stirred in chlorobenzene (3.0 mL) containing a catalyst (20.0 mg) to give a yellow color suspension. The temperature increased to 100 °C and further allowed to stir for the required time. After completion of the reaction, (monitored by TLC), the catalyst was removed with the help of external magnet and washed with ethanol (2 X 10 mL). Later, the reaction mixture was quenched with addition of (1.0 mL) 0.1 N HCl followed by EtOAc. After evaporation of the organic phase, the residue was purified by column chromatography (Hexane: EtOAc, 9:1 as eluent) to give colorless crystals.

### 3. Characterization of the catalyst

#### 3.1. XPS of MNP-L1/CNT (inside)

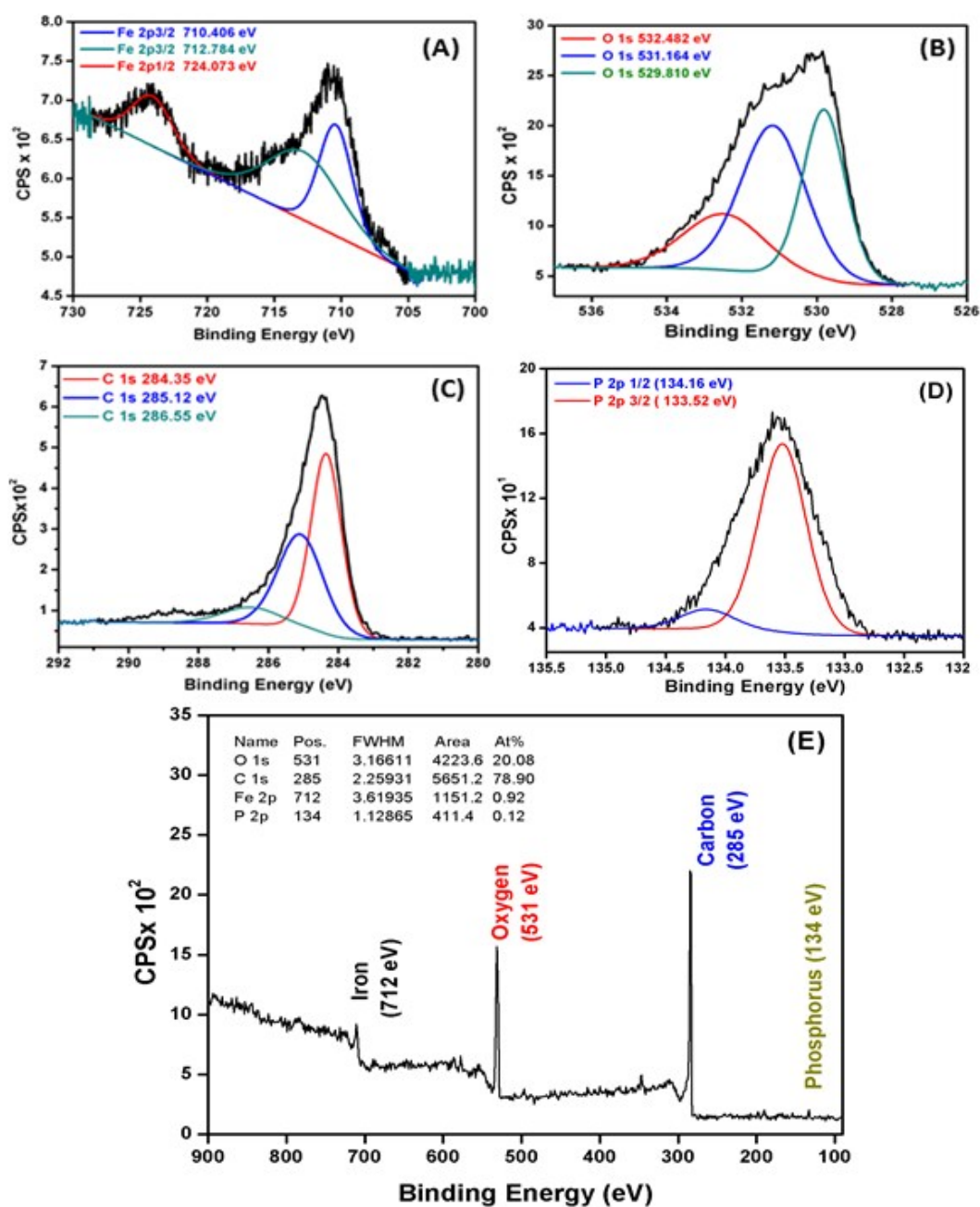


Fig. S1. XPS surface scan survey of catalyst

### 3.2 . FT-IR of MNP/L1-CNT (inside)

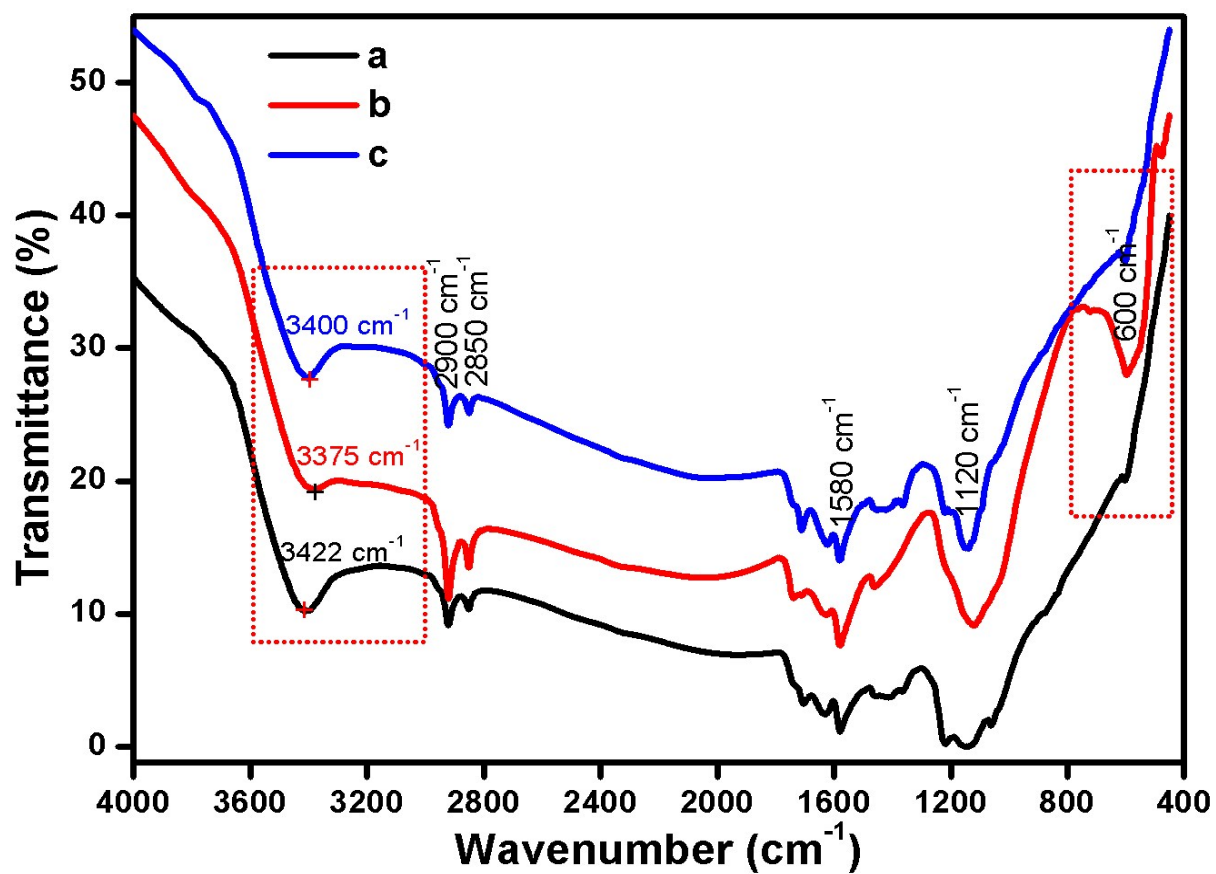


Fig. S2. (a) As received CNT (b) M/CNT/L1 (c) C/CNT-L1

#### 4. Mass spectra of Fe-CPA

(a)

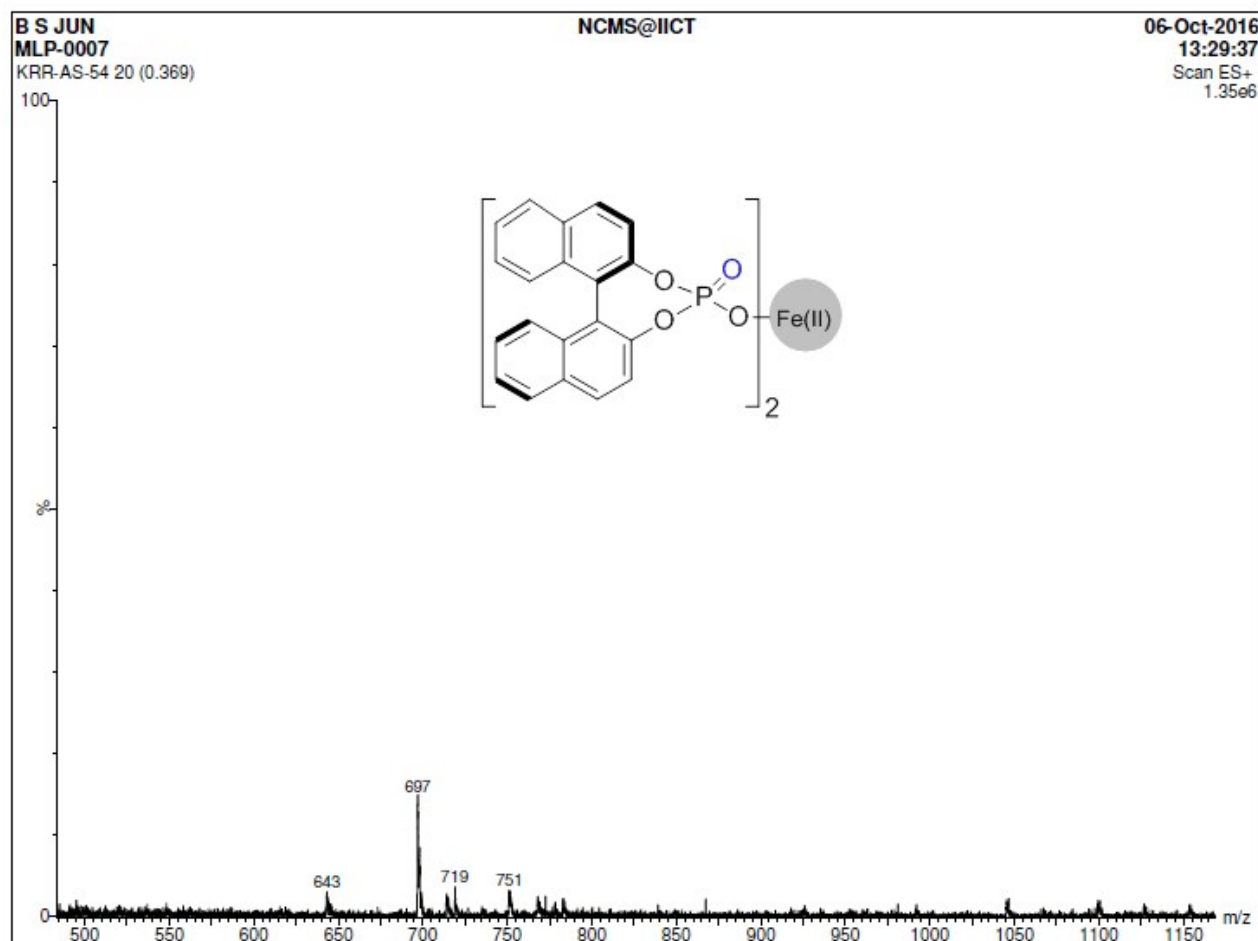


Fig. S3. Mass spectra of Fe<sup>2+</sup>-CPA

(b)

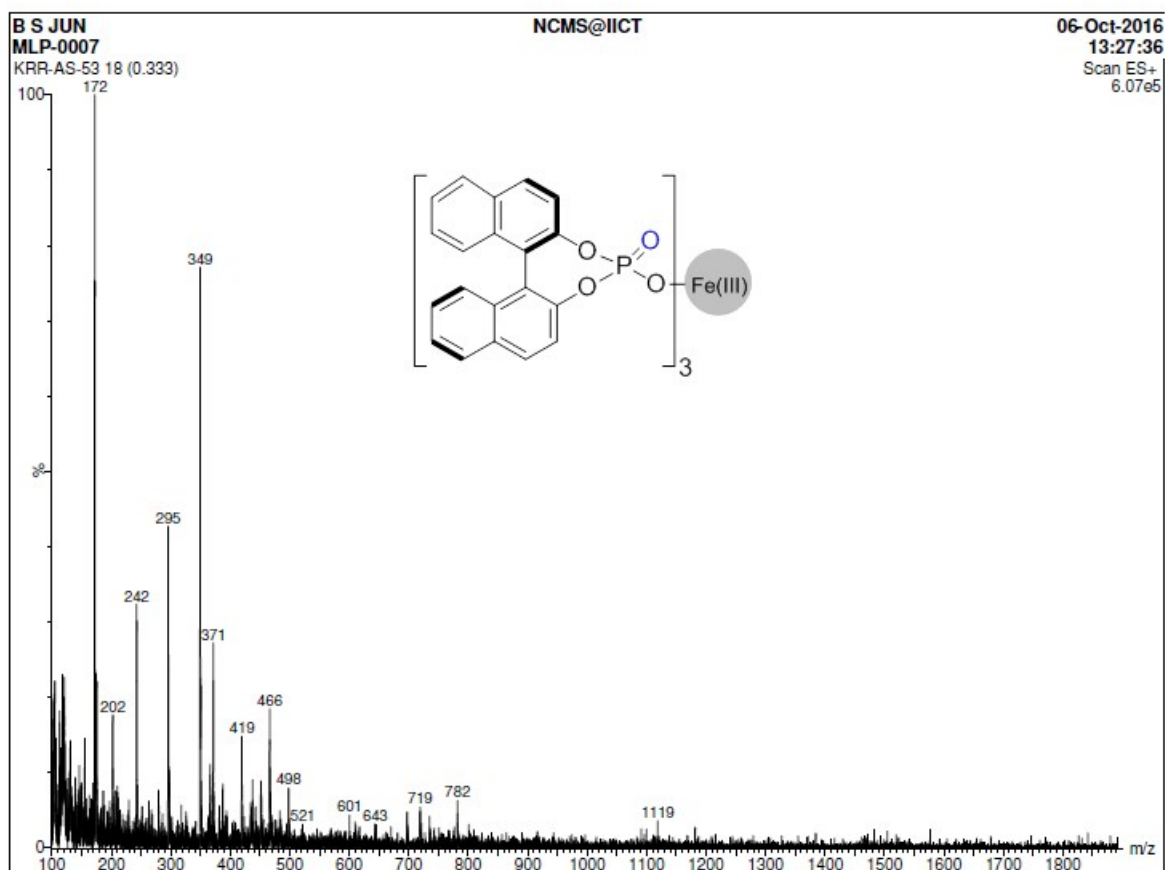
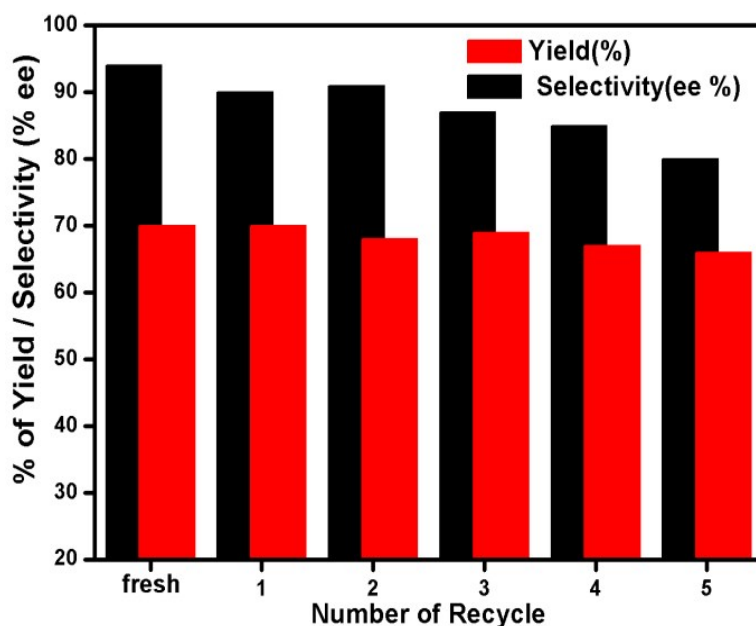


Fig. S4. Mass spectra of Fe<sup>2+</sup>-CPA

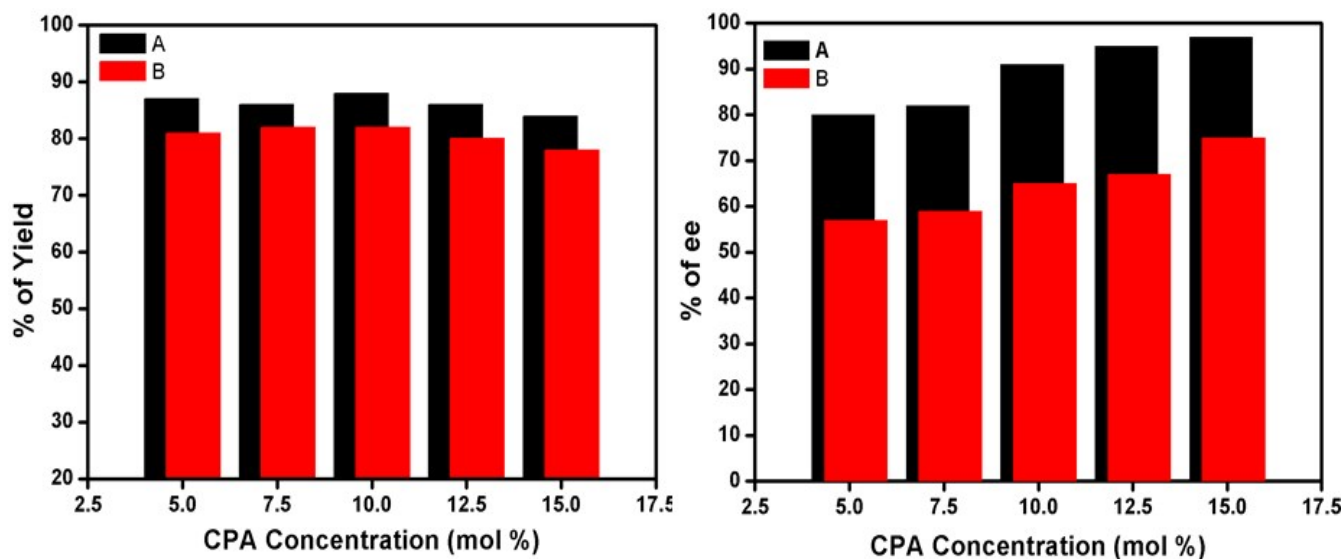


## 5. Recycling of the catalyst



**Fig. S5.** Recycling of M-L1/CNT (inside) in the asymmetric cyclization of 2'-hydroxychalcones

## 6. Effect of the chiral ligand



**Fig. S6.** Effect of the ligand concentration in reactivity and selectivity for asymmetric cyclization (A) inside of the CNT channel and (B) outside of the CNT surface [HPLC data for MNP-LI inside CNT channel (Fig. S20-S24) and outside of the CNT surface (Fig. S30-S34)].

**7. Table S1. Optimization conditions cyclization of 2'-hydroxychalcone (in the absence of chiral phosphoric acid).**

| entry | catalyst | solvent         | temp (°C) | Yield (%) |
|-------|----------|-----------------|-----------|-----------|
| 1     | MNPs     | Ethanol         | 100       | 10        |
| 2     | MNPs     | Methanol        | 100       | 10<       |
| 3     | MNPs     | toluene         | 100       | N.R       |
| 4     | MNPs     | DMF             | 100       | 80        |
| 5     | MNPs     | Dichloromethane | 60        | 16        |
| 6     | MNPs     | Chlorobenzene   | 100       | 92        |
| 7     | MNPs     | Chlorobenzene   | 80        | 85        |
| 8     | MNPs     | Chlorobenzene   | 60        | 75        |
| 9     | MNPs     | DMF             | 100       | 60        |
| 10    | CNT      | DMF             | 100       | <10       |
| 11    | CNT      | Chlorobenzene   | 100       | N.R       |
| 12    | CNPs     | Chlorobenzene   | 100       | 63        |
| 13    | CNPS     | Chlorobenzene   | 80        | 38        |

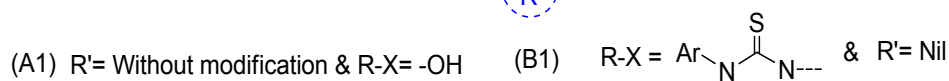
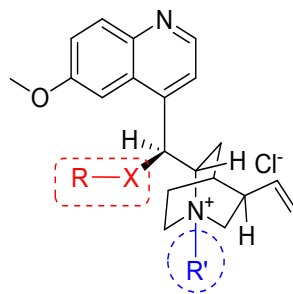
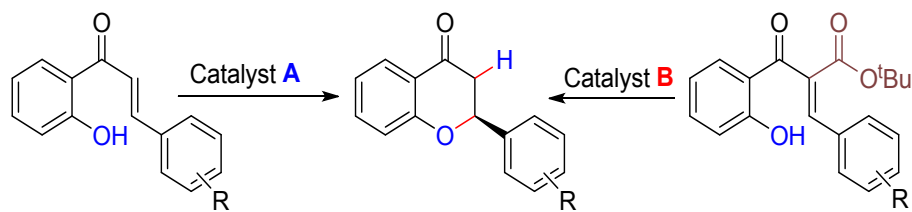
Reaction condition: 0.5 mmol of reactant, 3.0 mL of solvent, 20 mg of the catalyst

**Table S2: Asymmetric oxa-Michael addition reaction of various ratios of Fe: CPA.**

| entry | Fe: CPA | Fe <sub>3</sub> O <sub>4</sub> -CPA <sup>a</sup> |        |               | Fe <sub>3</sub> O <sub>4</sub> -CPA confinement in CNT <sup>b</sup> |        |               |
|-------|---------|--------------------------------------------------|--------|---------------|---------------------------------------------------------------------|--------|---------------|
|       |         | Yield (%)                                        | ee (%) | HPLC spectrum | Yield (%)                                                           | ee (%) | HPLC spectrum |
| 1     | 40      | 80                                               | 17     | Fig. S25      | 87                                                                  | -80    | Fig. S20      |
| 2     | 20      | 81                                               | 39     | Fig. S26      | 86                                                                  | -82    | Fig. S21      |
| 3     | 13.3    | 79                                               | 47     | Fig. S27      | 88                                                                  | -91    | Fig. S22      |
| 4     | 10      | 75                                               | 54     | Fig.S28       | 87                                                                  | -95    | Fig. S23      |
| 5     | 8       | 74                                               | 61     | Fig. S29      | 85                                                                  | -97    | Fig. S24      |

Reaction condition: Reactant (0.5 mmol): <sup>a</sup>catalyst (20.0 mg of Fe<sub>3</sub>O<sub>4</sub>-CPA): <sup>b</sup> (20.0 mg of CNT-Fe<sub>3</sub>O<sub>4</sub>-CPA)

8. (a) Previous reports for the asymmetric Oxa-Michael addition of 2'-hydroxychalcone:

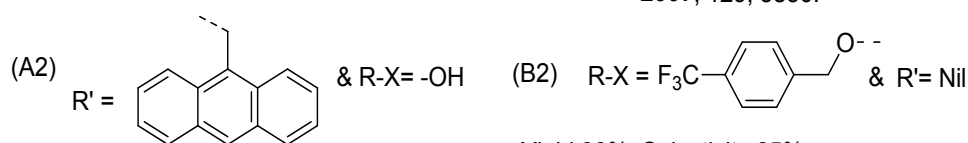


Yield 81%, Selectivity 61% ee

Hintermann *et al*, *Eur. J. Org. Chem.*, **2007**, 5886.

Yield 97%, Selectivity 80% ee

Scheidt *et al*, *J. Am. Chem. Soc.*, **2007**, 129, 3830.

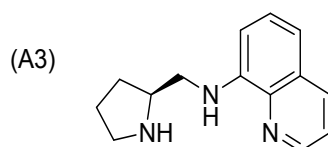


Yield 44%, Selectivity 77% ee

Dittmer *et al*, *Eur. J. Org. Chem.*, **2012**, 5573.

Yield 98%, Selectivity 85% ee

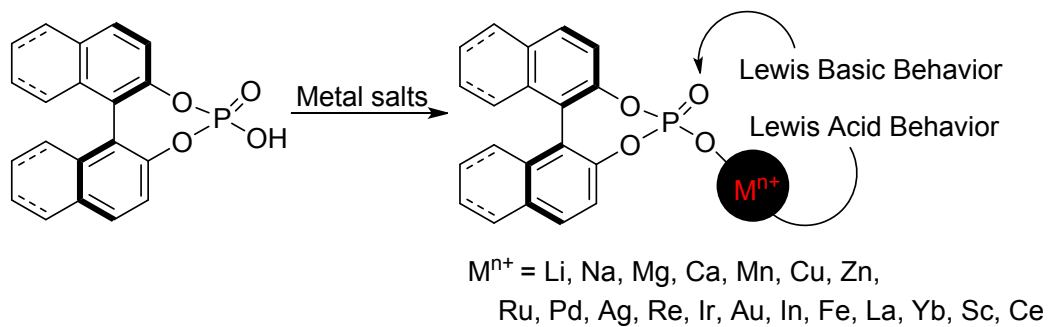
Zhao *et al*, *Tetrahedron*, **2011**, 67, 5389.



Yield 65%, Selectivity 96% ee

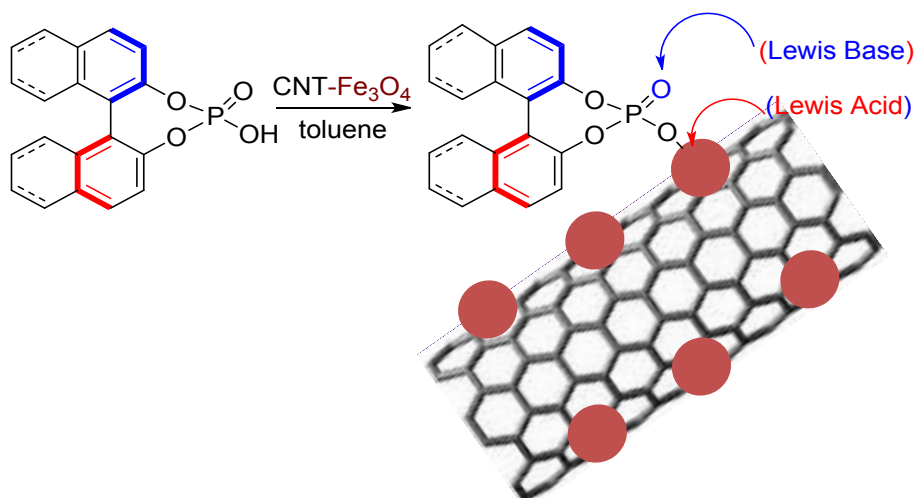
Wang *et al*, *Tetrahedron Lett.*, **2014**, 55, 3255.

## (b) Reported Metal-CPA catalysts for Various Reactions



1. D. Parmar, E. Sugiono, S. Raja and M. Rueping, *Chem. Rev.* 2014, **114**, 9047-9153.
2. S. Mukherjee, B. List, *J. Am. Chem. Soc.*, 2007, **129**, 11336.
3. G. L. Hamilton, E. J. Kang, M. Mba, F. D. Toste, *Science*, 2007, **317**, 496.
4. A. Parra, S. Reboredo, A. M. Martín Castro, J. Alemán, *Org. Biomol. Chem.*, 2012, **10**, 5001.
5. R. J. Phipps, G. L. Hamilton, F. D. Toste, *Nat. Chem.*, 2012, **4**, 603.
6. M. Mahlau, B. List, *Angew. Chem.Int. Ed.*, 2013, **52**, 518.

## (c) Our catalyst (heterogeneous catalyst)



## 9. TOF Calculation:

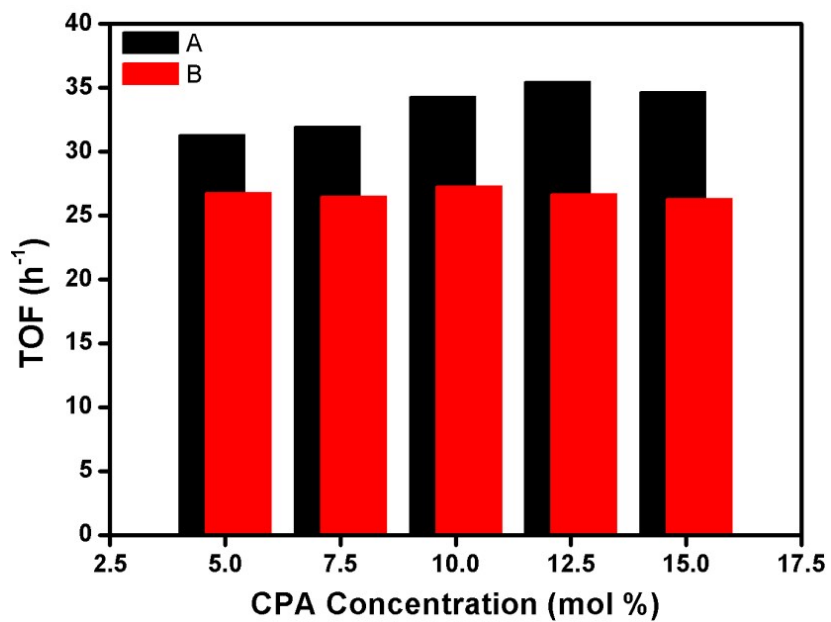


Fig. S7. TOF of (A) MNP-L1/CNT (in) and (B) MNP-L1/CNT (out)

## 10. $^1\text{H}$ -NMR Spectra of flavanones

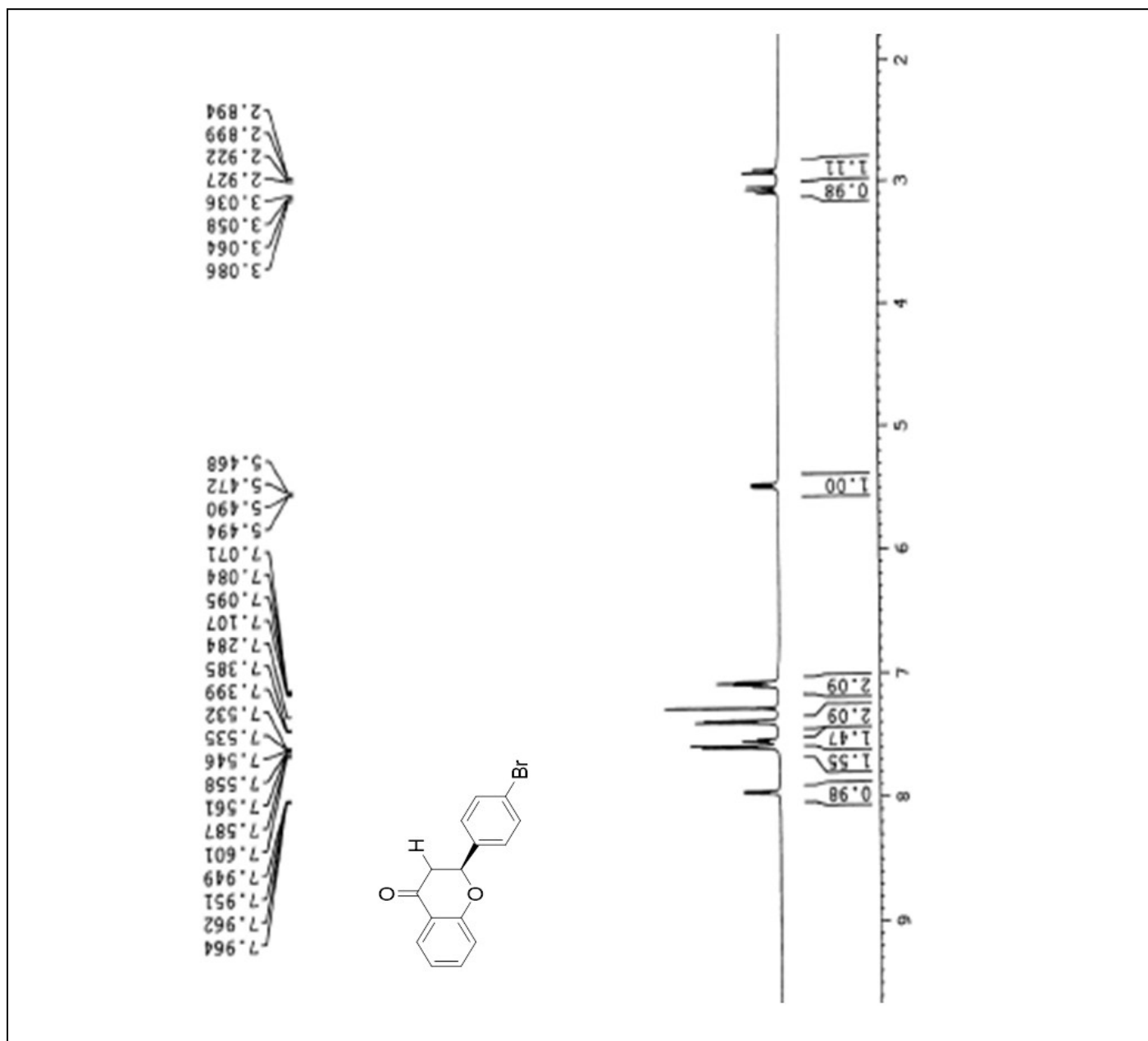
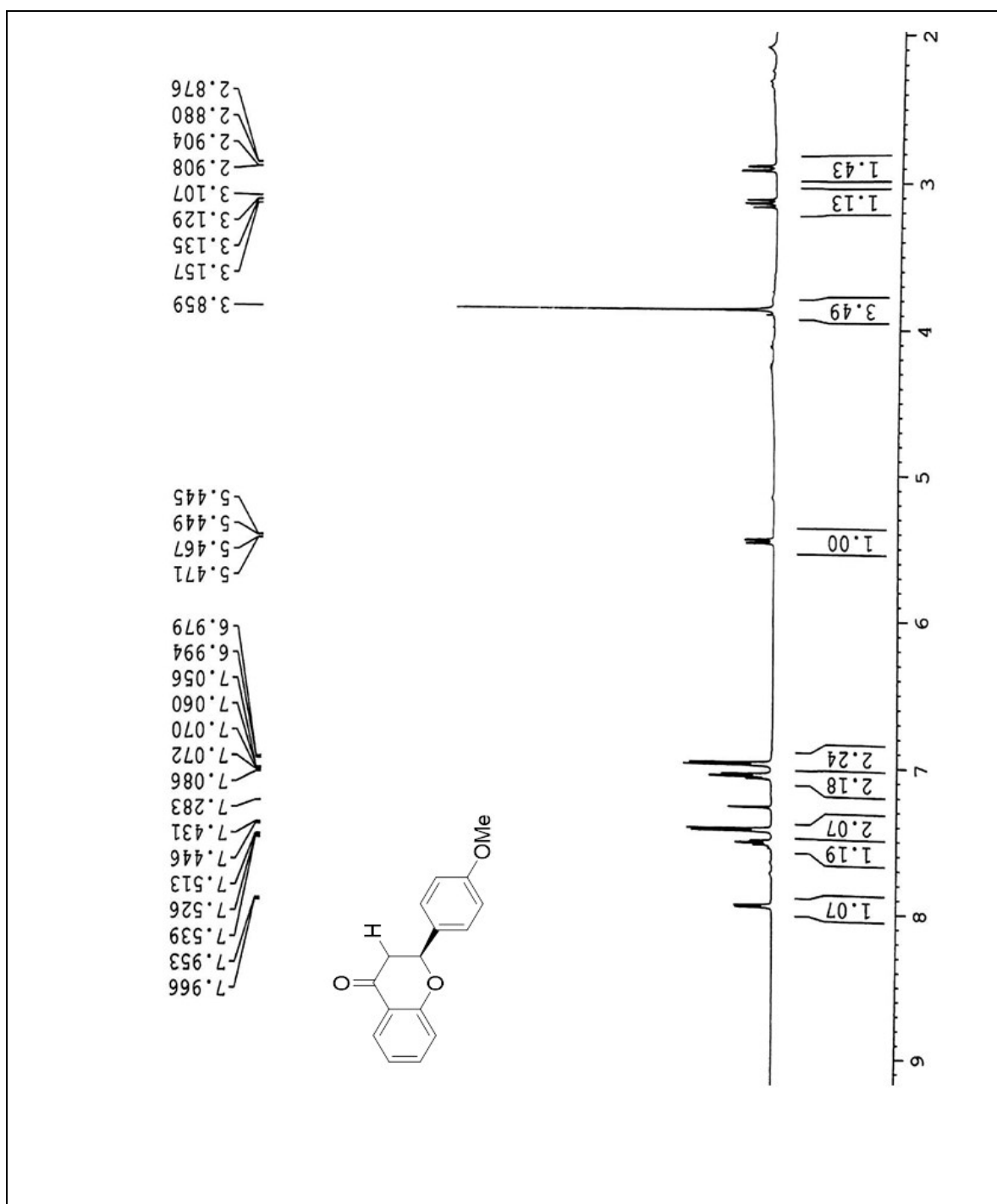


Fig. S8.  $^1\text{H}$  NMR of the 2-(4-bromophenyl) chroman-4-one



**Fig. S9.** <sup>1</sup>H NMR of the 2-(4-methoxyphenyl)chroman-4-one.



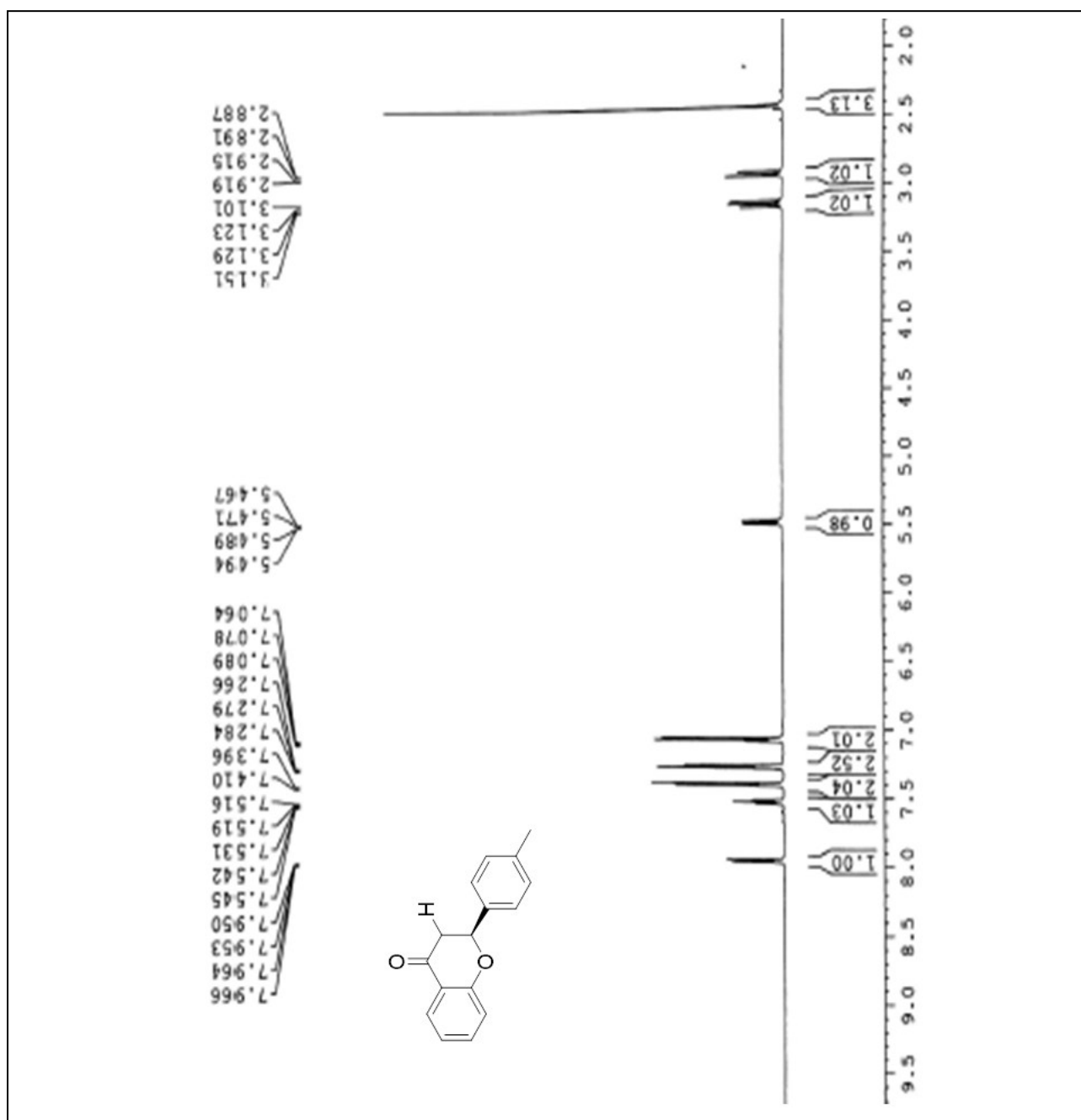
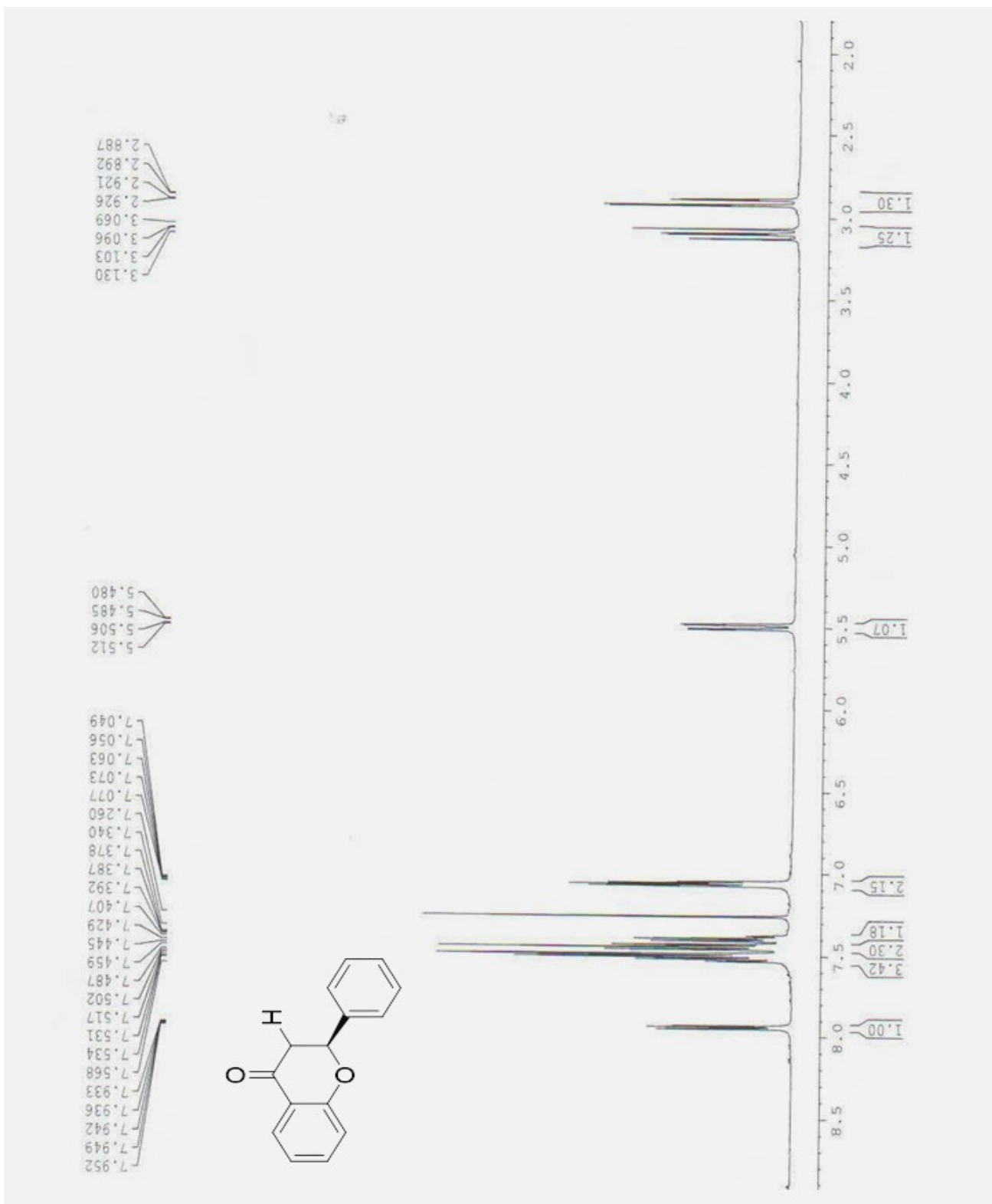
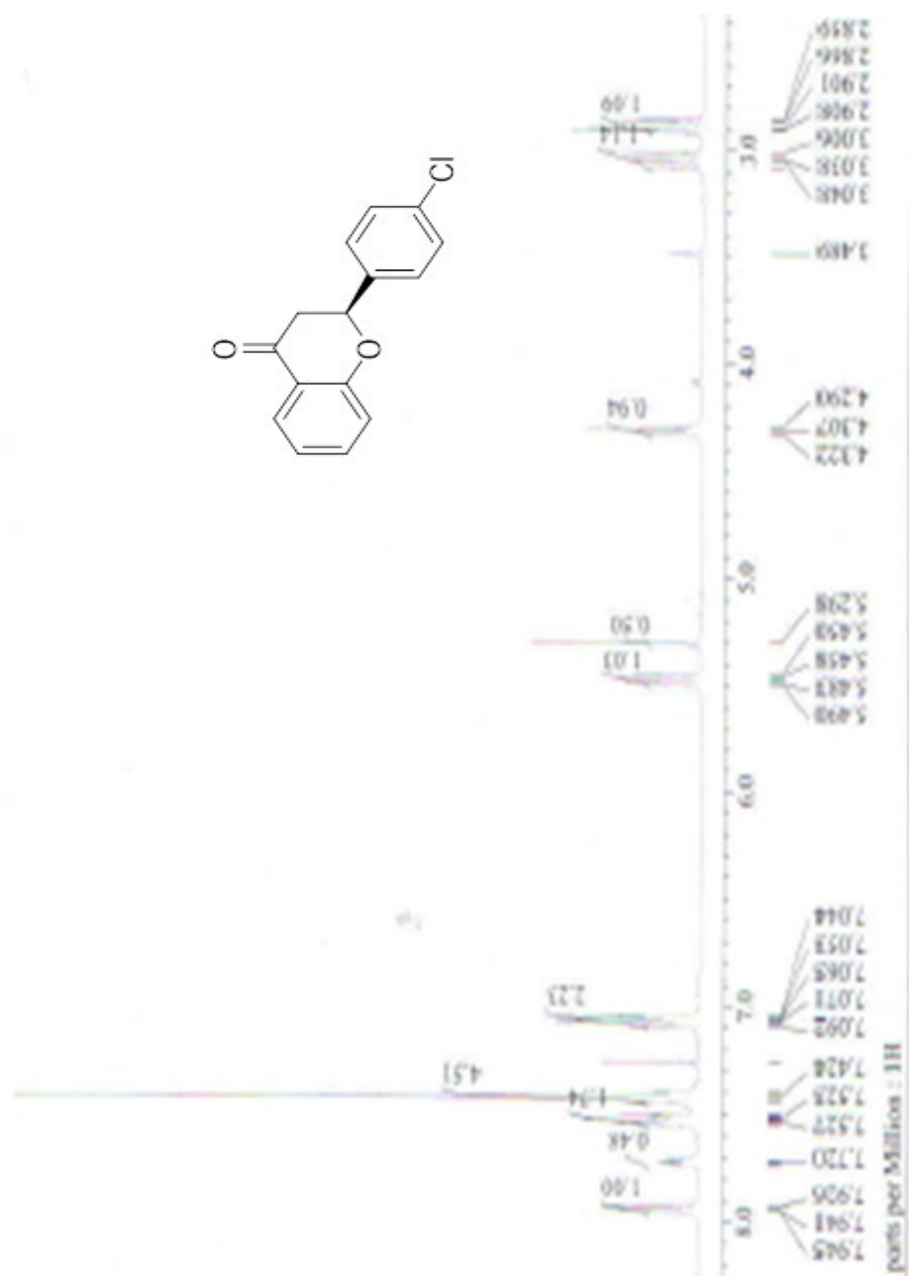


Fig. S10. <sup>1</sup>H NMR of the 2-(4-methylphenyl) chroman-4-one



**Fig. S11.** <sup>1</sup>H NMR of the 2-Phenylchroman-4-one (flavanone)



**Fig. S12.**  $^1\text{H}$  NMR of the 2-(4-chlorophenyl) chroman-4-one

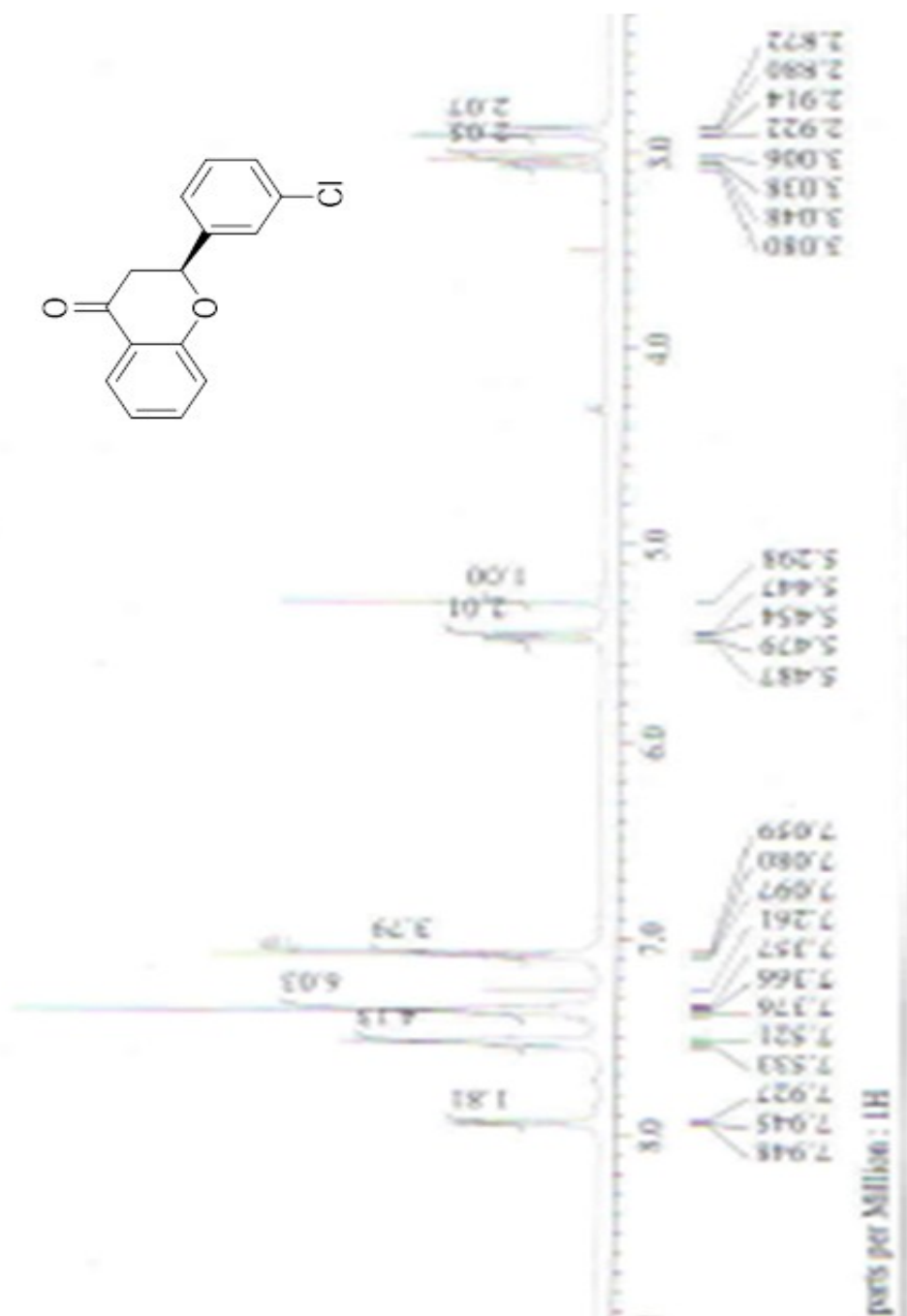
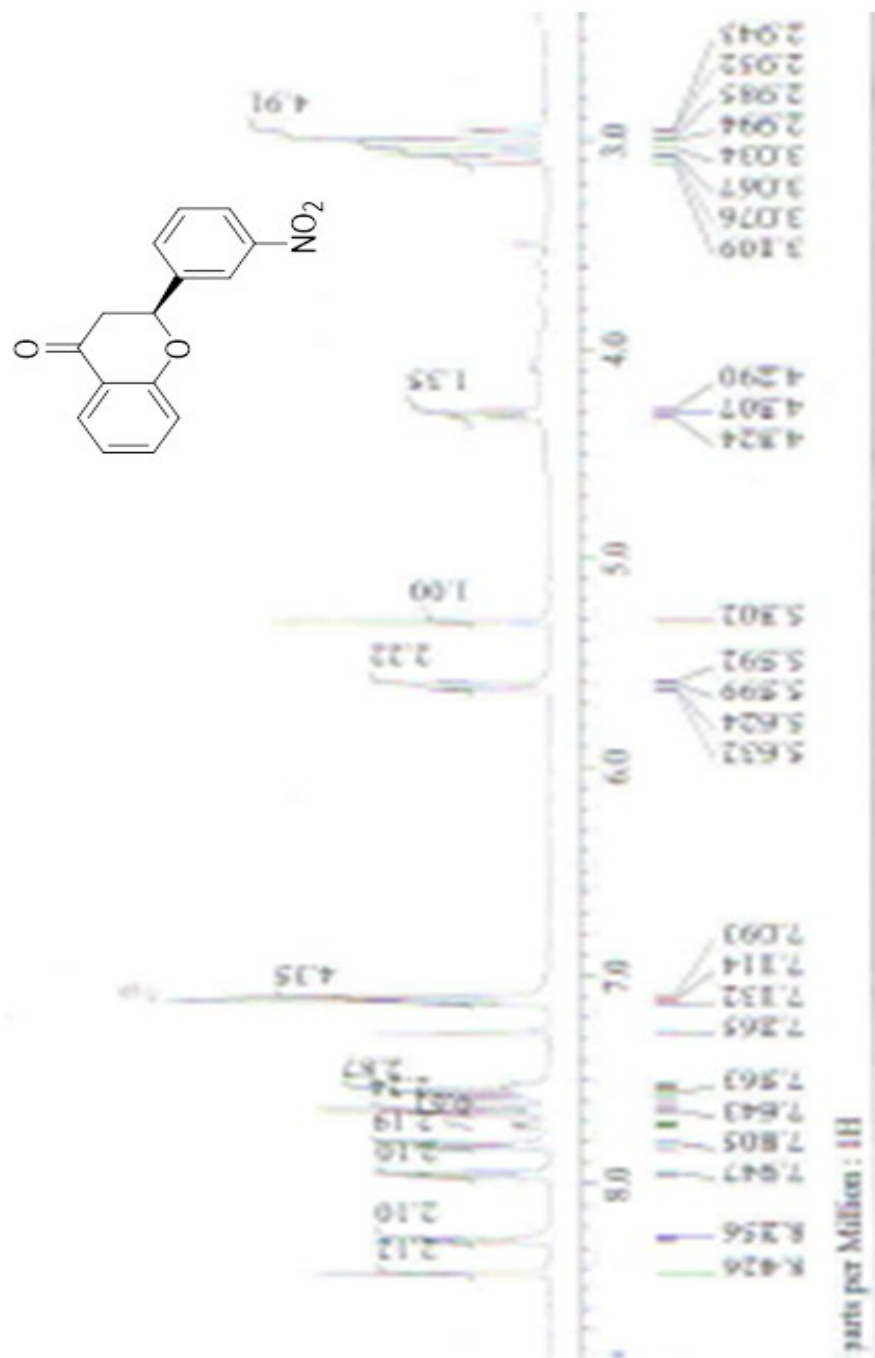
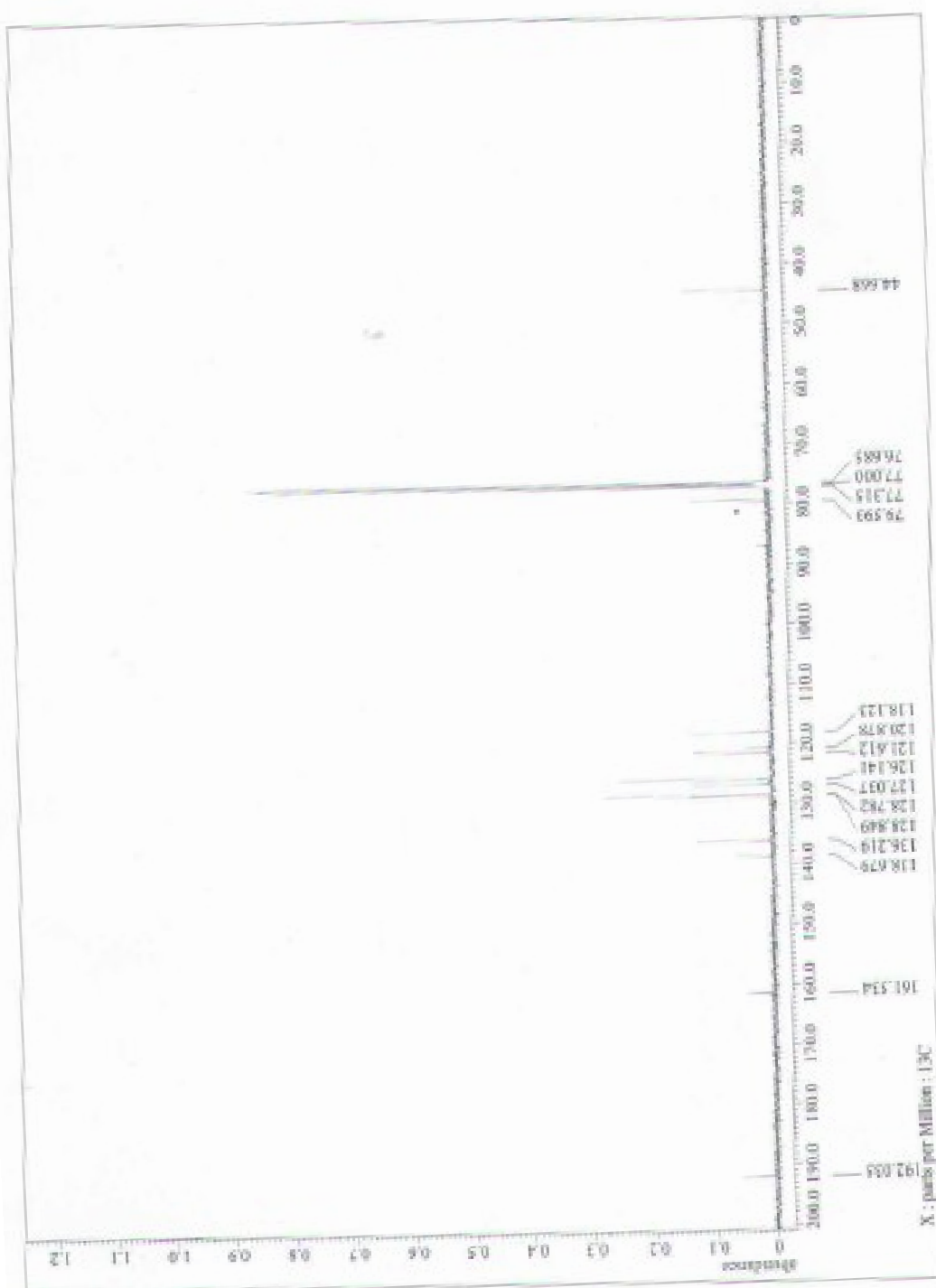


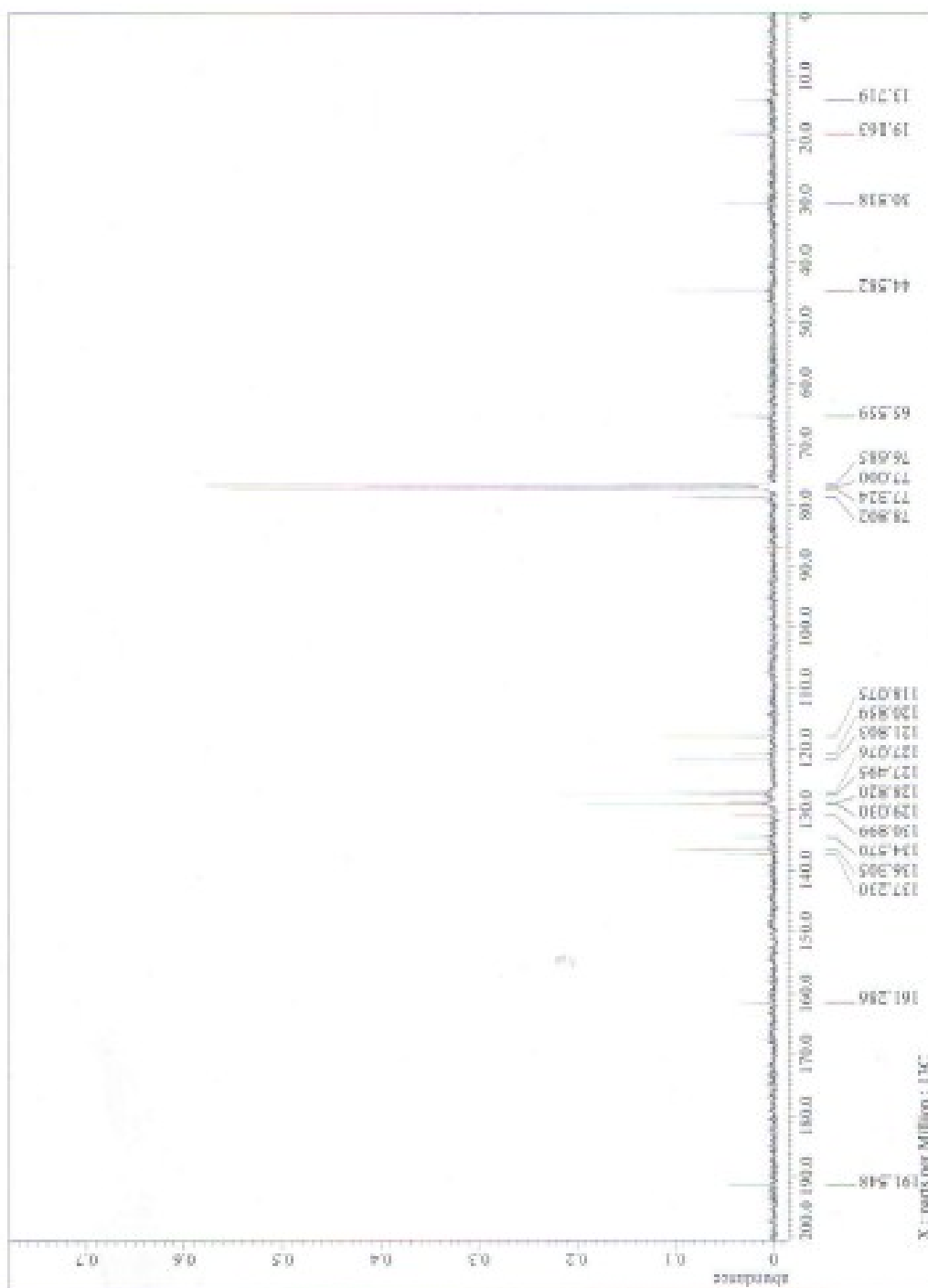
Fig. S13. <sup>1</sup>H NMR of the 2-(3-chlorophenyl) chroman-4-one



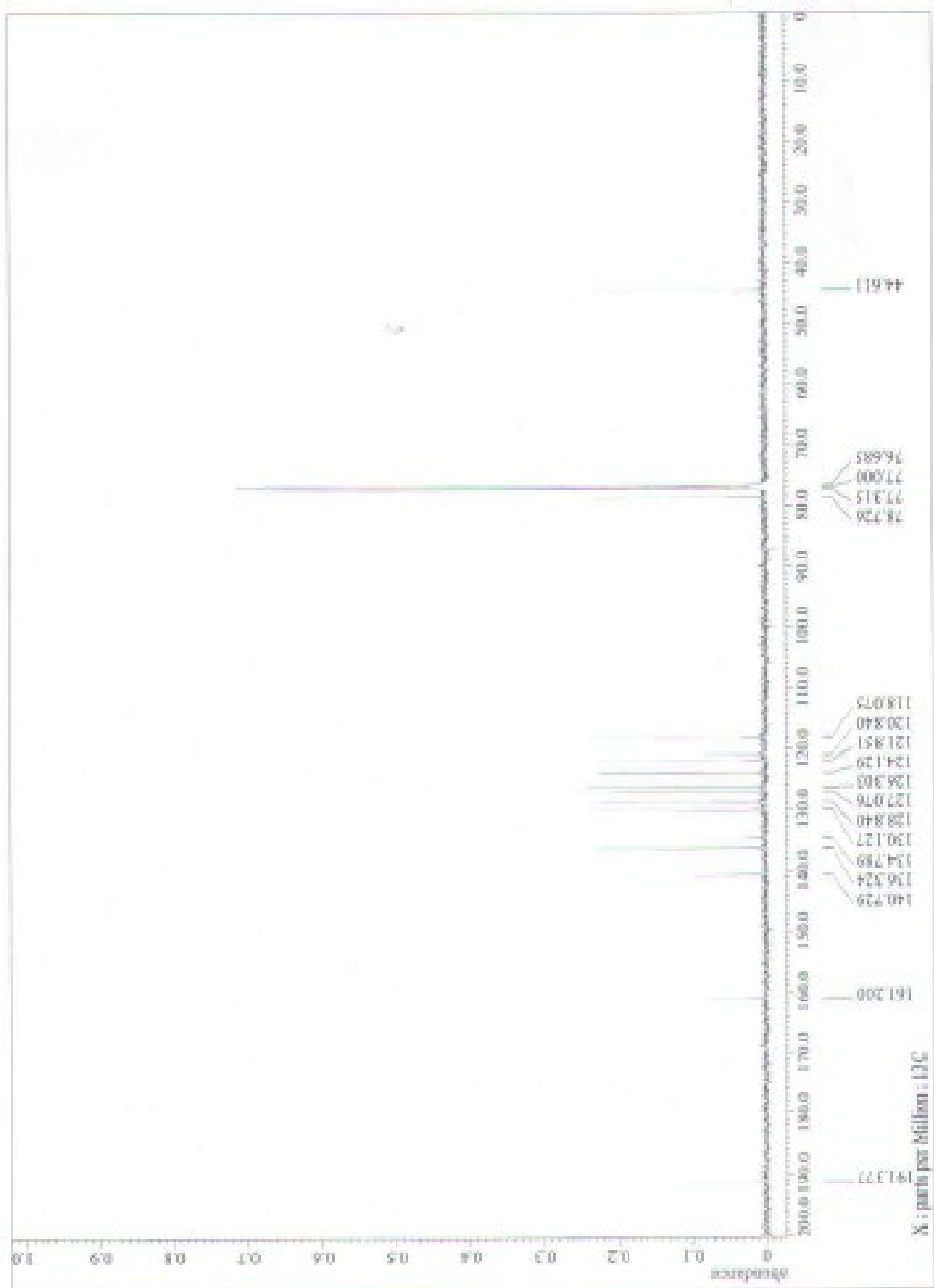
**Fig. S14.** <sup>1</sup>H NMR of the 2-(3-nitrophenyl) chroman-4-one



**Fig. S15.**  $^{13}\text{C}$  NMR of the 2-Phenylchroman-4-one (flavanone)

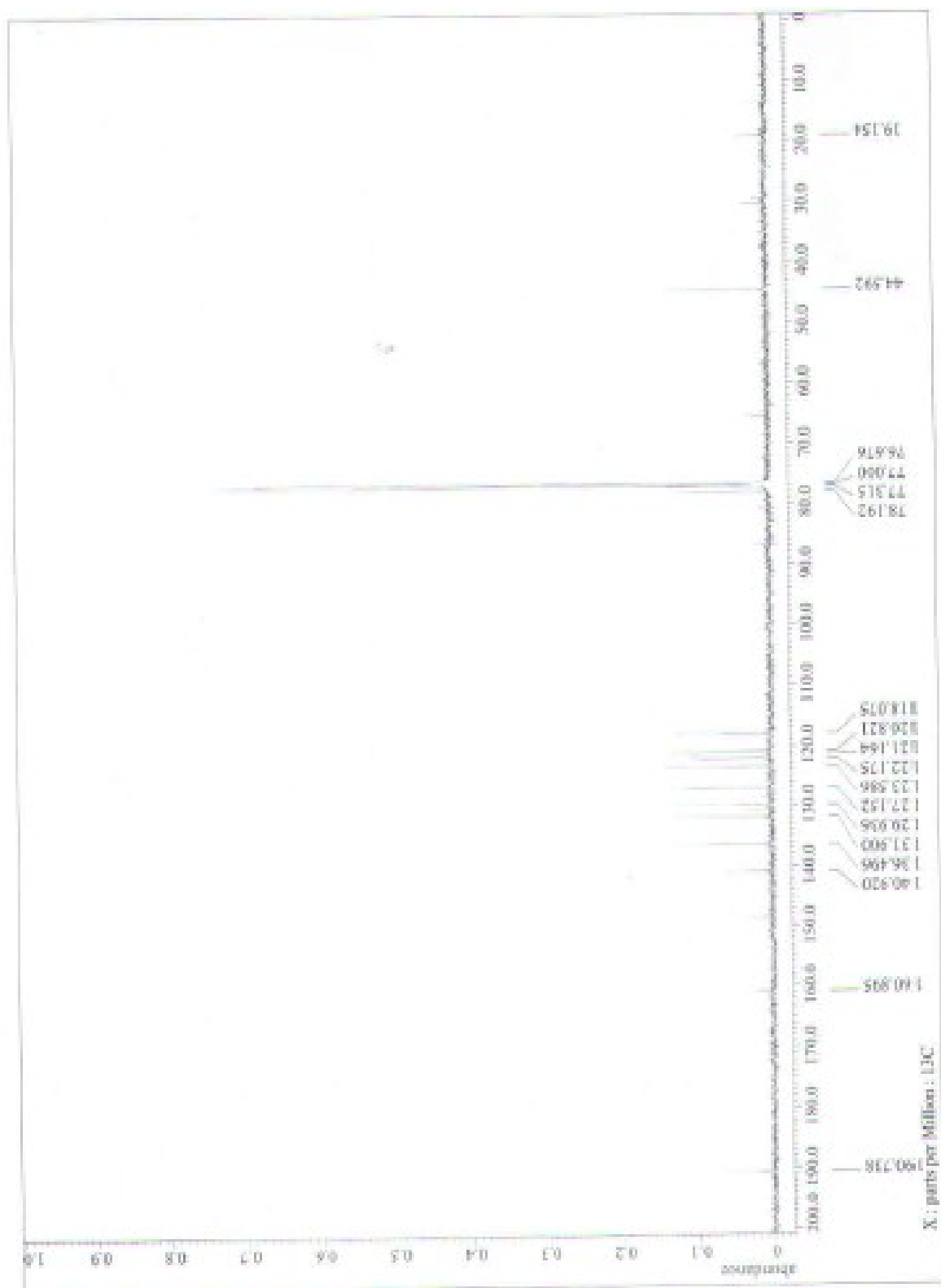


**Fig. S16.**  $^{13}\text{C}$  NMR of the 2-(4-chlorophenyl) chroman-4-one



**Fig. S17.** <sup>13</sup>C NMR of the 2-(3-chlorophenyl)chroman-4-one





**Fig. S18.**  $^{13}\text{C}$  NMR of the 2-(3-nitrophenyl) chroman-4-one

## 11. Chiral HPLC traces



# Analysis Report

### <Sample Information>

|                  |                         |              |                        |
|------------------|-------------------------|--------------|------------------------|
| Sample Name      | : Comp c ch9            | Sample Type  | : Unknown              |
| Sample ID        | : Comp c ch9            | Acquired by  | : System Administrator |
| Data Filename    | : Comp c ch 9.lcd       | Processed by | : System Administrator |
| Method Filename  | : Fav 2.lcm             |              |                        |
| Batch Filename   | :                       |              |                        |
| Vial #           | : 1-2                   |              |                        |
| Injection Volume | : 1 uL                  |              |                        |
| Date Acquired    | : 11/21/2016 4:02:11 PM |              |                        |
| Date Processed   | : 11/21/2016 4:23:01 PM |              |                        |

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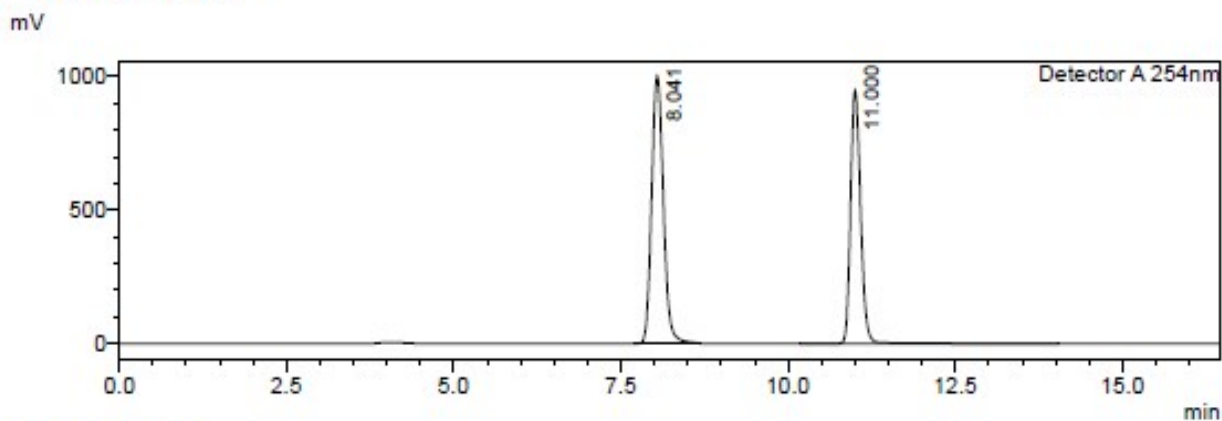


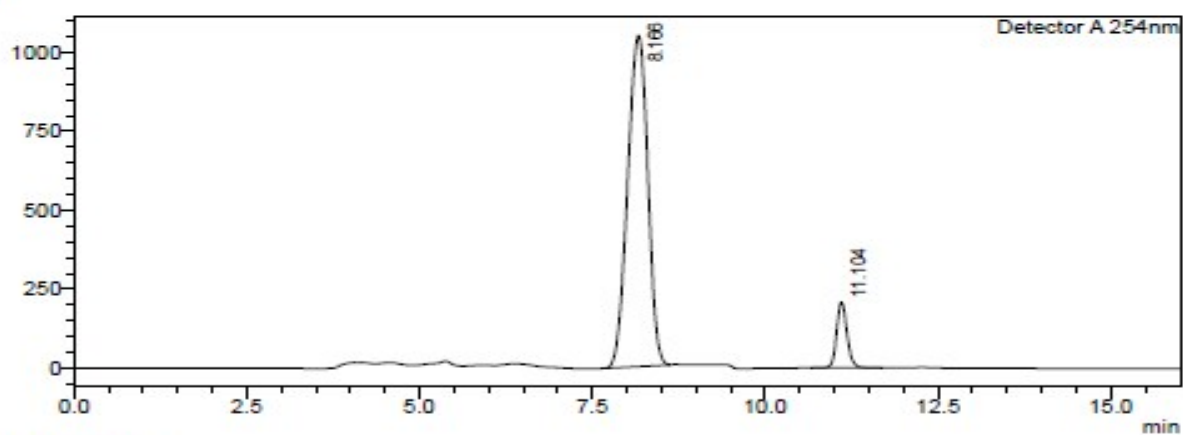
Fig. S19. HPLC of 2-Phenylchroman-4-one racemic

## <Sample Information>

|                  |                         |              |                        |
|------------------|-------------------------|--------------|------------------------|
| Sample Name      | : FLAB                  | Sample Type  | : Unknown              |
| Sample ID        | : FLAB                  | Acquired by  | : System Administrator |
| Data Filename    | : c72.lcd               | Processed by | : System Administrator |
| Method Filename  | : Fav 2.lcm             |              |                        |
| Batch Filename   | :                       |              |                        |
| Vial #           | : 1-2                   |              |                        |
| Injection Volume | : 1 uL                  |              |                        |
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| Date Processed   | : 4/25/2017 11:25:08 AM |              |                        |

## <Chromatogram>

mV



## <Peak Table>

Detector A 254nm

| Ret. Time | Area     | Height  | Area%   | Height% |
|-----------|----------|---------|---------|---------|
| 8.166     | 21265065 | 1048285 | 90.767  | 83.483  |
| 11.104    | 2163158  | 207403  | 9.233   | 16.517  |
|           | 23428223 | 1255687 | 100.000 | 100.000 |

Fig. S20. HPLC of 2-Phenylchroman-4-one using M/CNT/L1-(inside) (5 mol%)



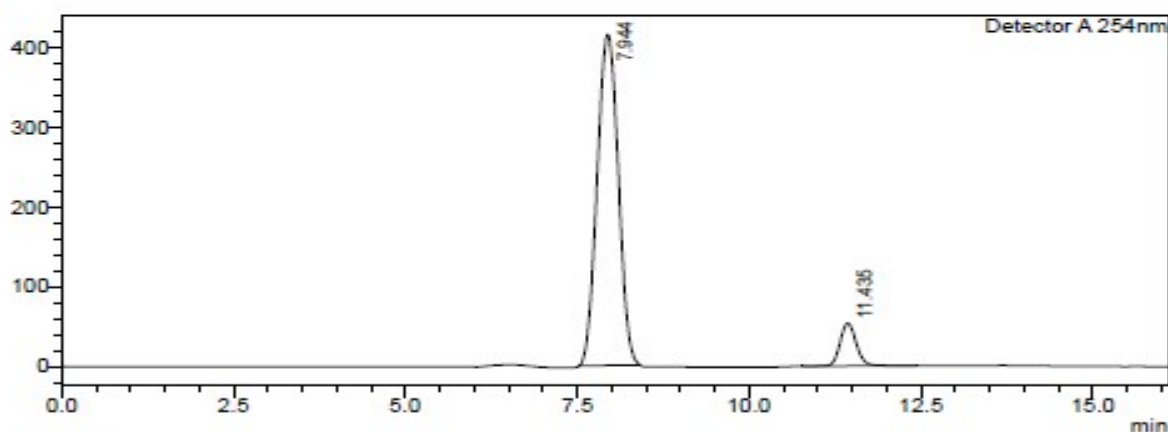
## <Sample Information>

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Sample ID : c115  
Data Filename : C119.lcd  
Method Filename : Fav 2.lcm  
Batch Filename :  
Vial # : 1-2  
Injection Volume : 1 uL  
Date Acquired : 4/26/2017 6:05:53 PM  
Date Processed : 4/26/2017 6:21:59 PM

Sample Type : Unknown  
Acquired by : System Administrator  
Processed by : System Administrator

## <Chromatogram>

mV



## <Peak Table>

Detector A 254nm

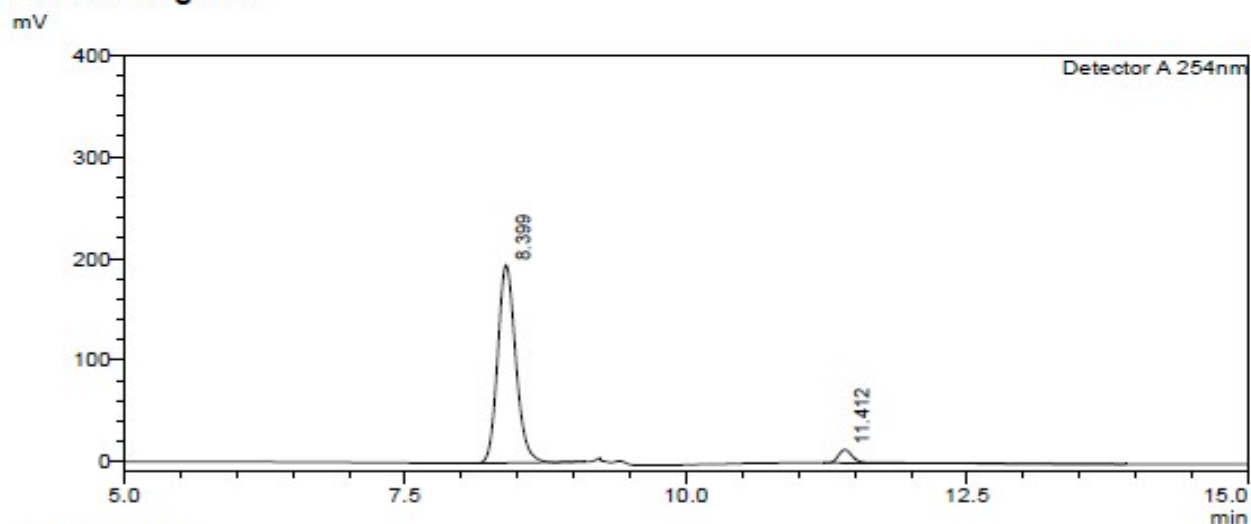
| Ret. Time | Area    | Height | Area%   | Height% |
|-----------|---------|--------|---------|---------|
| 7.944     | 8883309 | 415248 | 91.030  | 88.591  |
| 11.435    | 875388  | 53479  | 8.970   | 11.409  |
|           | 9758697 | 468727 | 100.000 | 100.000 |

Fig. S21. HPLC of 2-Phenylchroman-4-one using M/CNT/L1-inside (7.5 mol%)

## <Sample Information>

|                  |                          |              |                        |
|------------------|--------------------------|--------------|------------------------|
| Sample Name      | : Comp c ch1             | Sample Type  | : Unknown              |
| Sample ID        | : Comp c ch1             | Acquired by  | : System Administrator |
| Data Filename    | : Comp c ch1.lcd         | Processed by | : System Administrator |
| Method Filename  | : Fav 2.lcm              |              |                        |
| Batch Filename   | :                        |              |                        |
| Vial #           | : 1-1                    |              |                        |
| Injection Volume | : 0.4 uL                 |              |                        |
| Date Acquired    | : 11/21/2016 12:35:23 PM |              |                        |
| Date Processed   | : 11/21/2016 1:34:40 PM  |              |                        |

## <Chromatogram>



## <Peak Table>

Detector A 254nm

| Ret. Time | Area    | Height | Area%   | Height% |
|-----------|---------|--------|---------|---------|
| 8.399     | 2189666 | 194890 | 94.727  | 93.641  |
| 11.412    | 121900  | 13234  | 5.273   | 6.359   |
|           | 2311566 | 208124 | 100.000 | 100.000 |

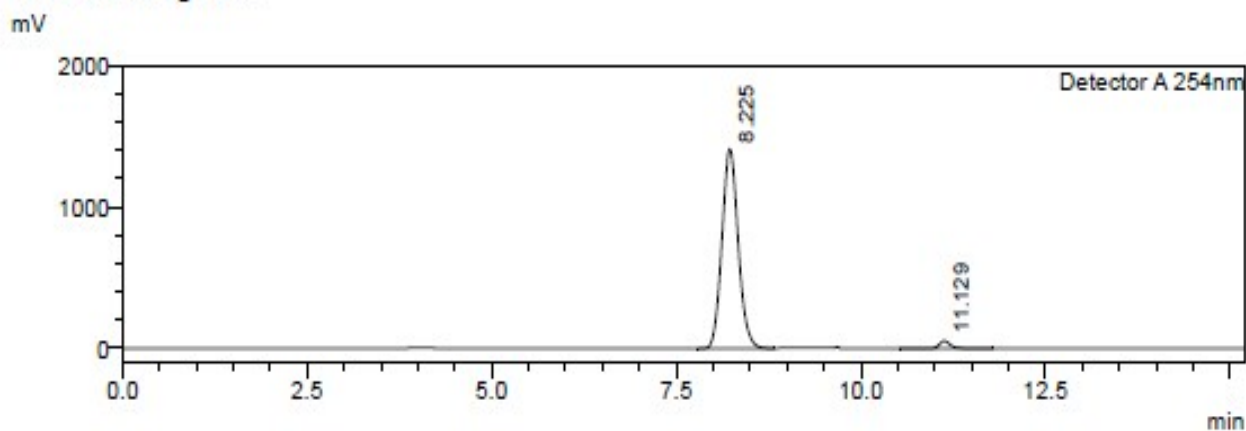
Fig. S22. HPLC of 2-Phenylchroman-4-one using M/CNT/L1-inside (10 mol%)

## <Sample Information>

Sample Name : Comp c ch8  
 Sample ID : Comp c ch8  
 Data Filename : Comp c ch 8.lcd  
 Method Filename : Fav 2.lcm  
 Batch Filename :  
 Vial # : 1-2  
 Injection Volume : 1 uL  
 Date Acquired : 11/21/2016 3:46:11 PM  
 Date Processed : 11/21/2016 4:07:09 PM

Sample Type : Unknown  
 Acquired by : System Administrator  
 Processed by : System Administrator

## <Chromatogram>



## <Peak Table>

Detector A 254nm

| Ret. Time | Area     | Height  | Area%   | Height% |
|-----------|----------|---------|---------|---------|
| 8.225     | 21841684 | 1412655 | 97.427  | 96.421  |
| 11.129    | 576730   | 52430   | 2.573   | 3.579   |
|           | 22418414 | 1465084 | 100.000 | 100.000 |

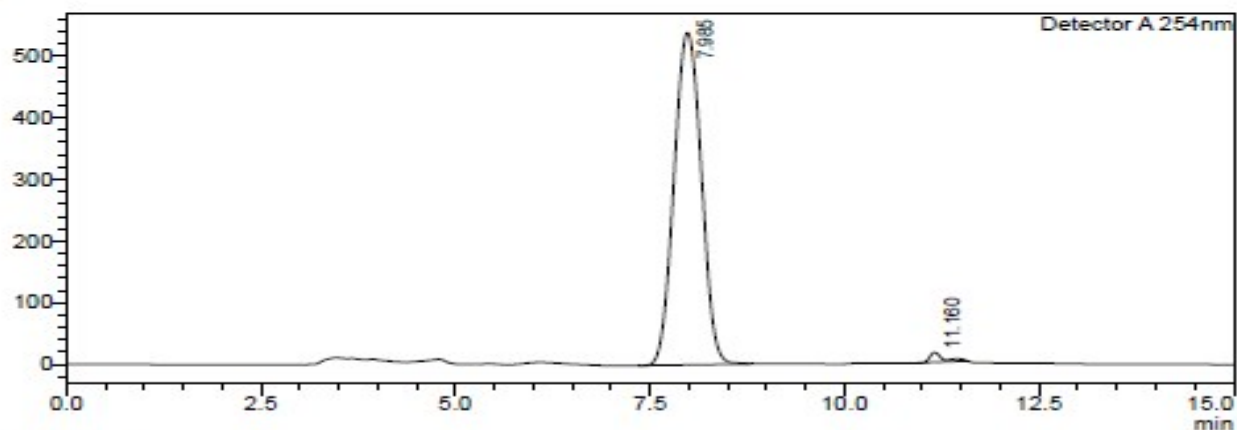
Fig. S23. HPLC of 2-Phenylchroman-4-one using M/CNT/L1-inside (12.5 mol%)

## <Sample Information>

|                  |                         |              |                        |
|------------------|-------------------------|--------------|------------------------|
| Sample Name      | : FLAB                  | Sample Type  | : Unknown              |
| Sample ID        | : FLAB                  | Acquired by  | : System Administrator |
| Data Filename    | : c74.lcd               | Processed by | : System Administrator |
| Method Filename  | : Fav 2.lcm             |              |                        |
| Batch Filename   | :                       |              |                        |
| Vial #           | : 1-2                   |              |                        |
| Injection Volume | : 1 uL                  |              |                        |
| Date Acquired    | : 4/25/2017 11:22:52 AM |              |                        |
| Date Processed   | : 4/25/2017 11:41:12 AM |              |                        |

## <Chromatogram>

mV



## <Peak Table>

Detector A 254nm

| Ret. Time | Area     | Height | Area%   | Height% |
|-----------|----------|--------|---------|---------|
| 7.985     | 13172646 | 538845 | 98.534  | 97.149  |
| 11.160    | 198040   | 15816  | 1.466   | 2.851   |
|           | 13368686 | 554661 | 100.000 | 100.000 |

Fig. S24. HPLC of 2-Phenylchroman-4-one using M/CNT/L1-inside (15 mol%)



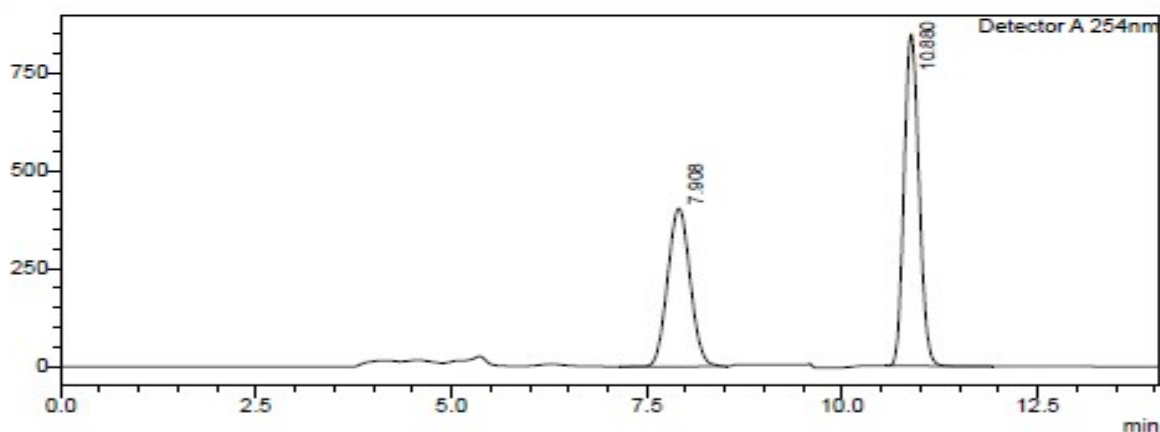
## <Sample Information>

Sample Name : Ferrite @ 5 mol% CPA  
Sample ID : Ferrite @ 5 mol% CPA  
Data Filename : Ferrite @ 5 mol% CPA  
Method Filename : Fav 2.lcm  
Batch Filename :  
Vial # : 1-2  
Injection Volume : 1 uL  
Date Acquired : 4/26/2017 1:22:12 PM  
Date Processed : 4/26/2017 1:38:15 PM

Sample Type : Unknown  
Acquired by : System Administrator  
Processed by : System Administrator

## <Chromatogram>

mV



## <Peak Table>

Detector A 254nm

| Ret. Time | Area     | Height  | Area%   | Height% |
|-----------|----------|---------|---------|---------|
| 7.908     | 8108732  | 404281  | 41.819  | 32.315  |
| 10.880    | 11278596 | 846767  | 58.181  | 67.685  |
|           | 19385328 | 1251048 | 100.000 | 100.000 |

Fig. S25. HPLC of 2-Phenylchroman-4-one using MNP/L1(5 mol%) (in the absence of CNT)



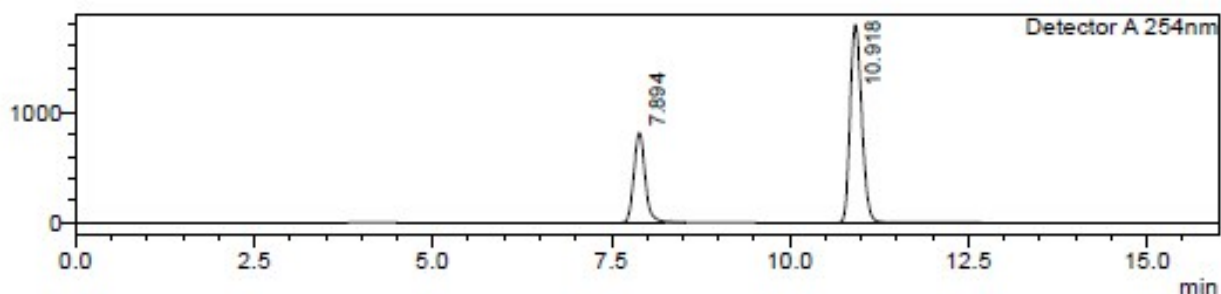
## <Sample Information>

Sample Name : Comp c ch12  
 Sample ID : Comp c ch12  
 Data Filename : Comp c ch 12.lcd  
 Method Filename : Fav 2.lcm  
 Batch Filename :  
 Vial # : 1-2  
 Injection Volume : 1 uL  
 Date Acquired : 11/21/2016 4:47:34 PM  
 Date Processed : 2/2/2017 4:43:54 PM

Sample Type : Unknown  
 Acquired by : System Administrator  
 Processed by : System Administrator

## <Chromatogram>

mV



Detector A 254nm

| Ret. Time | Area     | Height  | Area%   | Height% |
|-----------|----------|---------|---------|---------|
| 7.894     | 9005468  | 812137  | 30.619  | 31.240  |
| 10.918    | 20406272 | 1787538 | 69.381  | 68.760  |
|           | 29411740 | 2599675 | 100.000 | 100.000 |

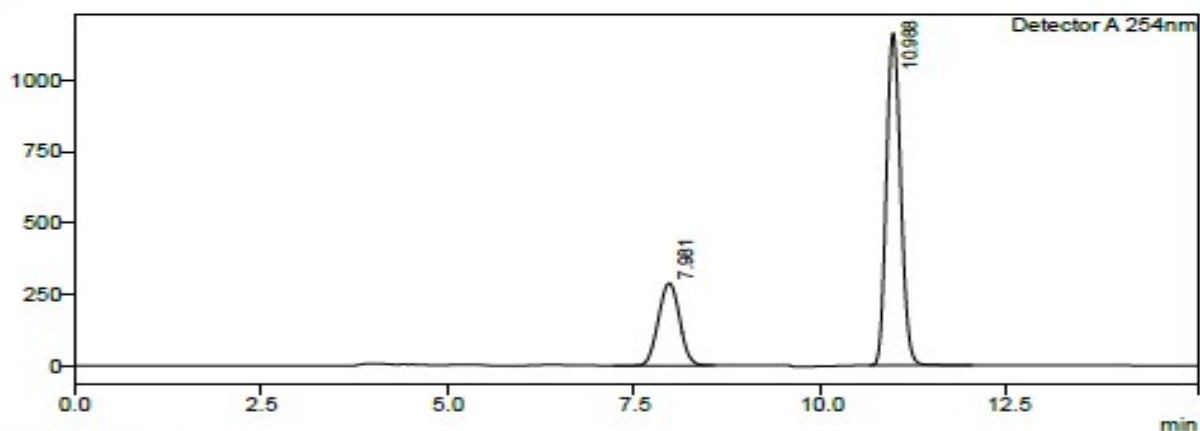
**Fig. S26.** HPLC of 2-Phenylchroman-4-one using MNP/L1 (7.5 mol%) (in the absence of CNTs)

## <Sample Information>

Sample Name : Ferrite@ 10 mole% CPA  
 Sample ID : Ferrite@ 10 mole% CPA  
 Data Filename : Ferrite@ 10 mole% CPA  
 Method Filename : Fav 2.lcm  
 Batch Filename :  
 Vial # : 1-2  
 Injection Volume : 1 uL  
 Date Acquired : 4/26/2017 11:34:27 AM  
 Date Processed : 4/26/2017 11:49:31 AM  
 Sample Type : Unknown  
 Acquired by : System Administrator  
 Processed by : System Administrator

## <Chromatogram>

mV



## <Peak Table>

Detector A 254nm

| Ret. Time | Area     | Height  | Area%   | Height% |
|-----------|----------|---------|---------|---------|
| 7.981     | 5757571  | 288539  | 26.988  | 19.879  |
| 10.988    | 15577751 | 1162922 | 73.014  | 80.121  |
|           | 21335321 | 1451461 | 100.000 | 100.000 |

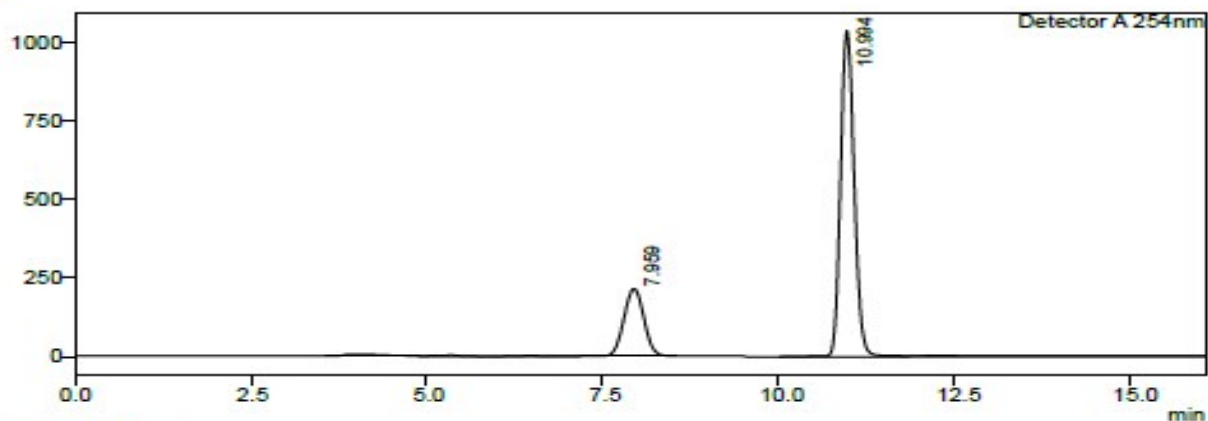
Fig. S27. HPLC of 2-Phenylchroman-4-one using MNP/L1 (10 mol%) (in the absence of CNTs)

Method Filename : Fav 2.lcm  
Batch Filename :  
Vial # : 1-2  
Injection Volume : 1 uL  
Date Acquired : 4/28/2017 10:50:15 AM  
Date Processed : 4/28/2017 11:06:21 AM

Sample Type : Unknown  
Acquired by : System Administrator  
Processed by : System Administrator

<Chromatogram>

mV



<Peak Table>

Detector A 254nm

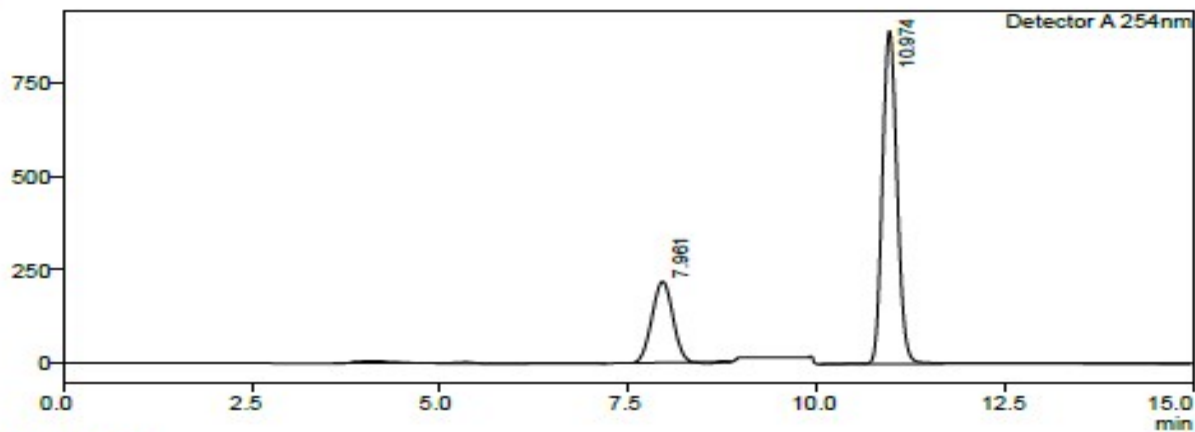
| Ret. Time | Area     | Height  | Area%   | Height% |
|-----------|----------|---------|---------|---------|
| 7.959     | 4257120  | 214437  | 22.668  | 17.126  |
| 10.994    | 14524777 | 1037642 | 77.334  | 82.874  |
|           | 18781897 | 1252079 | 100.000 | 100.000 |

Fig. S28. HPLC of 2-Phenylchroman-4-one using MNP/L1 (12.5 mol%) (in the absence of CNT)

Batch Filename :  
 Vial # : 1-2  
 Injection Volume : 1 uL  
 Date Acquired : 4/26/2017 10:28:19 AM  
 Date Processed : 4/26/2017 10:43:20 AM  
 Sample Type : Unknown  
 Acquired by : System Administrator  
 Processed by : System Administrator

<Chromatogram>

mV



<Peak Table>

Detector A 254nm

| Ret. Time | Area     | Height  | Area%   | Height% |
|-----------|----------|---------|---------|---------|
| 7.961     | 4194691  | 218301  | 19.615  | 25.424  |
| 10.974    | 12305695 | 894612  | 80.385  | 74.576  |
|           | 16500386 | 1112913 | 100.000 | 100.000 |

Fig. S29. HPLC of 2-Phenylchroman-4-one using MNP/L1 (15 mol%) (in absence of CNTs)



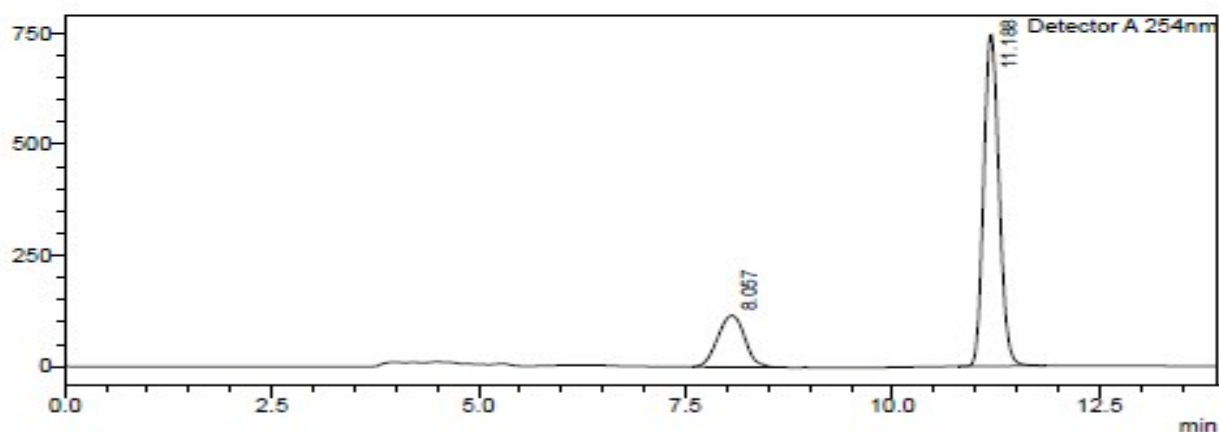
## <Sample Information>

Sample Name : 5 mole % CPA OUT side CNT  
Sample ID : 5 mole % CPA OUT side CNT  
Data Filename : 5 mole % CPA OUT side CNT  
Method Filename : Fav 2.lcm  
Batch Filename :  
Vial # : 1-2  
Injection Volume : 1 uL  
Date Acquired : 4/21/2017 12:38:56 PM  
Date Processed : 4/21/2017 12:56:23 PM

Sample Type : Unknown  
Acquired by : System Administrator  
Processed by : System Administrator

## <Chromatogram>

mV



## <Peak Table>

Detector A 254nm

| Ret. Time | Area     | Height | Area%   | Height% |
|-----------|----------|--------|---------|---------|
| 8.057     | 2643456  | 116207 | 21.500  | 13.474  |
| 11.188    | 9651564  | 746227 | 78.500  | 86.526  |
|           | 12295020 | 862434 | 100.000 | 100.000 |

Fig. S30. HPLC of 2-Phenylchroman-4-one using M/CNT/L1-outside (5 mol%)

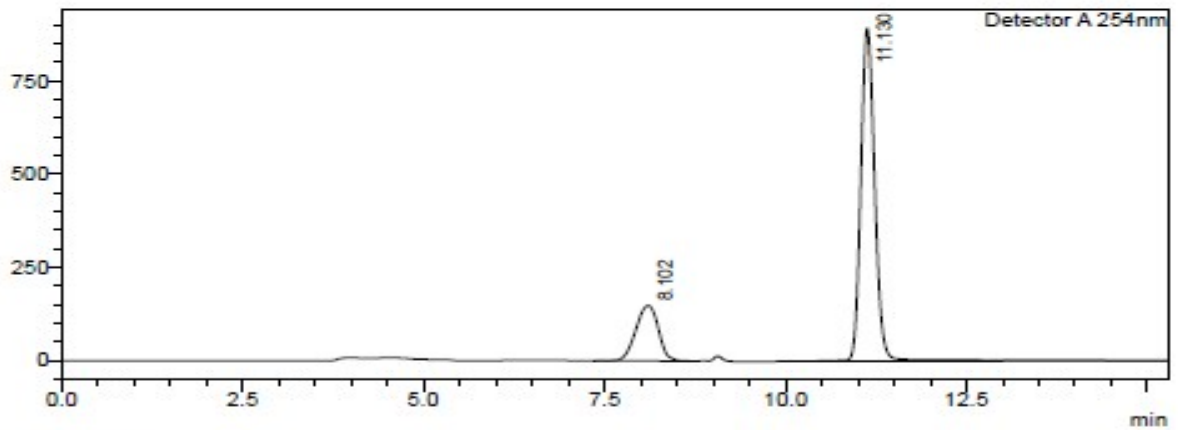


## <Sample Information>

Sample Name : 7.5 mole % CPA OUT side CNT  
Sample ID : 7.5 mole % CPA OUT side CNT  
Data Filename : 7.5 mole % CPA OUT side CNT  
Method Filename : Fav 2.lcm  
Batch Filename :  
Vial # : 1-2  
Injection Volume : 1 uL  
Date Acquired : 4/21/2017 1:26:33 PM  
Date Processed : 4/21/2017 1:43:36 PM  
Sample Type : Unknown  
Acquired by : System Administrator  
Processed by : System Administrator

## <Chromatogram>

mV



## <Peak Table>

Detector A 254nm

| Ret. Time | Area     | Height  | Area%   | Height% |
|-----------|----------|---------|---------|---------|
| 8.102     | 3220315  | 148704  | 20.684  | 14.275  |
| 11.130    | 12348756 | 892991  | 79.316  | 85.725  |
|           | 15569071 | 1041695 | 100.000 | 100.000 |

Fig. S31. HPLC of 2-Phenylchroman-4-one Using M/CNT/L1-outside (7.5 mol%)



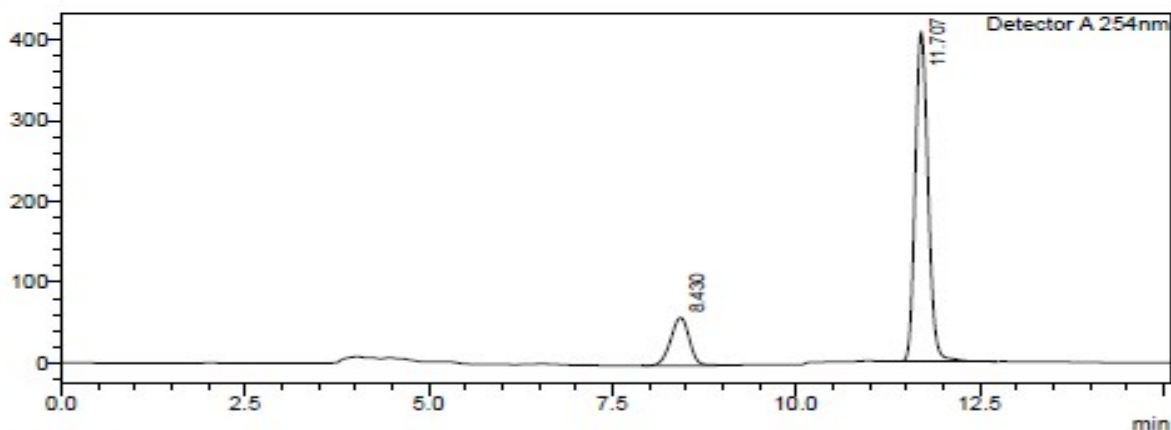
### <Sample Information>

Sample Name : 10 mole % CPA OUT side CNT  
Sample ID : 10 mole % CPA OUT side CNT  
Data Filename : 10 mole % CPA OUT side CNT  
Method Filename : Fav 2.lcm  
Batch Filename :  
Vial # : 1-2  
Injection Volume : 1 uL  
Date Acquired : 4/21/2017 1:45:01 PM  
Date Processed : 4/21/2017 2:04:09 PM

Sample Type : Unknown  
Acquired by : System Administrator  
Processed by : System Administrator

### <Chromatogram>

mV



### <Peak Table>

Detector A 254nm

| Ret. Time | Area    | Height | Area%   | Height% |
|-----------|---------|--------|---------|---------|
| 8.430     | 1046691 | 59216  | 17.428  | 12.709  |
| 11.707    | 4959094 | 406705 | 82.572  | 87.291  |
|           | 6005785 | 465920 | 100.000 | 100.000 |

Fig. S32. HPLC of 2-Phenylchroman-4-one using M/CNT/L1-outside (10 mol%)

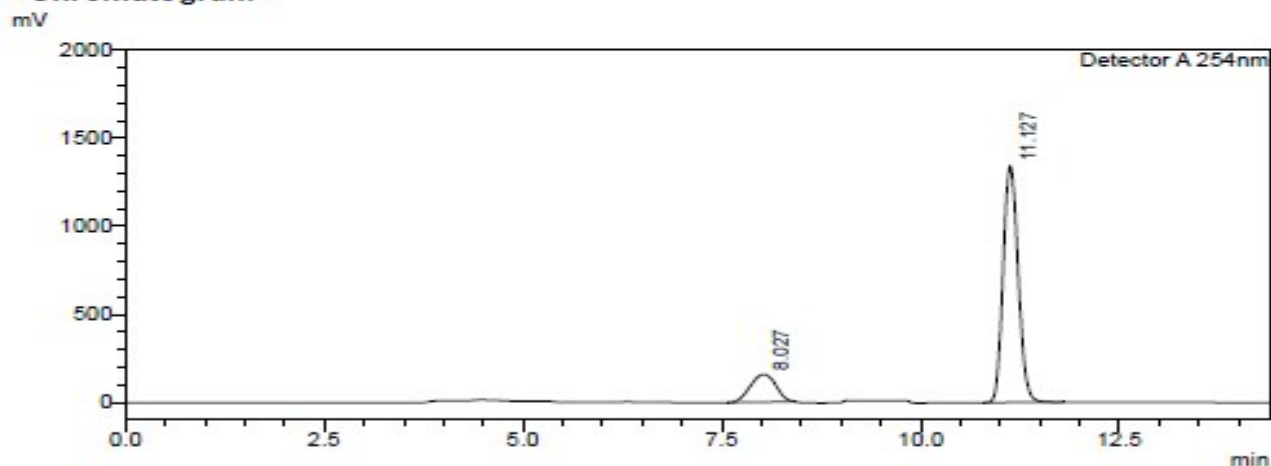


### <Sample Information>

Sample Name : 12.5 mole % CPA OUT side CNT  
Sample ID : 12.5 mole % CPA OUT side CNT  
Data Filename : 12.5 mole % CPA OUT side CNT  
Method Filename : Fav 2.lcm  
Batch Filename :  
Vial # : 1-2  
Injection Volume : 1 uL  
Date Acquired : 4/21/2017 12:06:29 PM  
Date Processed : 4/21/2017 12:27:41 PM

Sample Type : Unknown  
Acquired by : System Administrator  
Processed by : System Administrator

### <Chromatogram>



### <Peak Table>

Detector A 254nm

| Ret. Time | Area     | Height  | Area%   | Height% |
|-----------|----------|---------|---------|---------|
| 8.027     | 3511385  | 156914  | 16.566  | 10.477  |
| 11.127    | 17685290 | 1340791 | 83.434  | 89.523  |
|           | 21196674 | 1497705 | 100.000 | 100.000 |

Fig. S33. HPLC of 2-Phenylchroman-4-one Using M/CNT/L1-outside (12.5 mol%)





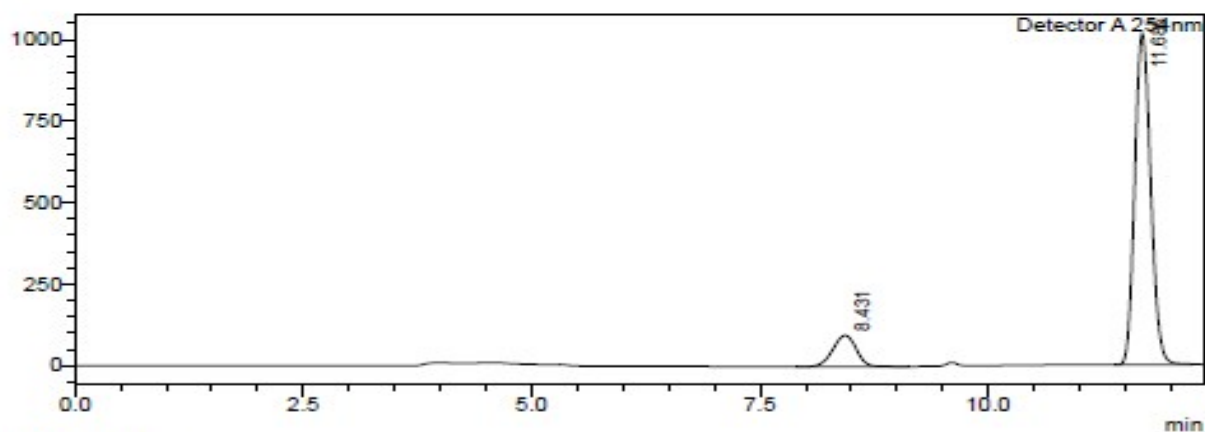
## <Sample Information>

Sample Name : 15 mole % CPA OUT side CNT  
Sample ID : 15 mole % CPA OUT side CNT  
Data Filename : 15 mole % CPA OUT side CNT  
Method Filename : Fav 2.lcm  
Batch Filename :  
Vial # : 1-2  
Injection Volume : 1 uL  
Date Acquired : 4/21/2017 12:56:12 PM  
Date Processed : 4/21/2017 1:31:24 PM

Sample Type : Unknown  
Acquired by : System Administrator  
Processed by : System Administrator

## <Chromatogram>

mV



## <Peak Table>

Detector A 254nm

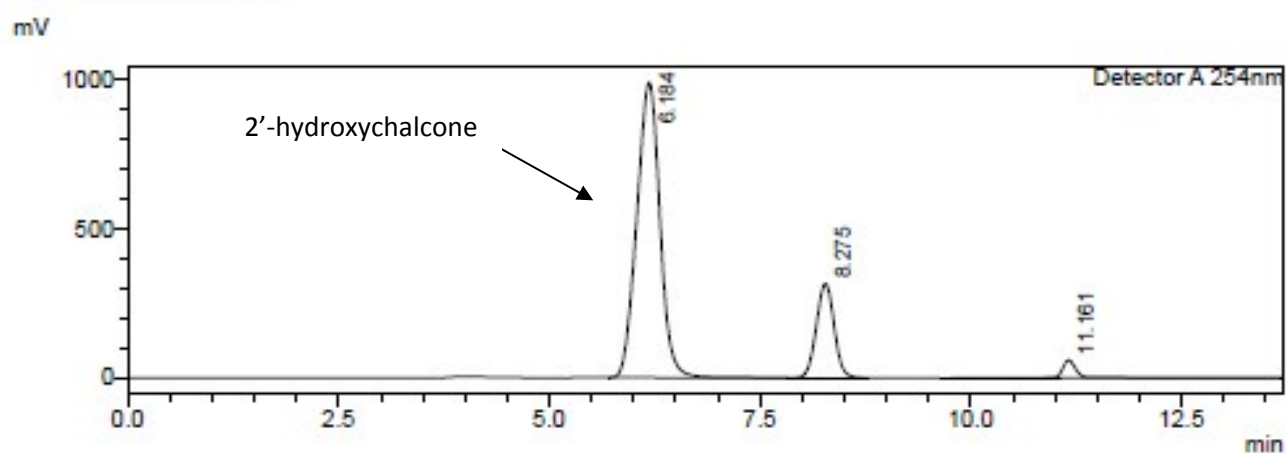
| Ret. Time | Area     | Height  | Area%   | Height% |
|-----------|----------|---------|---------|---------|
| 8.431     | 1714061  | 95943   | 12.166  | 8.623   |
| 11.685    | 12374835 | 1016661 | 87.834  | 91.377  |
|           | 14088896 | 1112604 | 100.000 | 100.000 |

Fig. S34. HPLC of 2-Phenylchroman-4-one Using M/CNT/L1-outside (15 mol%)

## <Sample Information>

|                  |                       |              |                        |
|------------------|-----------------------|--------------|------------------------|
| Sample Name      | : c18                 | Sample Type  | : Unknown              |
| Sample ID        | : c18                 | Acquired by  | : System Administrator |
| Data Filename    | : c20.lcd             | Processed by | : System Administrator |
| Method Filename  | : Fav 2.lcm           |              |                        |
| Batch Filename   | :                     |              |                        |
| Vial #           | : 1-2                 |              |                        |
| Injection Volume | : 1 uL                |              |                        |
| Date Acquired    | : 2/2/2017 5:53:33 PM |              |                        |
| Date Processed   | : 2/2/2017 6:25:28 PM |              |                        |

## <Chromatogram>



## <Peak Table>

Detector A 254nm

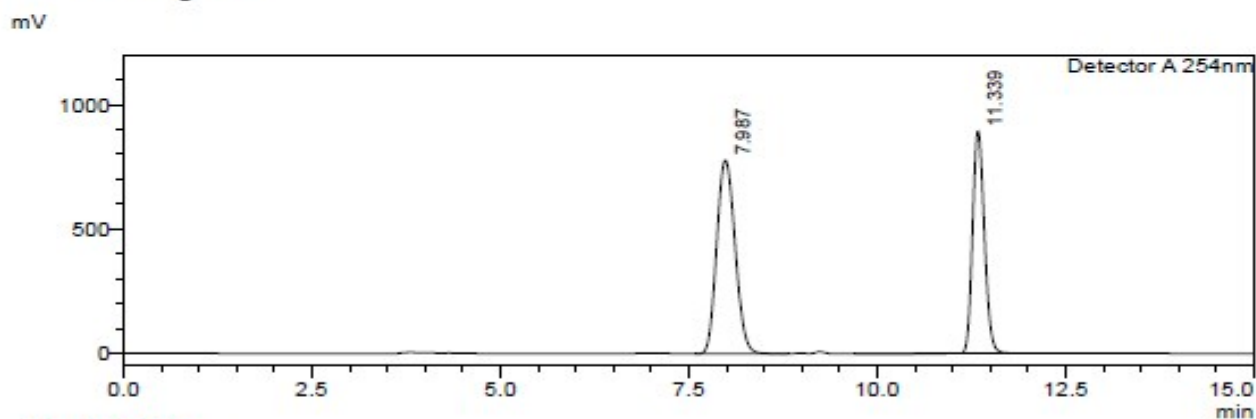
| Ret. Time | Area     | Height  | Area%   | Height% |
|-----------|----------|---------|---------|---------|
| 6.184     | 18840747 | 989507  | 77.450  | 72.472  |
| 8.275     | 4652580  | 315814  | 19.126  | 23.130  |
| 11.161    | 832906   | 60050   | 3.424   | 4.398   |
|           | 24328233 | 1365371 | 100.000 | 100.000 |

Fig. S35. HPLC of 2-Phenylchroman-4-one using M/CNT/L1 with reactant.

## <Sample Information>

|                  |                          |              |                        |
|------------------|--------------------------|--------------|------------------------|
| Sample Name      | : Com b2                 | Sample Type  | : Unknown              |
| Sample ID        | : Com b2                 | Acquired by  | : System Administrator |
| Data Filename    | : Com b2.lcd             | Processed by | : System Administrator |
| Method Filename  | : Fav.lcm                |              |                        |
| Batch Filename   | :                        |              |                        |
| Vial #           | : 1-1                    |              |                        |
| Injection Volume | : 4 uL                   |              |                        |
| Date Acquired    | : 11/17/2016 11:20:45 AM |              |                        |
| Date Processed   | : 11/17/2016 12:30:56 PM |              |                        |

## <Chromatogram>



## <Peak Table>

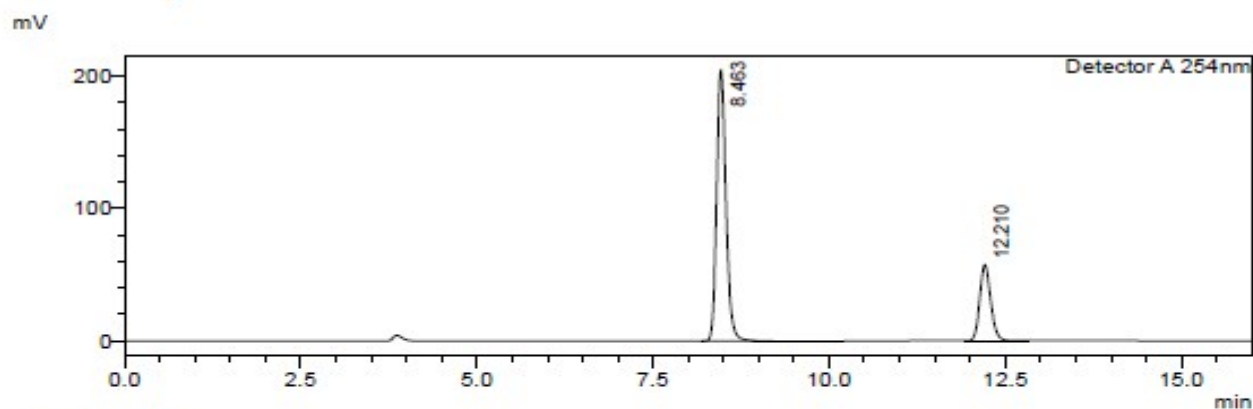
| Detector A 254nm |          |         |         |         |
|------------------|----------|---------|---------|---------|
| Ret. Time        | Area     | Height  | Area%   | Height% |
| 7.987            | 13255884 | 778362  | 57.297  | 46.515  |
| 11.339           | 9879637  | 894982  | 42.703  | 53.485  |
|                  | 23135521 | 1673344 | 100.000 | 100.000 |

Fig. S36. HPLC of 2-(4-Bromophenyl) chroman-4-one racemic

## <Sample Information>

Sample Name : Comp b ch4  
 Sample ID : Comp b ch4  
 Data Filename : Comp b ch4.lcd  
 Method Filename : Fav 2.lcm  
 Batch Filename :  
 Vial # : 1-2  
 Injection Volume : 1 uL  
 Date Acquired : 11/21/2016 5:53:40 PM  
 Date Processed : 11/21/2016 6:11:33 PM  
 Sample Type : Unknown  
 Acquired by : System Administrator  
 Processed by : System Administrator

## <Chromatogram>



## <Peak Table>

| Detector A 254nm |         |        |         |         |
|------------------|---------|--------|---------|---------|
| Ret. Time        | Area    | Height | Area%   | Height% |
| 8.463            | 1891228 | 204417 | 75.290  | 78.104  |
| 12.210           | 620691  | 57307  | 24.710  | 21.896  |
|                  | 2511919 | 261724 | 100.000 | 100.000 |

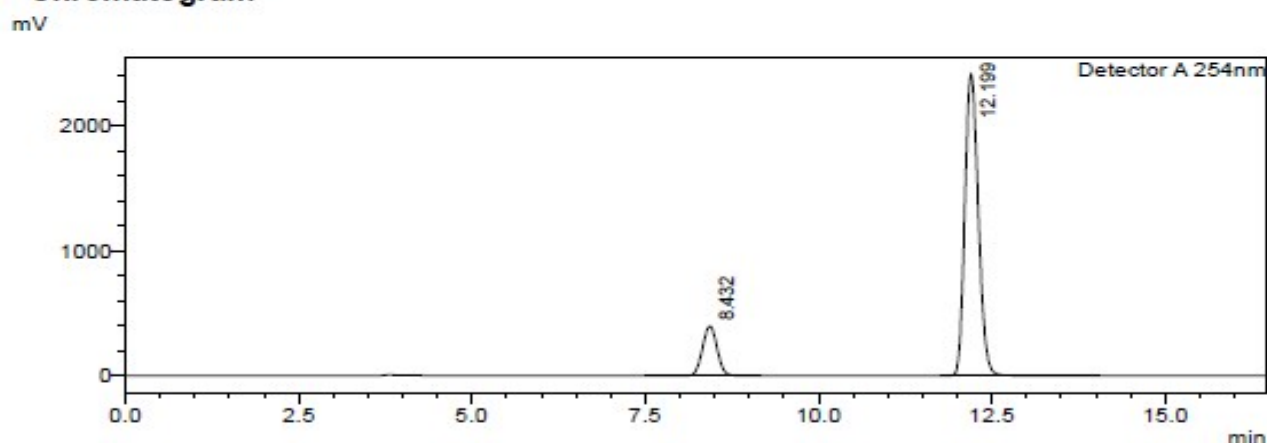
Fig. S37. HPLC of 2-(4-Bromophenyl) chroman-4-one using M/CNT/L1(inside)

## <Sample Information>

Sample Name : Comp b ch2  
 Sample ID : Comp b ch2  
 Data Filename : Comp b ch2.lcd  
 Method Filename : Fav 2.lcm  
 Batch Filename :  
 Vial # : 1-2  
 Injection Volume : 1 uL  
 Date Acquired : 11/21/2016 5:21:15 PM  
 Date Processed : 11/21/2016 5:40:31 PM

Sample Type : Unknown  
 Acquired by : System Administrator  
 Processed by : System Administrator

## <Chromatogram>



## <Peak Table>

Detector A 254nm

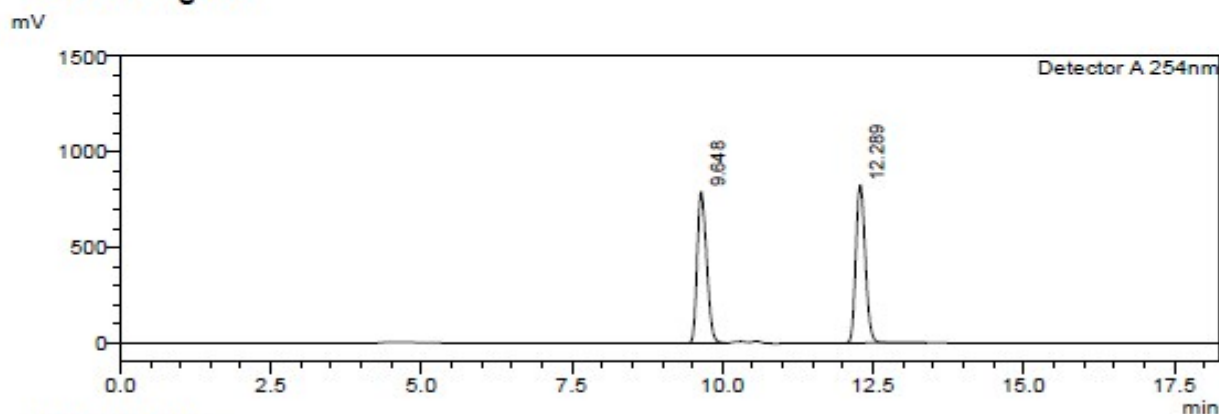
| Ret. Time | Area     | Height  | Area%   | Height% |
|-----------|----------|---------|---------|---------|
| 8.432     | 5855214  | 396738  | 15.177  | 14.114  |
| 12.199    | 32724817 | 2414224 | 84.823  | 85.886  |
|           | 38580031 | 2810962 | 100.000 | 100.000 |

Fig. S38. HPLC of 2-(4-Bromophenyl) chroman-4-one using MNP/L1 (in absence of CNT)

## <Sample Information>

Sample Name : Comp d5  
 Sample ID : Comp d5  
 Data Filename : Comp d5.lcd  
 Method Filename : Fav 2.lcm  
 Batch Filename :  
 Vial # : 1-1  
 Injection Volume : 1 uL  
 Date Acquired : 11/18/2016 6:01:39 PM  
 Date Processed : 11/18/2016 6:23:19 PM  
 Sample Type : Unknown  
 Acquired by : System Administrator  
 Processed by : System Administrator

## <Chromatogram>



## <Peak Table>

Detector A 254nm

| Ret. Time | Area     | Height  | Area%   | Height% |
|-----------|----------|---------|---------|---------|
| 9.648     | 8597231  | 789365  | 48.629  | 48.857  |
| 12.289    | 9081876  | 826312  | 51.371  | 51.143  |
|           | 17679107 | 1615677 | 100.000 | 100.000 |

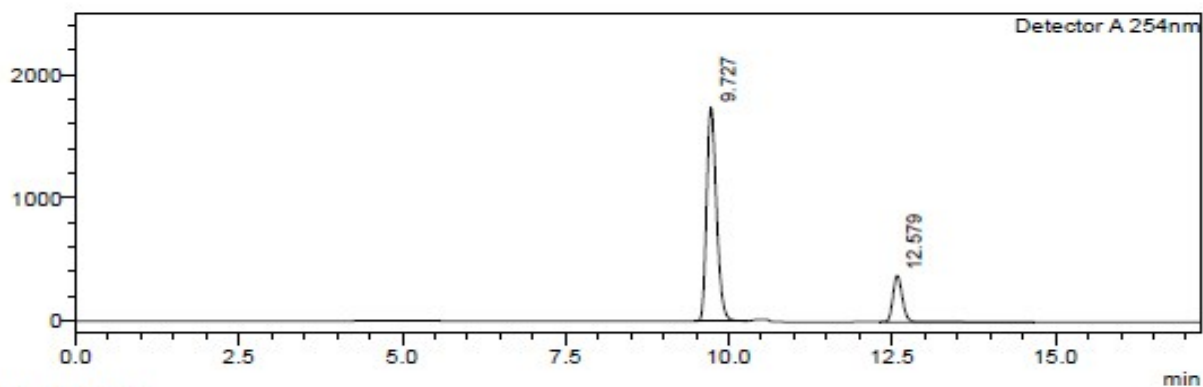
Fig. S39. HPLC of 2-(4-methoxyphenyl) chroman-4-one racemic

## <Sample Information>

Sample Name : Comp d ch6  
 Sample ID : Comp d ch6  
 Data Filename : Comp d ch6.lcd  
 Method Filename : Fav 2.lcm  
 Batch Filename :  
 Vial # : 1-1  
 Injection Volume : 0.4 uL  
 Date Acquired : 11/21/2016 12:16:07 PM  
 Date Processed : 11/21/2016 12:41:40 PM  
 Sample Type : Unknown  
 Acquired by : System Administrator  
 Processed by : System Administrator

## <Chromatogram>

mV



## <Peak Table>

| Detector A 254nm |          |         |         |         |
|------------------|----------|---------|---------|---------|
| Ret. Time        | Area     | Height  | Area%   | Height% |
| 9.727            | 18208969 | 1734642 | 82.872  | 82.167  |
| 12.579           | 3763541  | 376474  | 17.128  | 17.833  |
|                  | 21972510 | 2111116 | 100.000 | 100.000 |

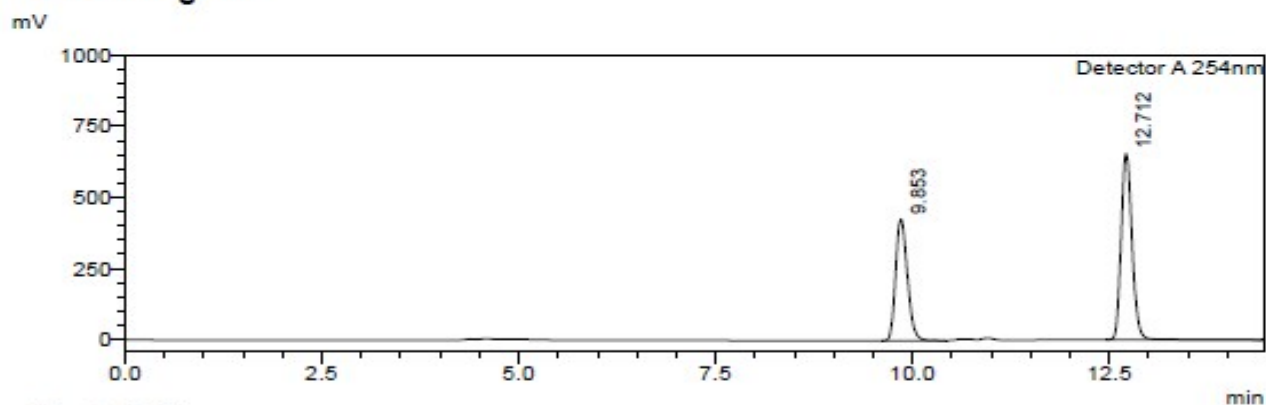
Fig. S40. HPLC of 2-(4-methoxyphenyl) chroman-4-one using M/CNT/L1 (inside)

## <Sample Information>

Sample Name : Comp d4  
 Sample ID : Comp d4  
 Data Filename : Comp d4.lcd  
 Method Filename : Fav 2.lcm  
 Batch Filename :  
 Vial # : 1-1  
 Injection Volume : 1 uL  
 Date Acquired : 11/18/2016 5:46:51 PM  
 Date Processed : 11/21/2016 11:06:24 AM

Sample Type : Unknown  
 Acquired by : System Administrator  
 Processed by : System Administrator

## <Chromatogram>



## <Peak Table>

| Detector A 254nm |          |         |         |         |
|------------------|----------|---------|---------|---------|
| Ret. Time        | Area     | Height  | Area%   | Height% |
| 9.853            | 4438145  | 426078  | 41.386  | 39.496  |
| 12.712           | 6285703  | 652722  | 58.614  | 60.504  |
|                  | 10723848 | 1078800 | 100.000 | 100.000 |

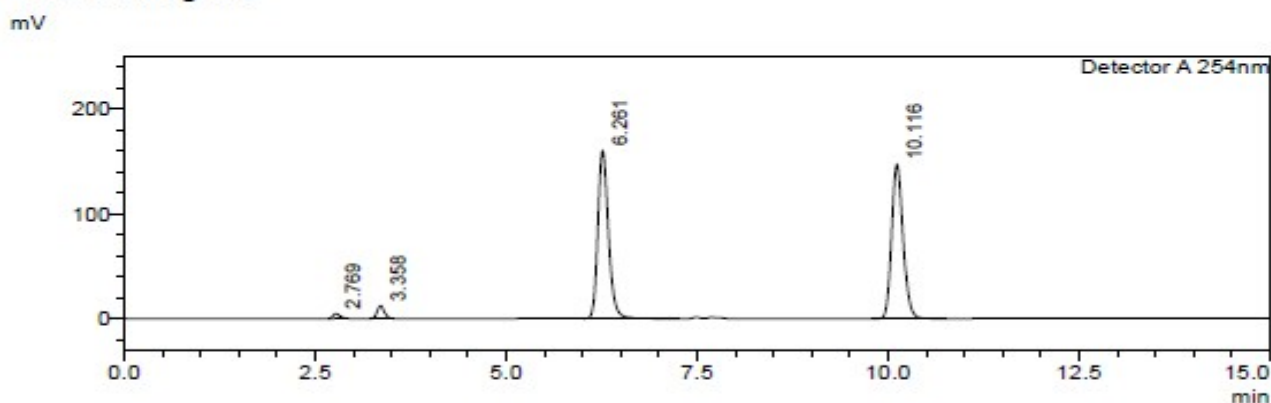
Fig. S41. HPLC of 2-(4-methoxyphenyl) chroman-4-one using MNP/L1 (in absence of CNT)



## <Sample Information>

Sample Name : Racemic flavanone  
 Sample ID : Racemic flavanone  
 Data Filename : Racemic flavanone  
 Method Filename : Fav.lcm  
 Batch Filename :  
 Vial # : 1-1  
 Injection Volume : 1 uL  
 Date Acquired : 11/16/2016 2:06:38 PM  
 Date Processed : 11/22/2016 12:45:31 PM  
 Sample Type : Unknown  
 Acquired by : System Administrator  
 Processed by : System Administrator

## <Chromatogram>



## <Peak Table>

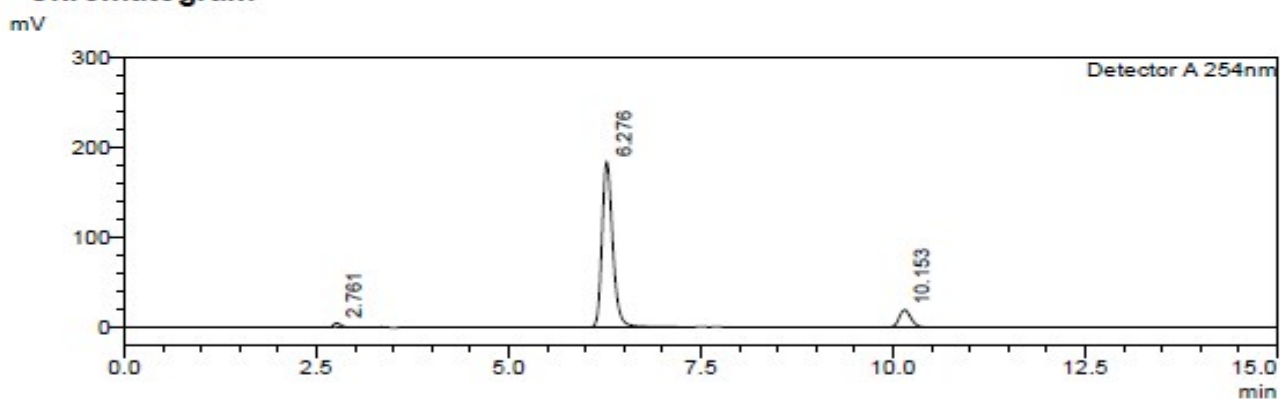
| Detector A 254nm |         |        |         |         |
|------------------|---------|--------|---------|---------|
| Ret. Time        | Area    | Height | Area%   | Height% |
| 2.769            | 27305   | 4598   | 0.861   | 1.423   |
| 3.358            | 77579   | 12169  | 2.445   | 3.767   |
| 6.261            | 1544968 | 159763 | 48.689  | 49.458  |
| 10.116           | 1523269 | 146501 | 48.005  | 45.352  |
|                  | 3173121 | 323030 | 100.000 | 100.000 |

Fig. S42. HPLC of 2-(4-methylphenyl) chroman-4-one racemic

## <Sample Information>

Sample Name : CHIRAL 2  
 Sample ID : CHIRAL 2  
 Data Filename : CHIRAL 1.lcd  
 Method Filename : Fav.lcm  
 Batch Filename :  
 Vial # : 1-1  
 Injection Volume : 1 uL  
 Date Acquired : 11/16/2016 2:22:22 PM  
 Date Processed : 11/16/2016 2:55:41 PM  
 Sample Type : Unknown  
 Acquired by : System Administrator  
 Processed by : System Administrator

## <Chromatogram>



## <Peak Table>

Detector A 254nm

| Ret. Time | Area    | Height | Area%   | Height% |
|-----------|---------|--------|---------|---------|
| 2.761     | 24754   | 4417   | 1.220   | 2.130   |
| 6.276     | 1798663 | 183458 | 88.650  | 88.487  |
| 10.153    | 205540  | 19454  | 10.130  | 9.383   |
|           | 2028957 | 207329 | 100.000 | 100.000 |

Fig. S43. HPLC of 2-(4-methylphenyl) chroman-4-one M/CNT/L1 (inside)

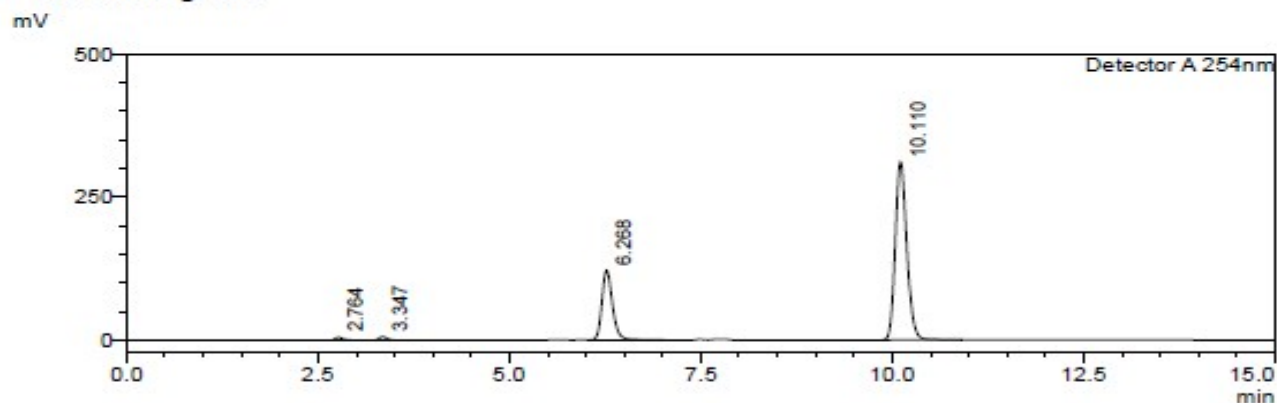


## <Sample Information>

Sample Name : FE CPA2  
Sample ID : FE CPA2  
Data Filename : FE CPA2.lcd  
Method Filename : Fav.lcm  
Batch Filename :  
Vial # : 1-1  
Injection Volume : 1 uL  
Date Acquired : 11/16/2016 4:44:47 PM  
Date Processed : 11/16/2016 5:16:39 PM

Sample Type : Unknown  
Acquired by : System Administrator  
Processed by : System Administrator

## <Chromatogram>



## <Peak Table>

Detector A 254nm

| Ret. Time | Area    | Height | Area%   | Height% |
|-----------|---------|--------|---------|---------|
| 2.764     | 29157   | 4740   | 0.648   | 1.069   |
| 3.347     | 38300   | 5822   | 0.852   | 1.313   |
| 6.268     | 1176411 | 121702 | 26.159  | 27.445  |
| 10.110    | 3253303 | 311175 | 72.341  | 70.173  |
|           | 4497171 | 443440 | 100.000 | 100.000 |

Fig. S44. HPLC of 2-(4-methylphenyl) chroman-4-one MNP/L1 (in absence of CNT)



## <Sample Information>

|                  |                         |              |                        |
|------------------|-------------------------|--------------|------------------------|
| Sample Name      | : E5                    | Sample Type  | : Unknown              |
| Sample ID        | : E5                    |              |                        |
| Data Filename    | : E9.lcd                |              |                        |
| Method Filename  | : Fav 2.lcm             |              |                        |
| Batch Filename   | :                       |              |                        |
| Vial #           | : 1-2                   |              |                        |
| Injection Volume | : 1 uL                  |              |                        |
| Date Acquired    | : 4/27/2017 11:33:58 AM | Acquired by  | : System Administrator |
| Date Processed   | : 4/27/2017 11:48:59 AM | Processed by | : System Administrator |

## <Chromatogram>

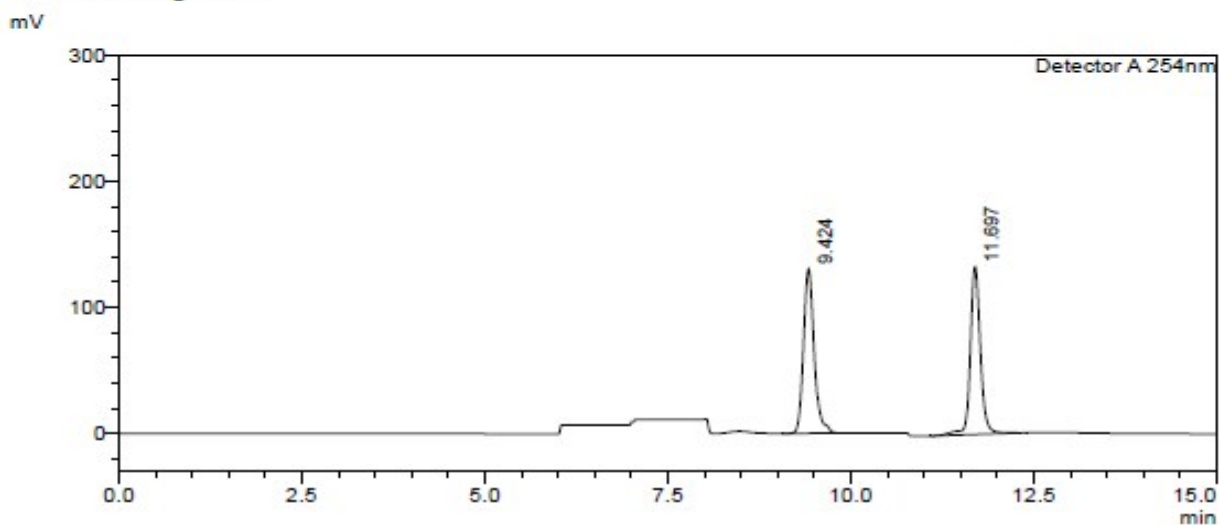


Fig. S45. HPLC of 2-(4-chlorophenyl) chroman-4-one racemic

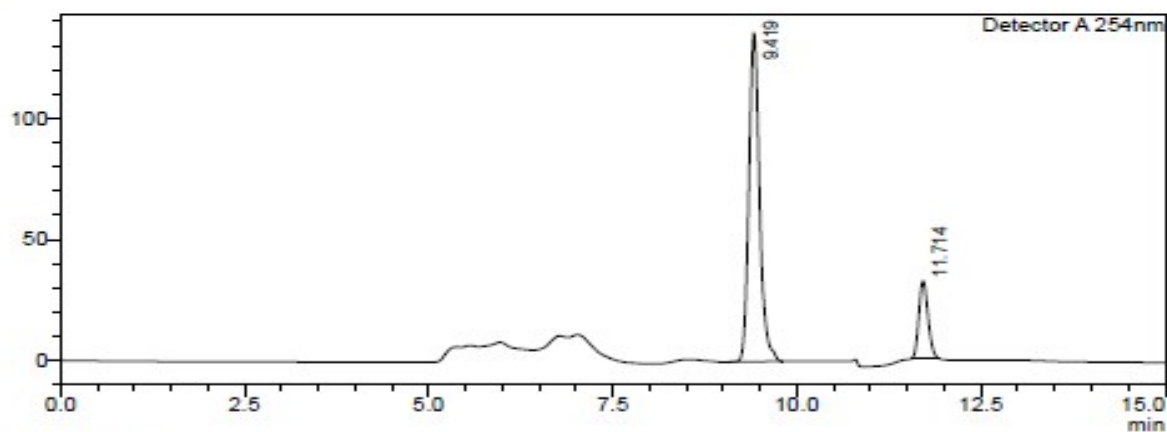
<Sample Information>

Sample Name : E5  
 Sample ID : E5  
 Data Filename : E12.lcd  
 Method Filename : Fav 2.lcm  
 Batch Filename :  
 Vial # : 1-2  
 Injection Volume : 1 uL  
 Date Acquired : 4/27/2017 12:20:39 PM  
 Date Processed : 4/27/2017 12:45:50 PM

Sample Type : Unknown  
 Acquired by : System Administrator  
 Processed by : System Administrator

<Chromatogram>

mV



<Peak Table>

Detector A 254nm

| Ret. Time | Area    | Height | Area%   | Height% |
|-----------|---------|--------|---------|---------|
| 9.419     | 1389623 | 135458 | 82.881  | 80.806  |
| 11.714    | 282903  | 32176  | 17.119  | 19.194  |
|           | 1652526 | 167635 | 100.000 | 100.000 |

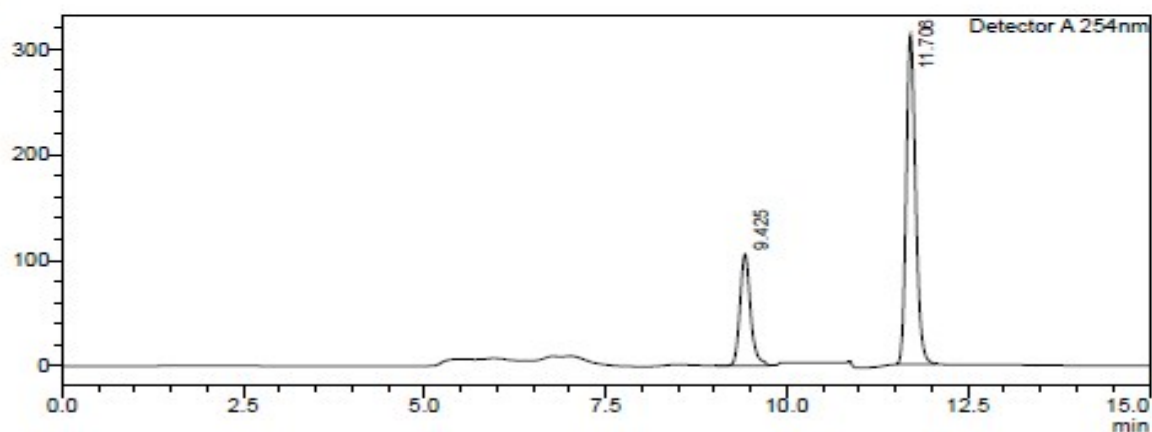
Fig. S46. HPLC of 2-(4-chlorophenyl) chroman-4-one M/CNT/L1 (inside CNT)

<Sample Information>

|                  |                         |              |                        |
|------------------|-------------------------|--------------|------------------------|
| Sample Name      | : E5                    | Sample Type  | : Unknown              |
| Sample ID        | : E5                    | Acquired by  | : System Administrator |
| Data Filename    | : E10.lcd               | Processed by | : System Administrator |
| Method Filename  | : Fav 2.lcm             |              |                        |
| Batch Filename   | :                       |              |                        |
| Vial #           | : 1-2                   |              |                        |
| Injection Volume | : 1 uL                  |              |                        |
| Date Acquired    | : 4/27/2017 11:50:18 AM |              |                        |
| Date Processed   | : 4/27/2017 12:08:47 PM |              |                        |

<Chromatogram>

mV



<Peak Table>

Detector A 254nm

| Ret. Time | Area    | Height | Area%   | Height% |
|-----------|---------|--------|---------|---------|
| 9.425     | 1070313 | 105328 | 27.534  | 25.250  |
| 11.706    | 2818873 | 311815 | 72.466  | 74.750  |
|           | 3887186 | 417144 | 100.000 | 100.000 |

Fig. S47. HPLC of 2-(4-chlorophenyl) chroman-4-one MNP/L1 (in absence of CNT)

## <Sample Information>

|                  |                        |              |                        |
|------------------|------------------------|--------------|------------------------|
| Sample Name      | : F                    | Sample Type  | : Unknown              |
| Sample ID        | : F                    |              |                        |
| Data Filename    | : F7.lcd               |              |                        |
| Method Filename  | : Fav 2.lcm            |              |                        |
| Batch Filename   | :                      |              |                        |
| Vial #           | : 1-2                  |              |                        |
| Injection Volume | : 1 uL                 |              |                        |
| Date Acquired    | : 4/27/2017 5:50:31 PM | Acquired by  | : System Administrator |
| Date Processed   | : 4/27/2017 6:05:33 PM | Processed by | : System Administrator |

## <Chromatogram>

mV

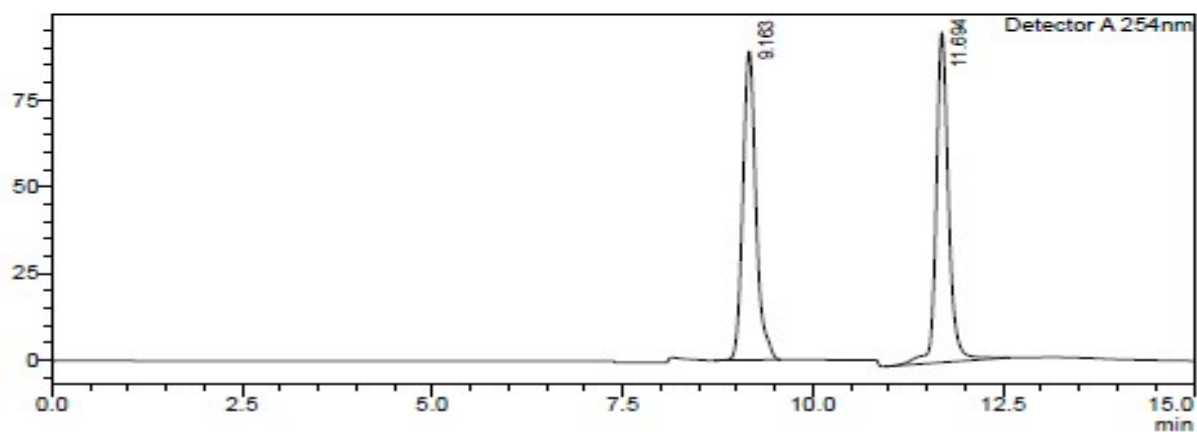


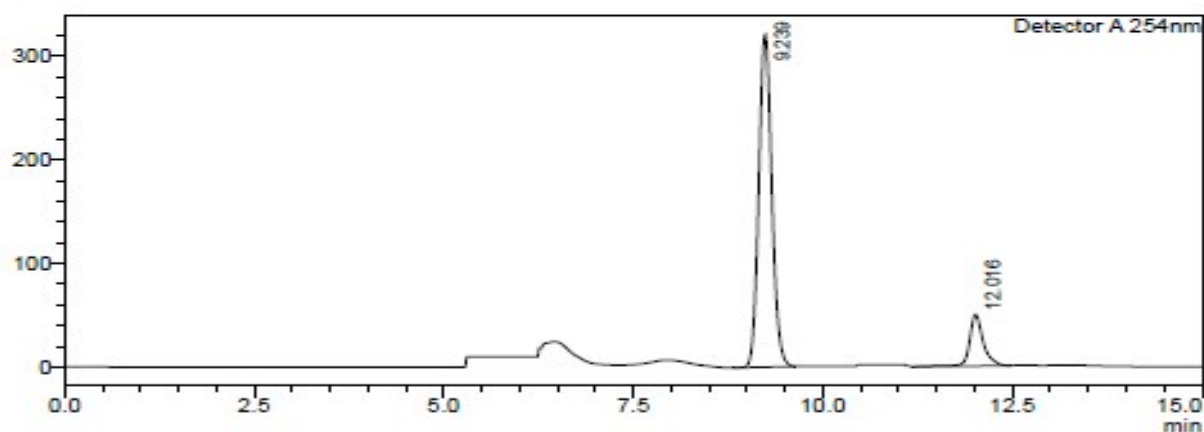
Fig. S48. HPLC of 2-(3-chlorophenyl) chroman-4-one racemic

## <Sample Information>

|                  |                        |              |                        |
|------------------|------------------------|--------------|------------------------|
| Sample Name      | : F                    | Sample Type  | : Unknown              |
| Sample ID        | : F                    | Acquired by  | : System Administrator |
| Data Filename    | : F2.lcd               | Processed by | : System Administrator |
| Method Filename  | : Fav 2.lcm            |              |                        |
| Batch Filename   | :                      |              |                        |
| Vial #           | : 1-2                  |              |                        |
| Injection Volume | : 1 uL                 |              |                        |
| Date Acquired    | : 4/27/2017 4:42:48 PM |              |                        |
| Date Processed   | : 4/27/2017 4:57:48 PM |              |                        |

## <Chromatogram>

mV



## <Peak Table>

Detector A 254nm

| Ret. Time | Area    | Height | Area%   | Height% |
|-----------|---------|--------|---------|---------|
| 9.239     | 3885028 | 321418 | 86.094  | 86.619  |
| 12.016    | 624299  | 49653  | 13.906  | 13.381  |
|           | 4489327 | 371072 | 100.000 | 100.000 |

Fig. S49. HPLC of 2-(3-chlorophenyl) chroman-4-one M/CNT/L1(inside CNT)

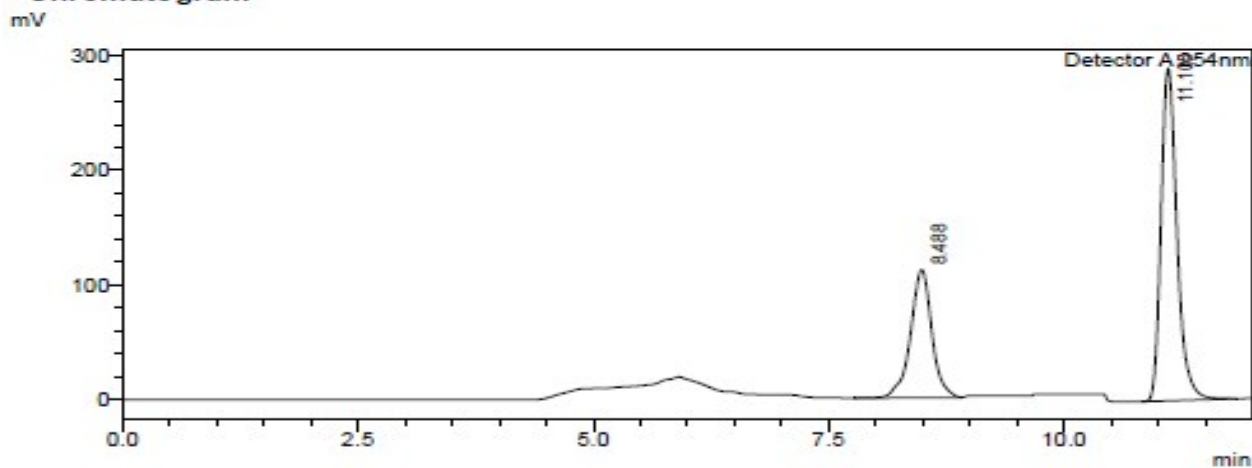


<Sample Information>

Sample Name : F  
 Sample ID : F  
 Data Filename : F5.lcd  
 Method Filename : Fav 2.lcm  
 Batch Filename :  
 Vial # : 1-2  
 Injection Volume : 1 uL  
 Date Acquired : 4/27/2017 5:22:13 PM  
 Date Processed : 4/27/2017 5:34:14 PM

Sample Type : Unknown  
 Acquired by : System Administrator  
 Processed by : System Administrator

<Chromatogram>



<Peak Table>

Detector A 254nm

| Ret. Time | Area    | Height | Area%   | Height% |
|-----------|---------|--------|---------|---------|
| 8.488     | 1762332 | 111569 | 34.028  | 27.784  |
| 11.105    | 3416769 | 289997 | 65.972  | 72.216  |
|           | 5179101 | 401566 | 100.000 | 100.000 |

Fig. S50. HPLC of 2-(3-chlorophenyl) chroman-4-one MNP/L1 (in absence of CNT)

## <Sample Information>

|                  |                        |              |                        |
|------------------|------------------------|--------------|------------------------|
| Sample Name      | : G                    | Sample Type  | : Unknown              |
| Sample ID        | : G                    |              |                        |
| Data Filename    | : G1.lcd               |              |                        |
| Method Filename  | : Fav 2.lcm            |              |                        |
| Batch Filename   | :                      |              |                        |
| Vial #           | : 1-2                  |              |                        |
| Injection Volume | : 1 uL                 | Acquired by  | : System Administrator |
| Date Acquired    | : 4/27/2017 6:07:50 PM | Processed by | : System Administrator |
| Date Processed   | : 4/27/2017 6:23:58 PM |              |                        |

## <Chromatogram>

mV

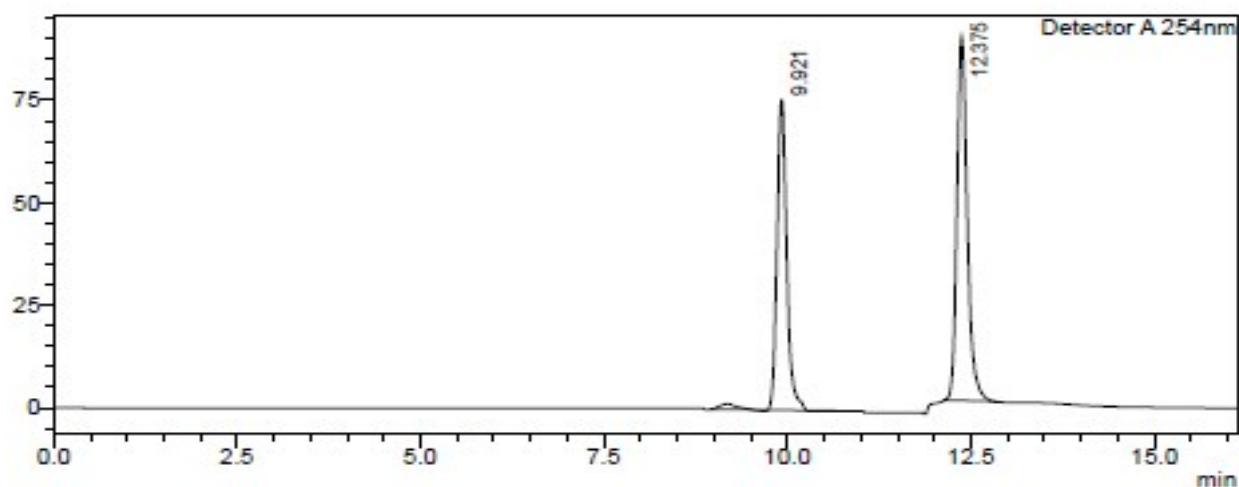


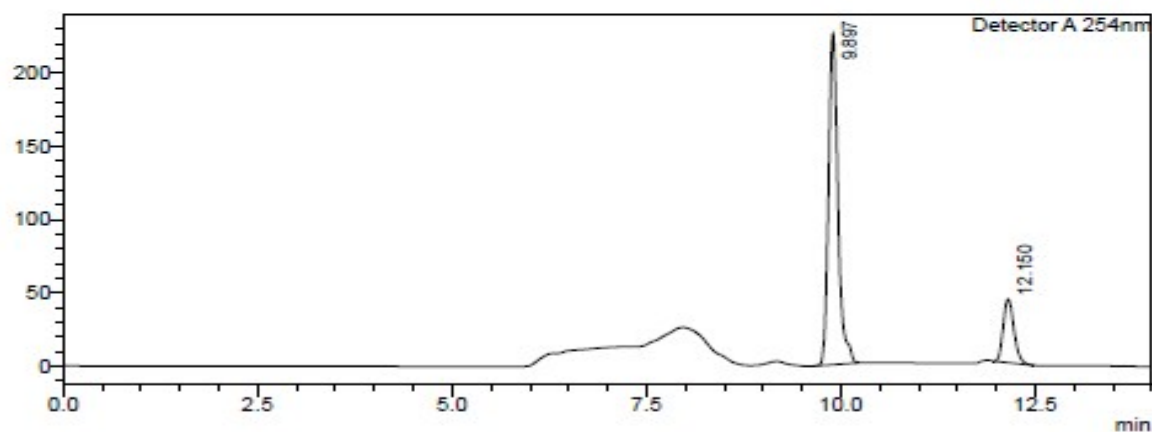
Fig. S51. HPLC of 2-(3-nitrophenyl) chroman-4-one racemic

## <Sample Information>

Sample Name : G  
 Sample ID : G  
 Data Filename : G4.lcd  
 Method Filename : Fav 2.lcm  
 Batch Filename :  
 Vial # : 1-2  
 Injection Volume : 1 uL  
 Date Acquired : 4/27/2017 6:53:25 PM  
 Date Processed : 4/27/2017 7:07:28 PM  
 Sample Type : Unknown  
 Acquired by : System Administrator  
 Processed by : System Administrator

## <Chromatogram>

mV



## <Peak Table>

Detector A 254nm

| Ret. Time | Area    | Height | Area%   | Height% |
|-----------|---------|--------|---------|---------|
| 9.897     | 1924699 | 226230 | 82.264  | 83.859  |
| 12.150    | 414954  | 43543  | 17.736  | 16.141  |
|           | 2339653 | 269773 | 100.000 | 100.000 |

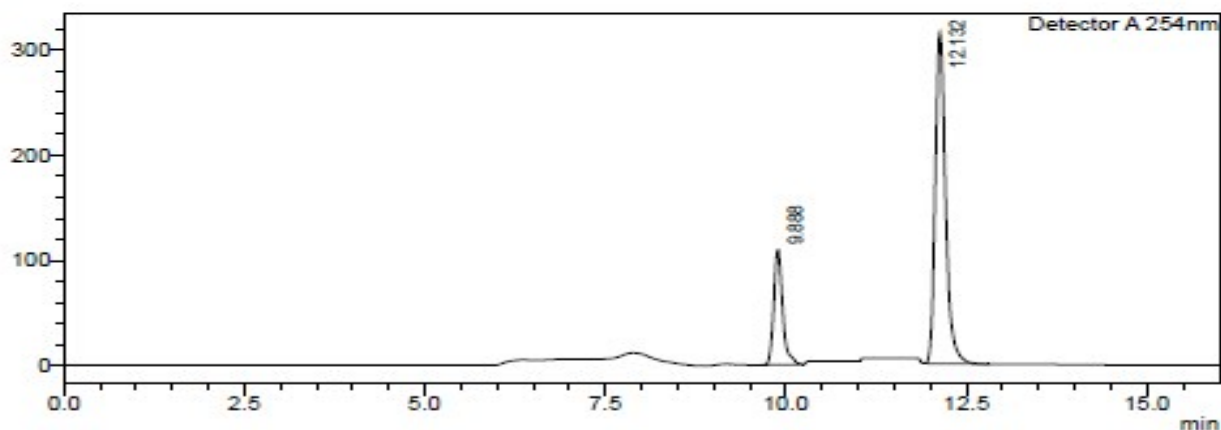
Fig. S52. HPLC of 2-(3-nitrophenyl) chroman-4-one M/CNT/L1(inside CNT)

## <Sample Information>

|                  |                        |              |                        |
|------------------|------------------------|--------------|------------------------|
| Sample Name      | : G                    | Sample Type  | : Unknown              |
| Sample ID        | : G                    | Acquired by  | : System Administrator |
| Data Filename    | : G2.lcd               | Processed by | : System Administrator |
| Method Filename  | : Fav 2.lcm            |              |                        |
| Batch Filename   | :                      |              |                        |
| Vial #           | : 1-2                  |              |                        |
| Injection Volume | : 1 uL                 |              |                        |
| Date Acquired    | : 4/27/2017 6:24:12 PM |              |                        |
| Date Processed   | : 4/27/2017 6:40:13 PM |              |                        |

## <Chromatogram>

mV



## <Peak Table>

Detector A 254nm

| Ret. Time | Area    | Height | Area%   | Height% |
|-----------|---------|--------|---------|---------|
| 9.888     | 941858  | 109519 | 23.043  | 25.784  |
| 12.132    | 3145455 | 315238 | 76.957  | 74.216  |
|           | 4087313 | 424757 | 100.000 | 100.000 |

Fig. S53. HPLC of 2-(3-nitrophenyl) chroman-4-one MNP/L1 (in absence of CNT)