

## Supporting Information of

# Fe<sub>3</sub>O<sub>4</sub>@SiO<sub>2</sub>/Schiff base/Pd complex as an efficient heterogeneous and recyclable nanocatalyst for chemoselective N-arylation of O-alkyl primary carbamates

A. R. Sardarian, M. Zangiabadi and I. Dindarloo Inaloo  
*Chemistry Department, College of Sciences, Shiraz University, Shiraz 71946 84795, Iran*  
*E-mail: sardarian@shirazu.ac.ir*

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**Figure S76.** MS of propyl (4-chlorophenyl)carbamate (S44)

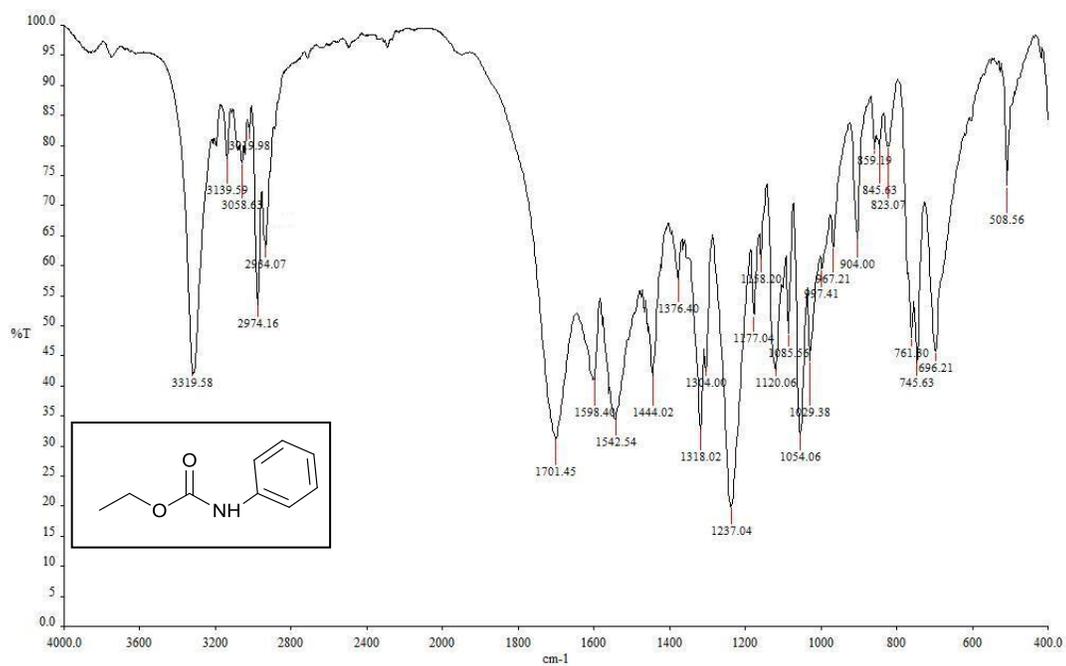
## 1. Experimental

### 1.1 General experimental methods

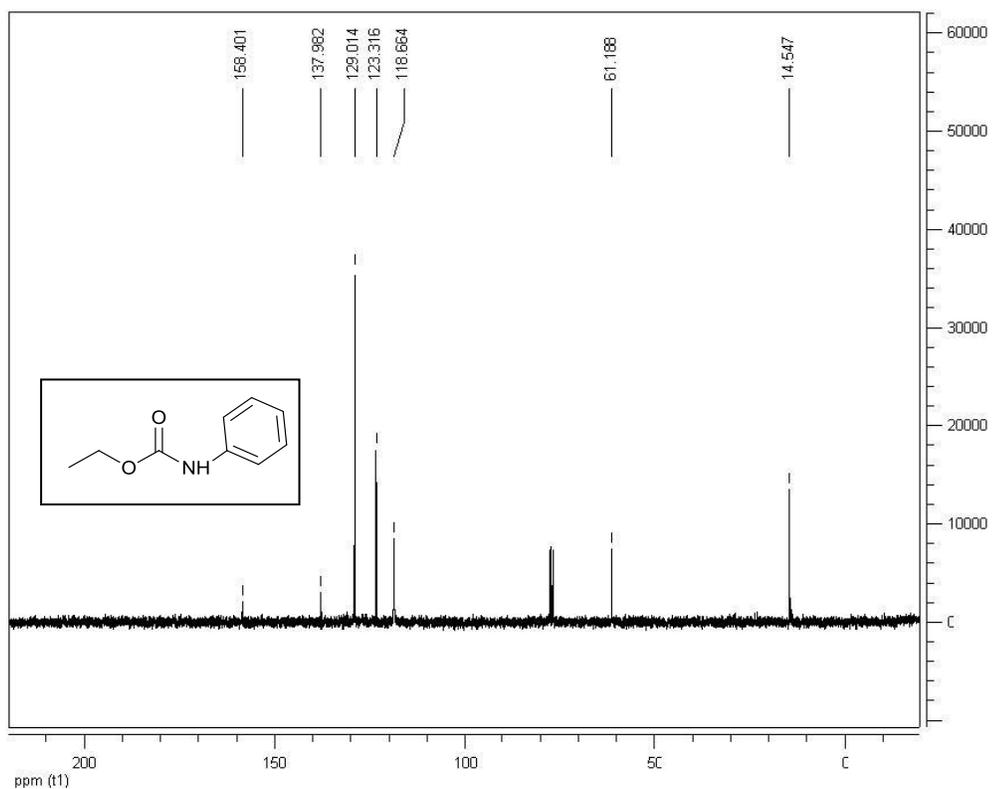
$^1\text{H}$  and  $^{13}\text{C}$  NMR spectra were recorded by BRUKER AVANCE DRX250 (250 MHz). The IR spectra were obtained on a Shimadzu FT-IR 8300. Mass spectra were analyzed by Shimadzu GC-MS QP 1000 EX. Elemental analysis was performed using Thermofinigan Flash EA-1112 CHNSO rapid elemental analyzer. Melting points were recorded by Electrothermal 9100 and the Gallenkamp melting point apparatus and were uncorrected.

### 1.2 Chemicals

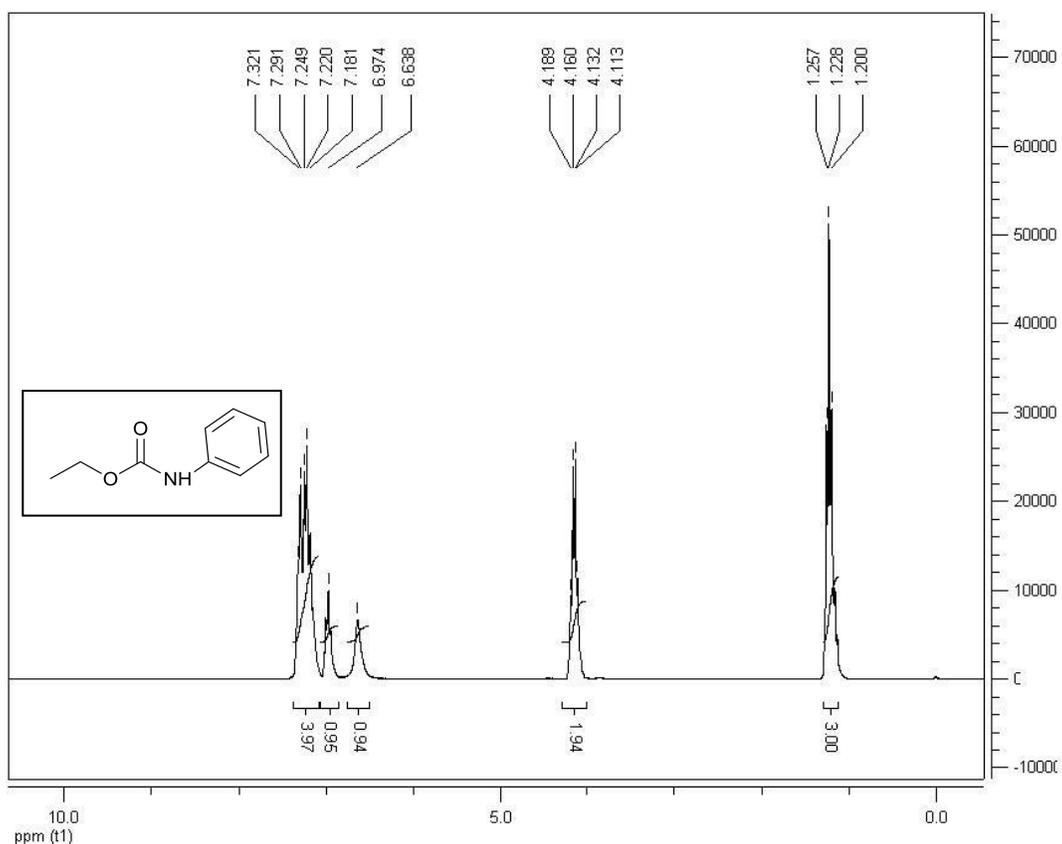
All starting materials and solvents were purified with appropriate purification techniques before use. *O*-alkyl-*N*-aryl carbamates, were prepared according to literature.



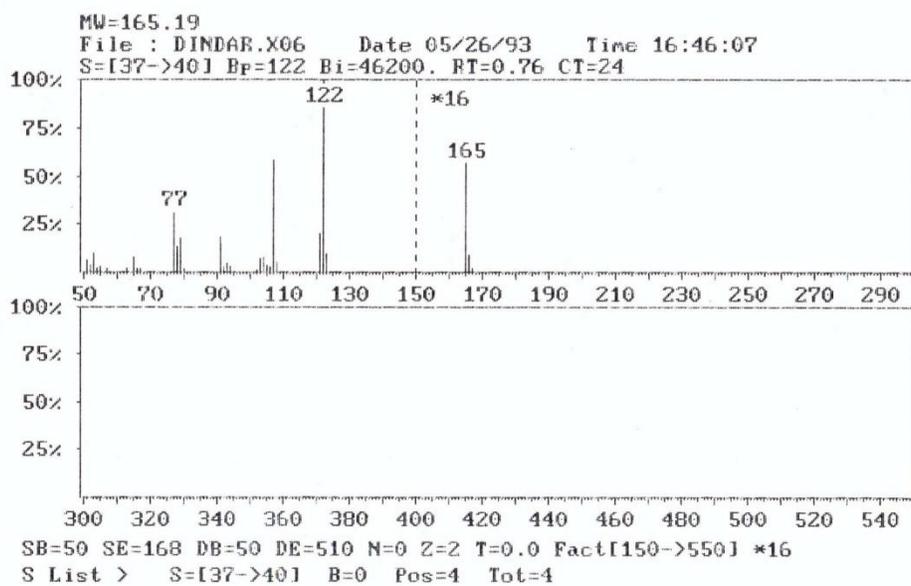
**Figure S1.** FT-IR spectra of ethyl phenylcarbamate in KBr



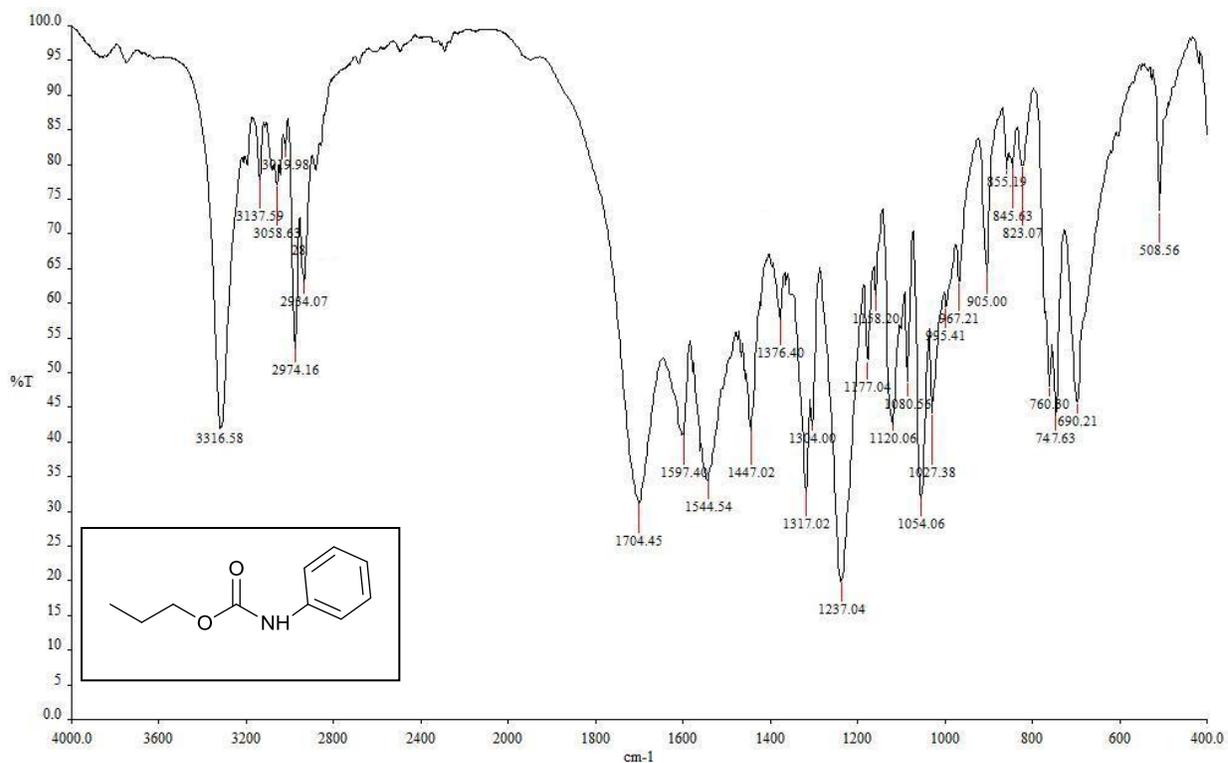
**Figure S2.** <sup>13</sup>C-NMR spectra (63 MHz) of ethyl phenylcarbamate in CDCl<sub>3</sub>



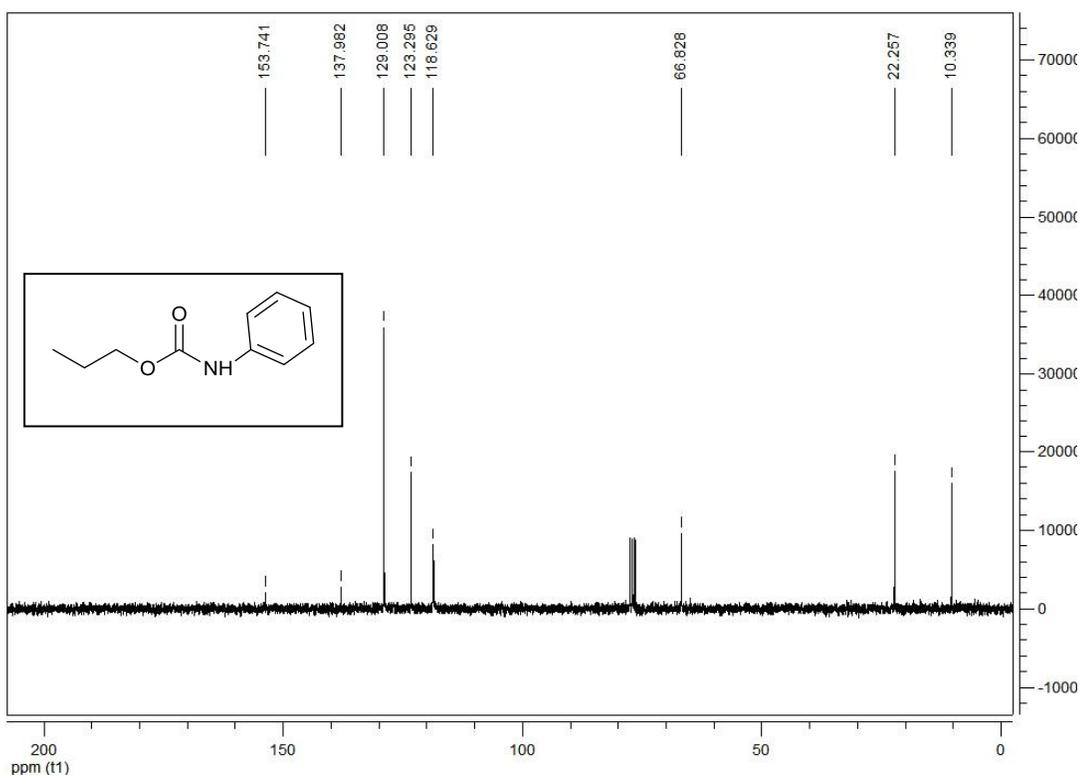
**Figure S3.**  $^1\text{H-NMR}$  spectra (250 MHz) of ethyl phenylcarbamate in  $\text{CDCl}_3$



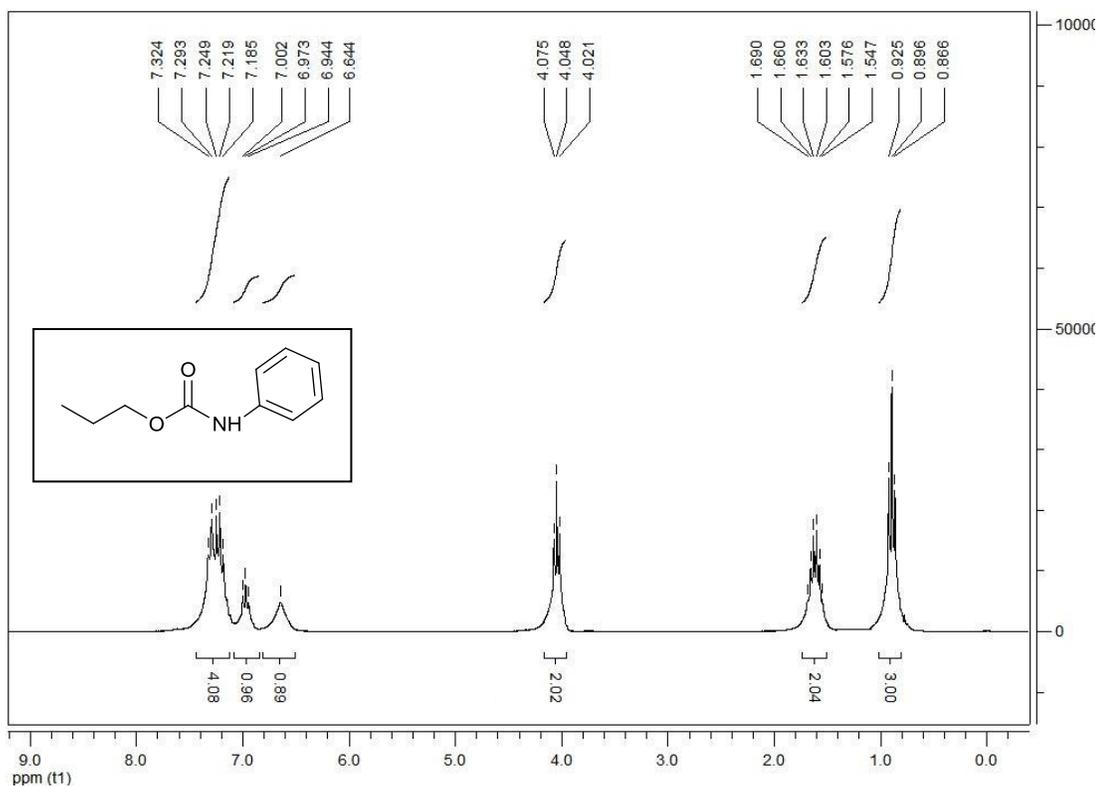
**Figure S4.** MS of ethyl phenylcarbamate



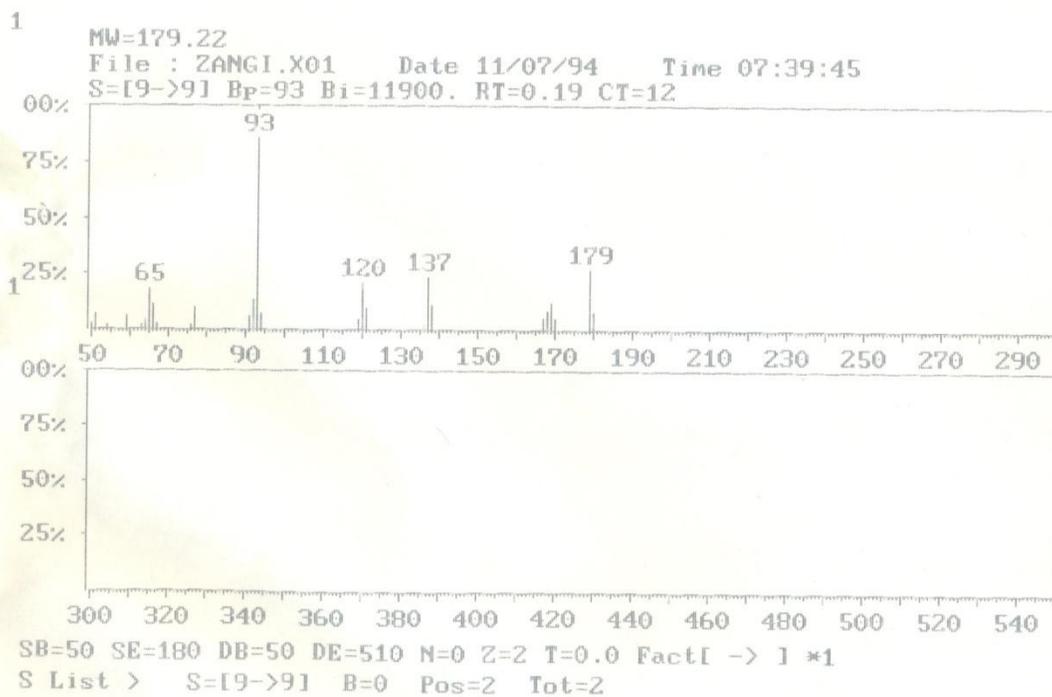
**Figure S5.** FT-IR spectra of propyl phenylcarbamate in KBr



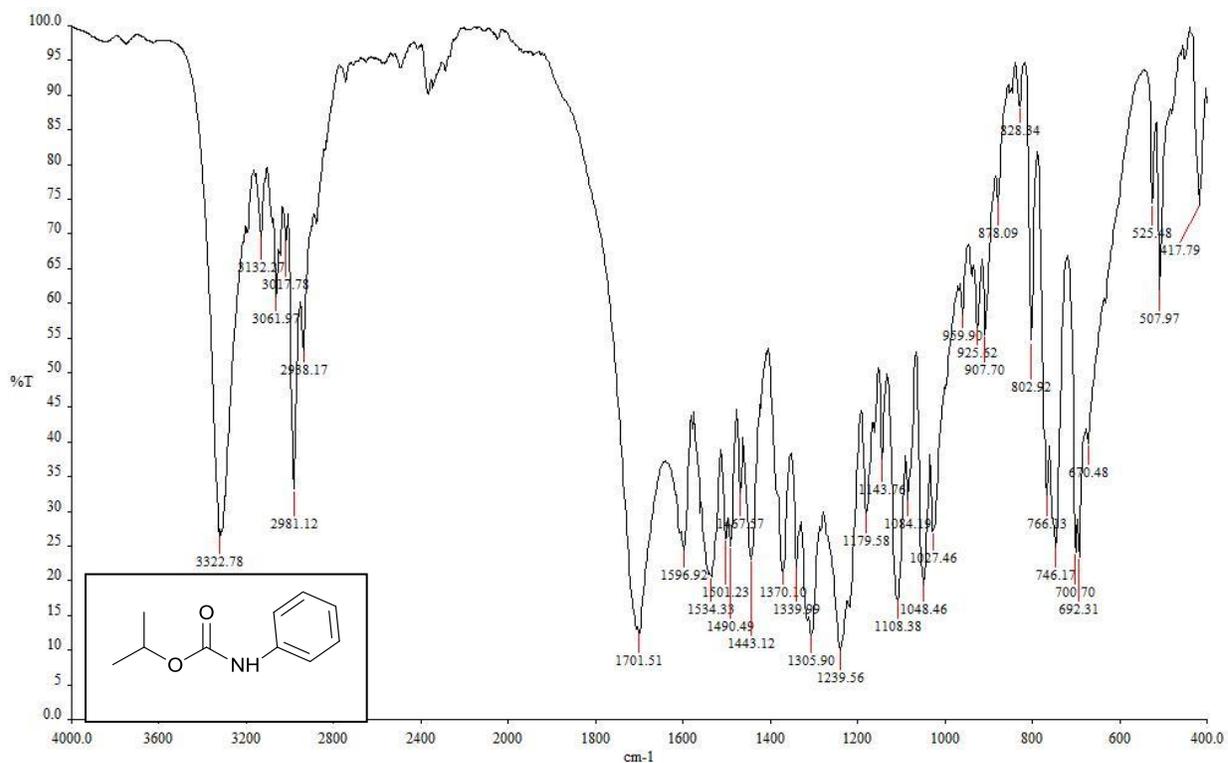
**Figure S6.** <sup>13</sup>C-NMR spectra (63 MHz) of propyl phenylcarbamate in CDCl<sub>3</sub>



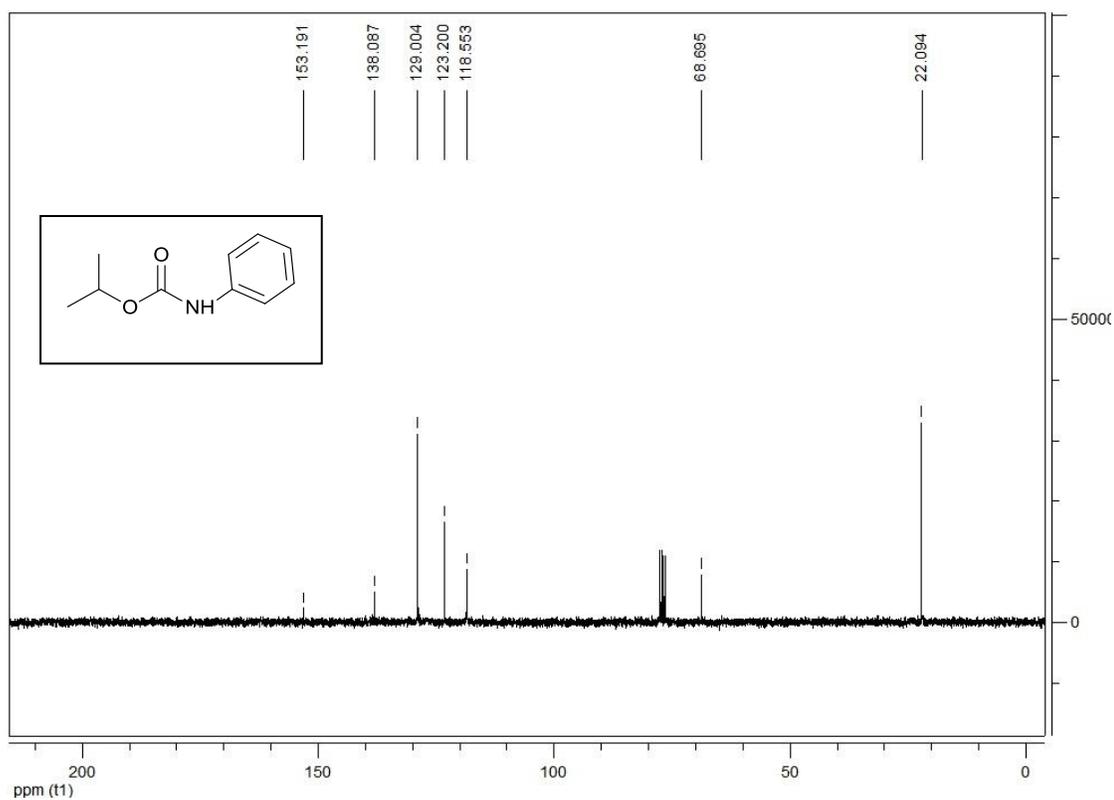
**Figure S7.**  $^1\text{H-NMR}$  spectra (250 MHz) of propyl phenylcarbamate in  $\text{CDCl}_3$



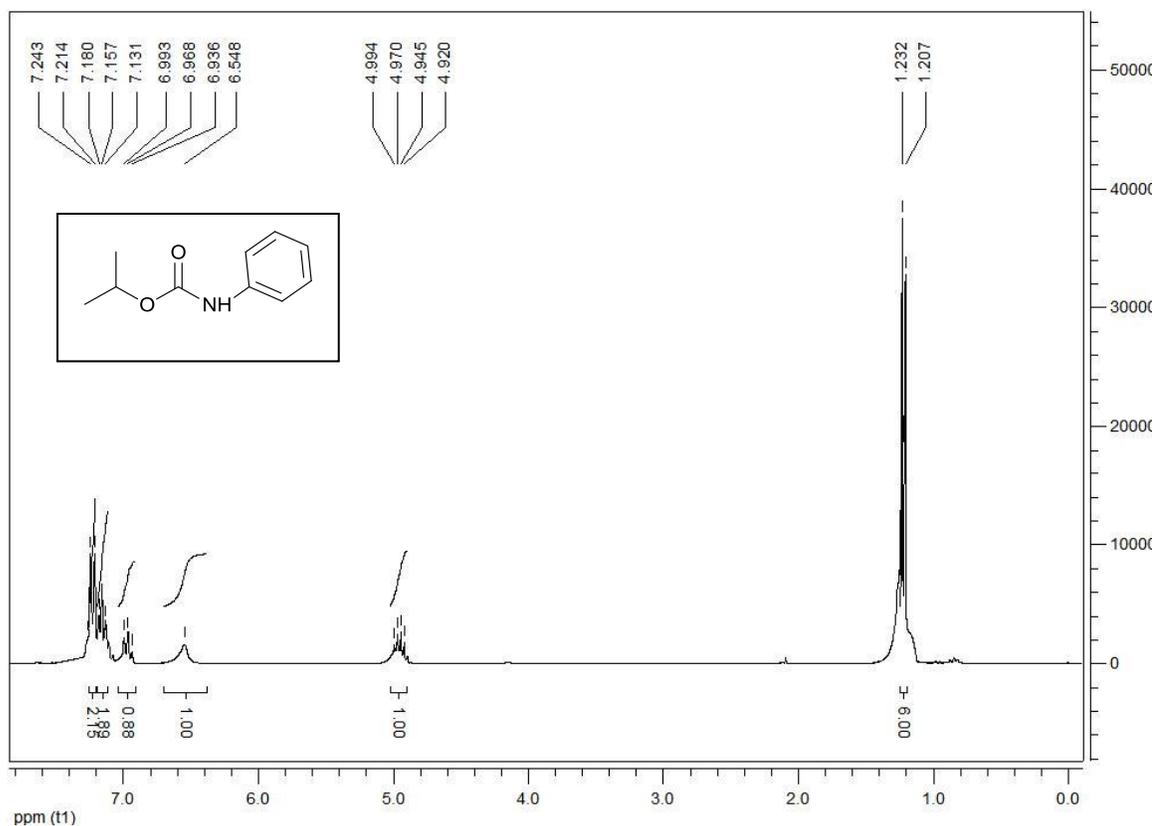
**Figure S8.** MS of propyl phenylcarbamate



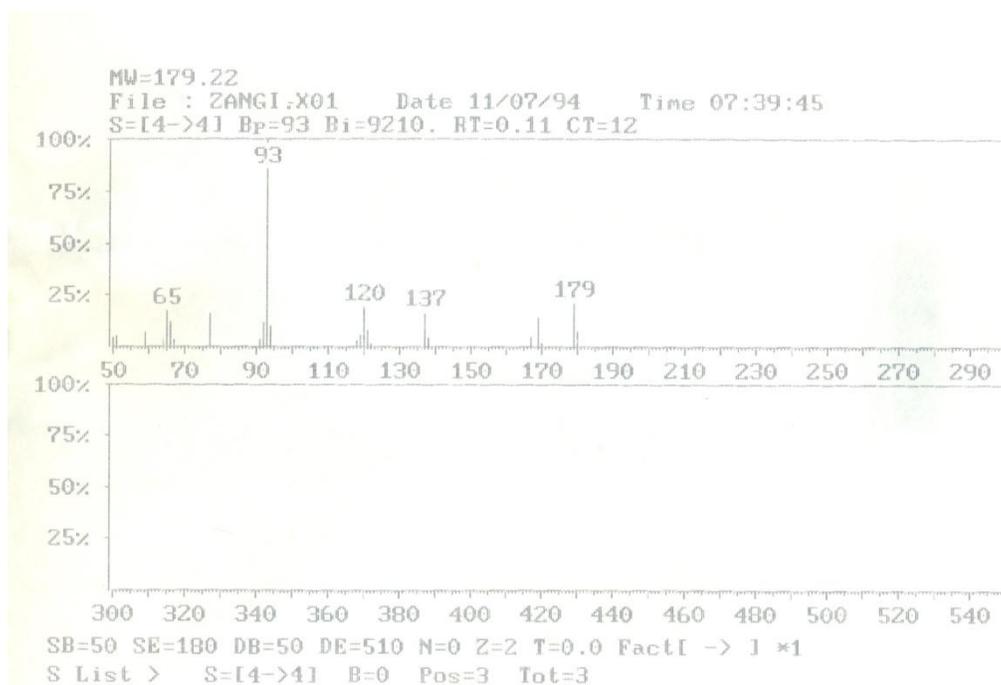
**Figure S9.** FT-IR spectra of 2-propyl phenylcarbamate in KBr



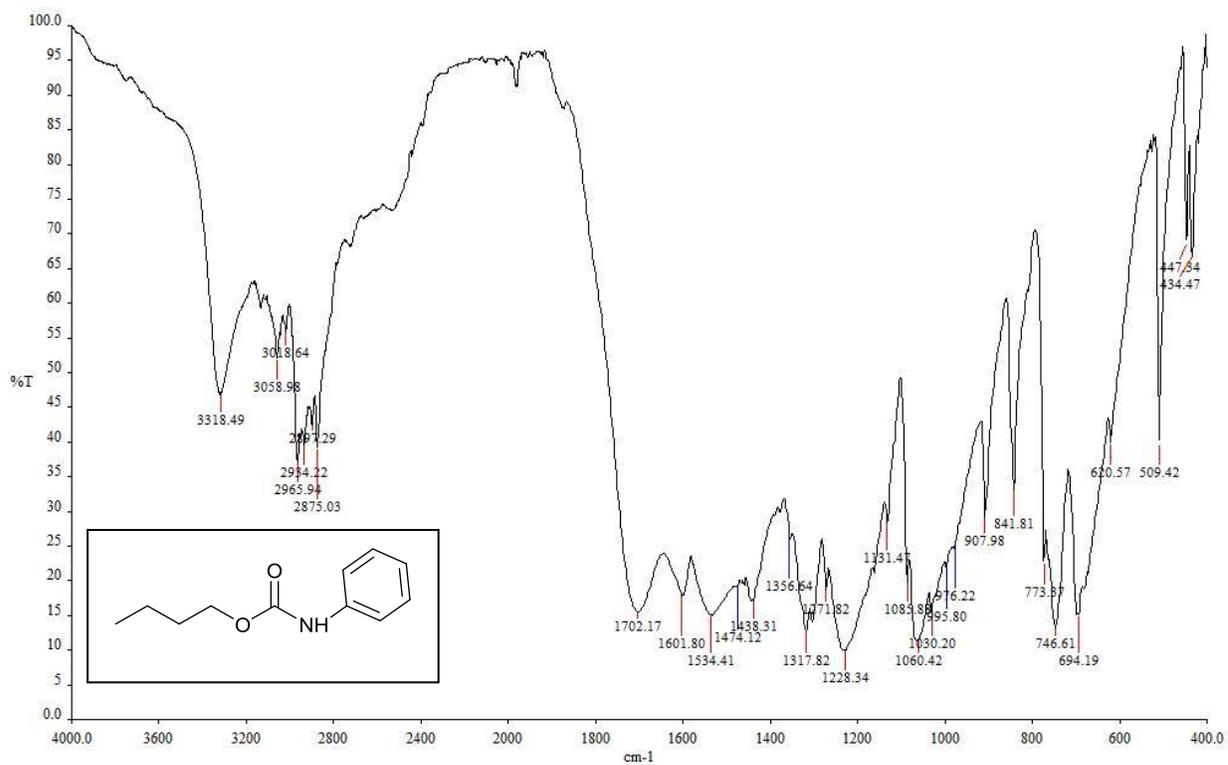
**Figure S10.** <sup>13</sup>C-NMR spectra (63 MHz) of 2-propyl phenylcarbamate in CDCl<sub>3</sub>



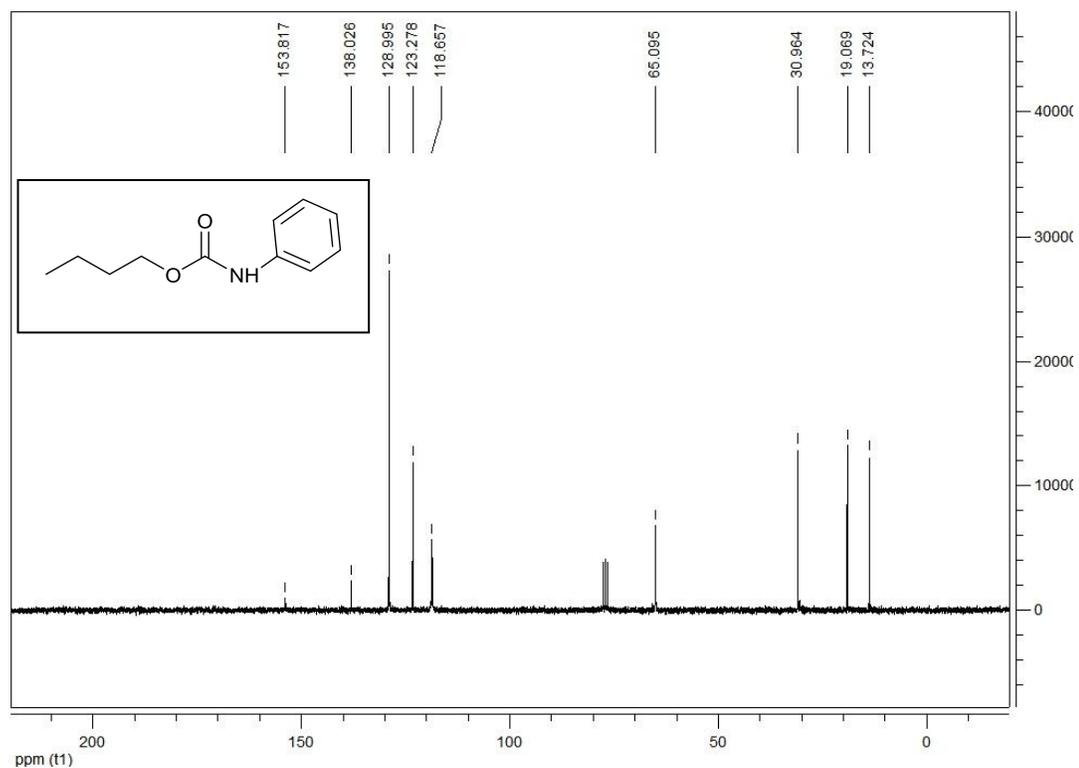
**Figure S11.**  $^1\text{H-NMR}$  spectra (250 MHz) of 2-propyl phenylcarbamate in  $\text{CDCl}_3$



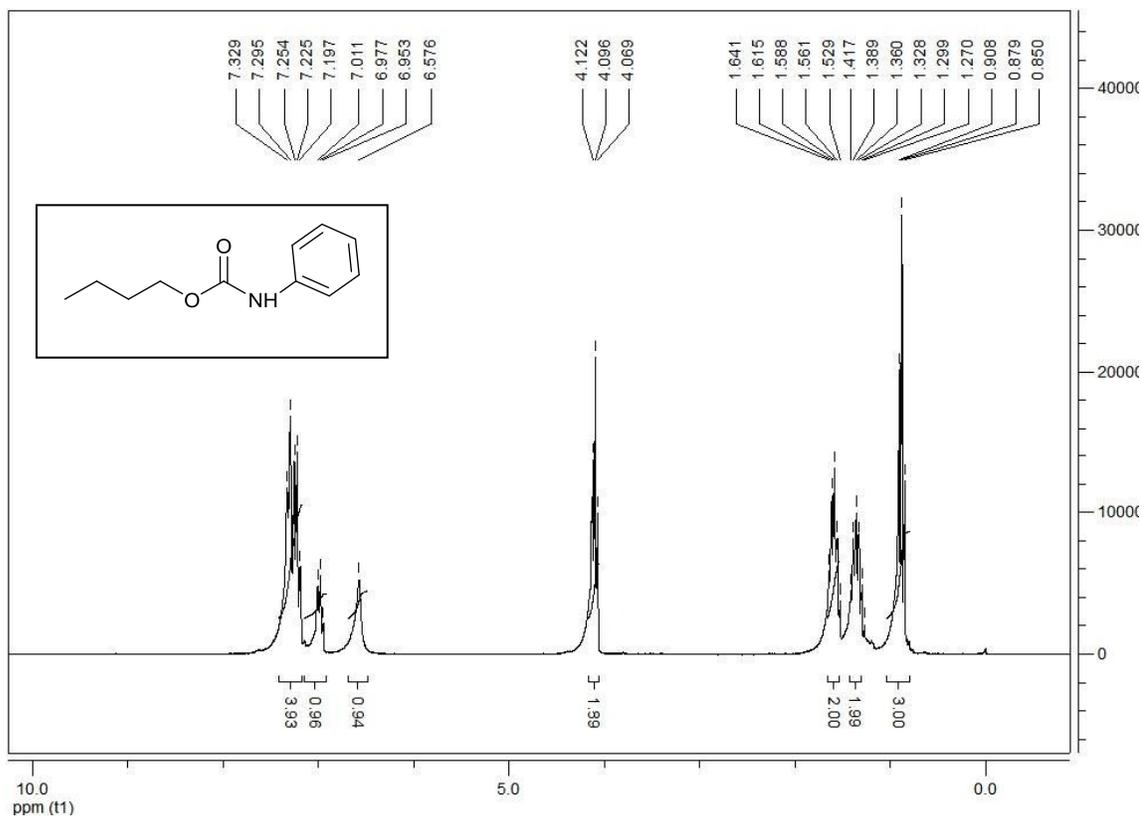
**Figure S12.** MS of 2-propyl phenylcarbamate



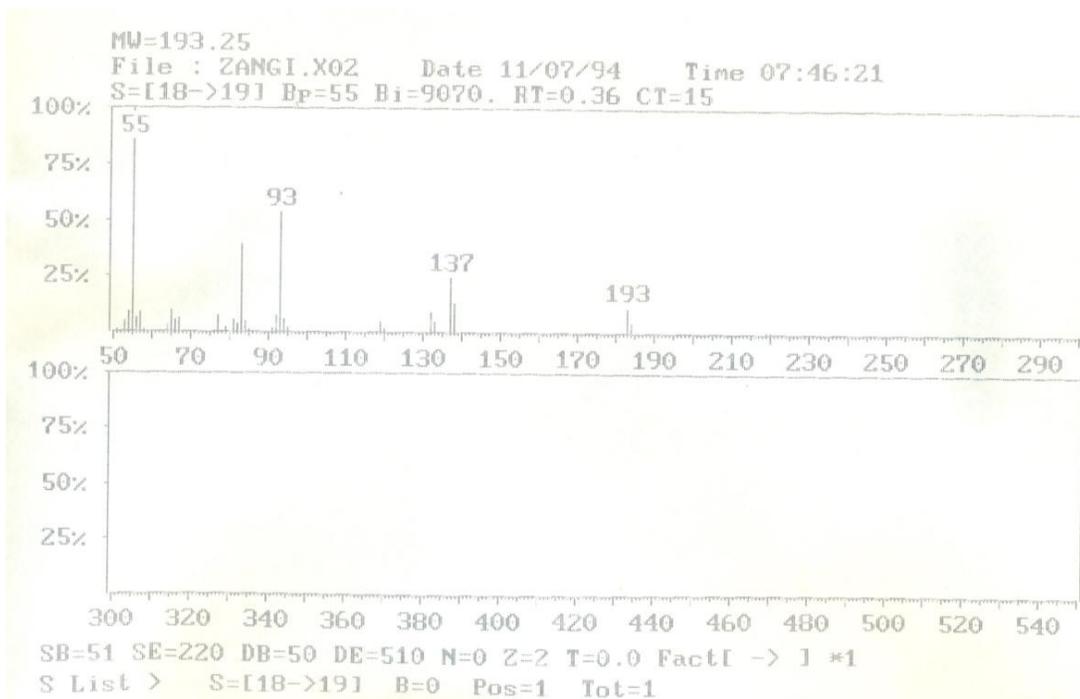
**Figure S13.** FT-IR spectra of 1-butyl phenylcarbamate in KBr



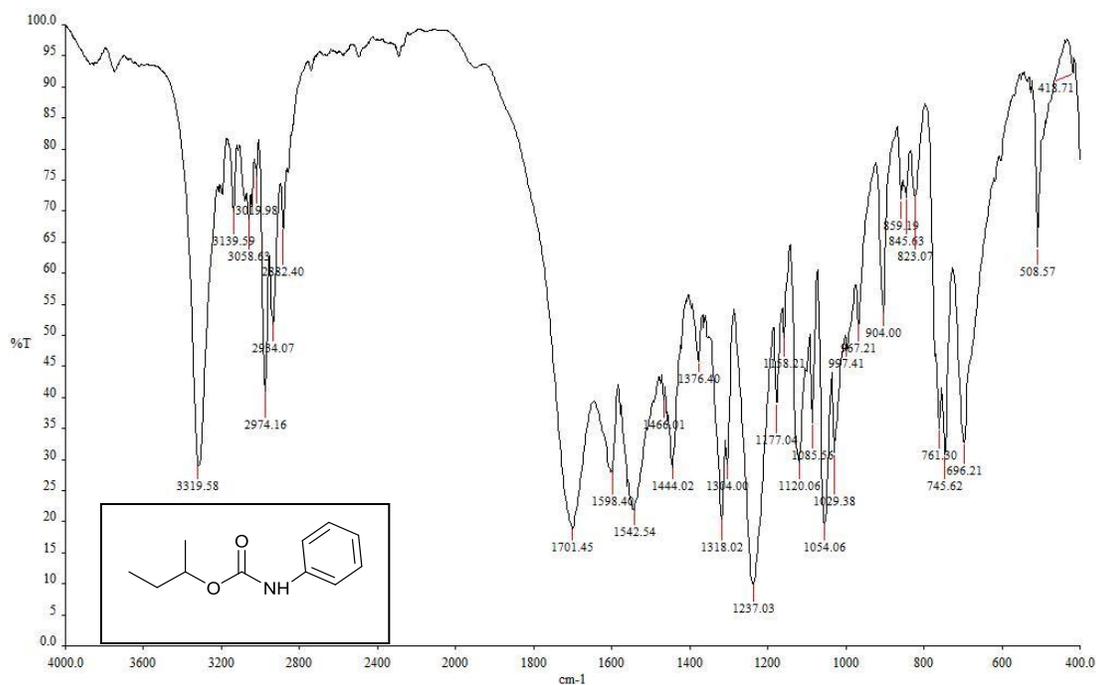
**Figure S14.**  $^{13}\text{C}$ -NMR spectra (63 MHz) of 1-butyl phenylcarbamate in  $\text{CDCl}_3$



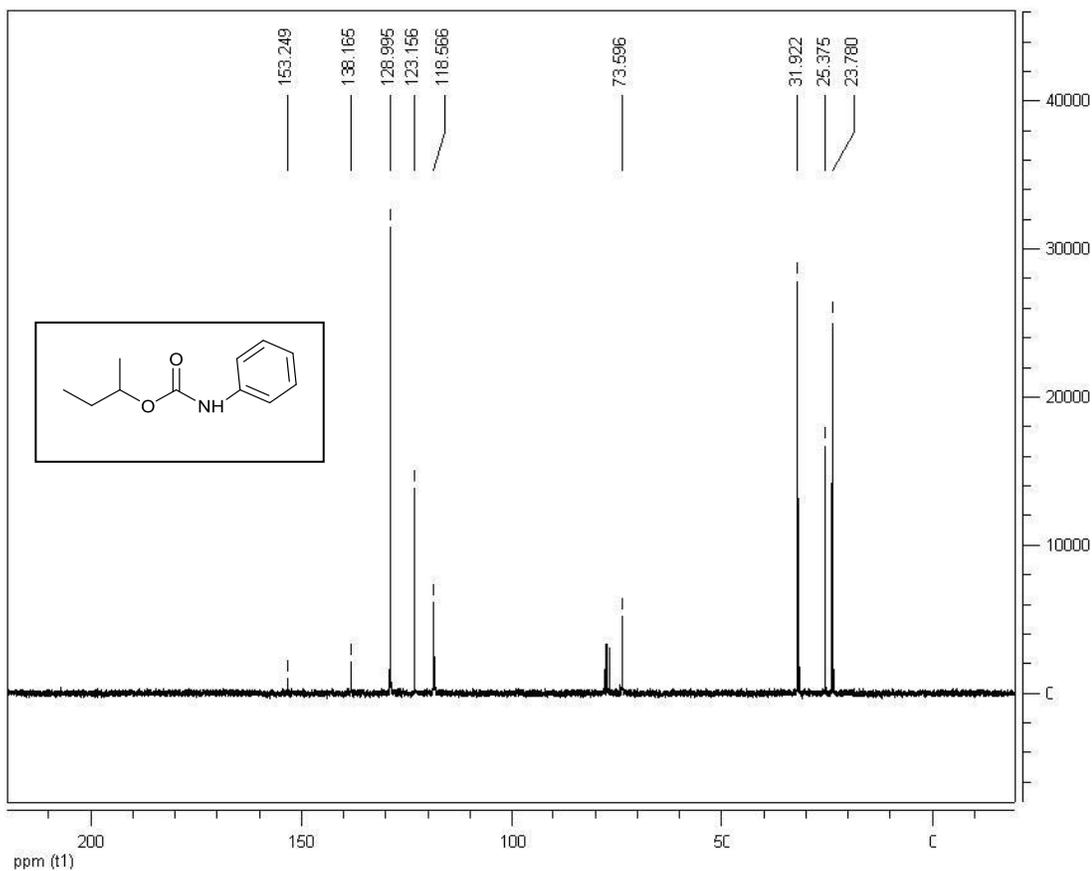
**Figure S15.**  $^1\text{H-NMR}$  spectra (250 MHz) of 1-butyl phenylcarbamate in  $\text{CDCl}_3$



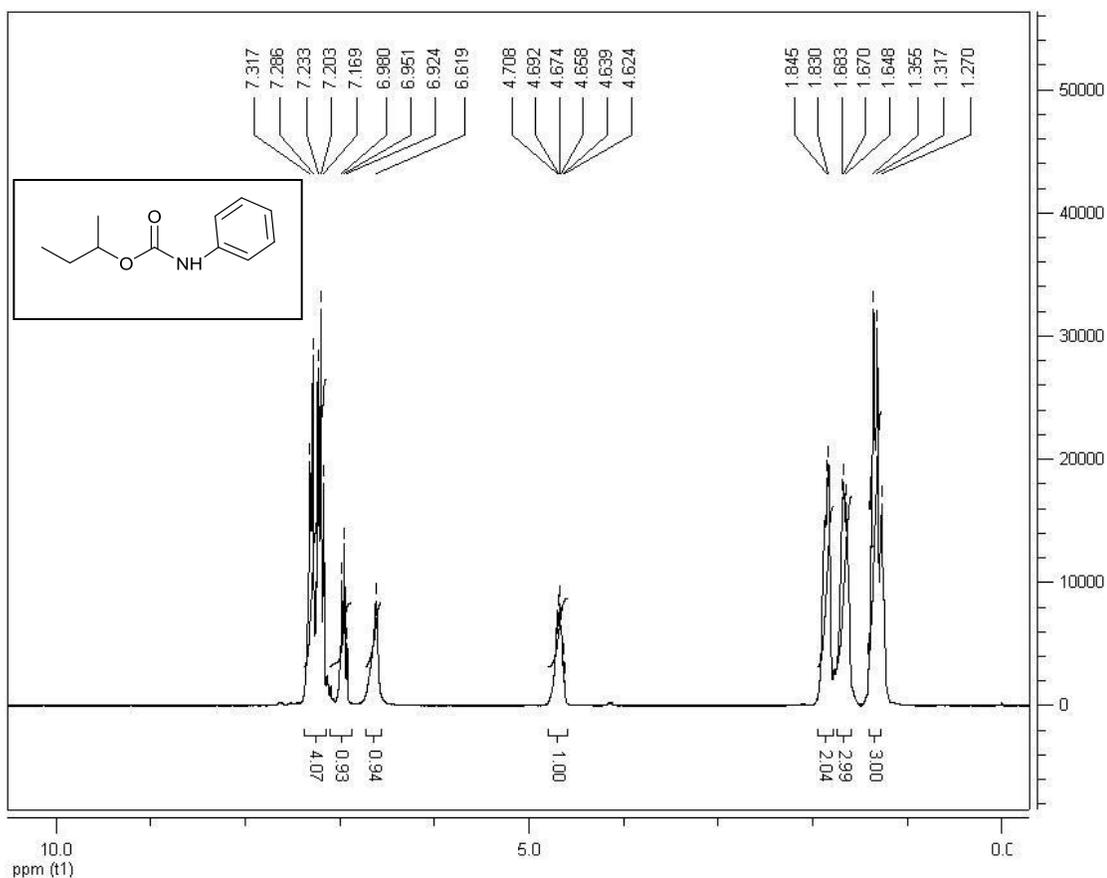
**Figure S16.** MS of 1-butyl phenylcarbamate



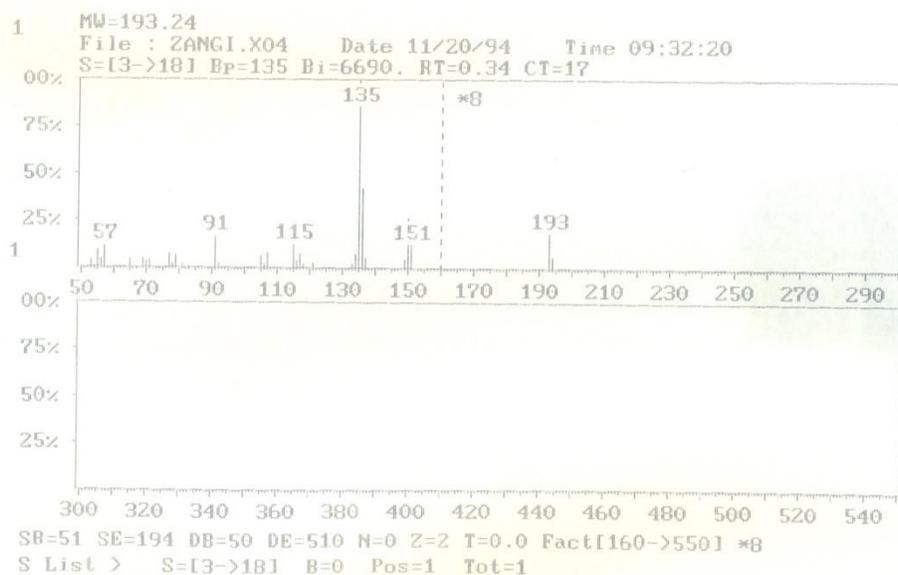
**Figure S17.** FT-IR spectra of 2-butyl phenylcarbamate in KBr



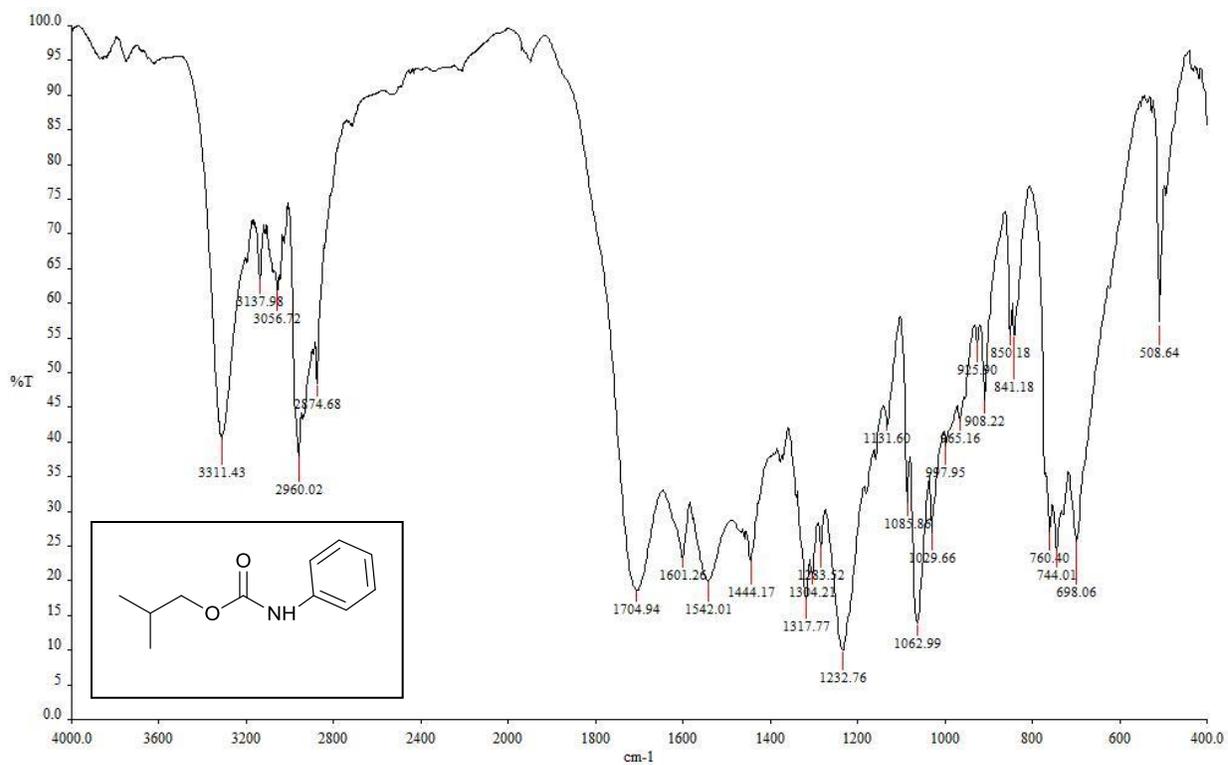
**Figure S18.** <sup>13</sup>C-NMR spectra (63 MHz) of 2-butyl phenylcarbamate in CDCl<sub>3</sub>



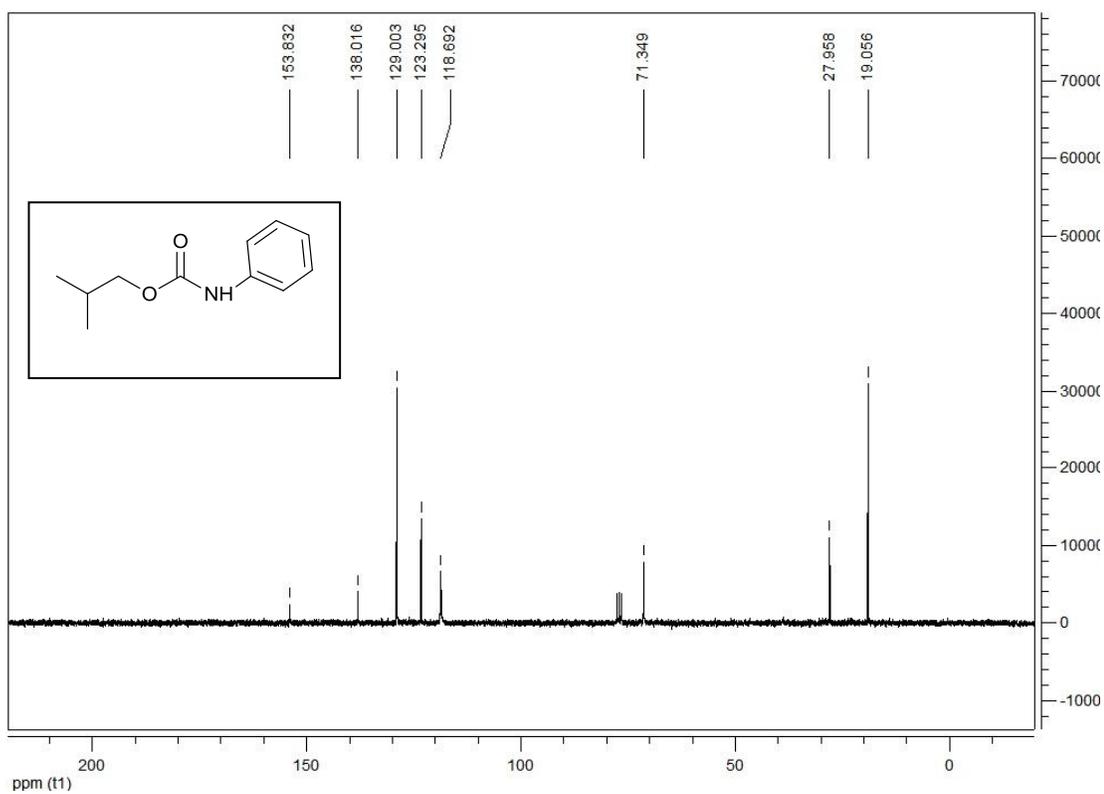
**Figure S19.**  $^1\text{H-NMR}$  spectra (250 MHz) of 2-butyl phenylcarbamate in  $\text{CDCl}_3$



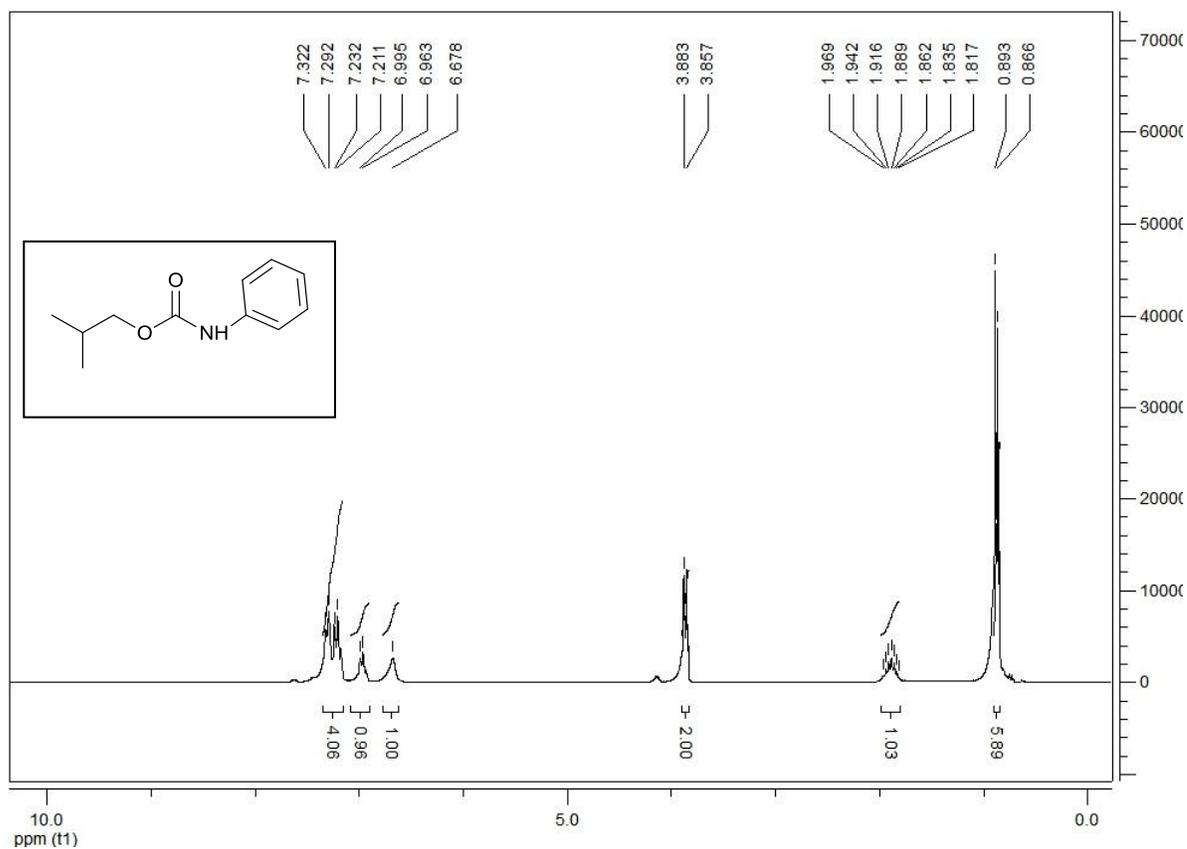
**Figure S20.** MS of 2-butyl phenylcarbamate



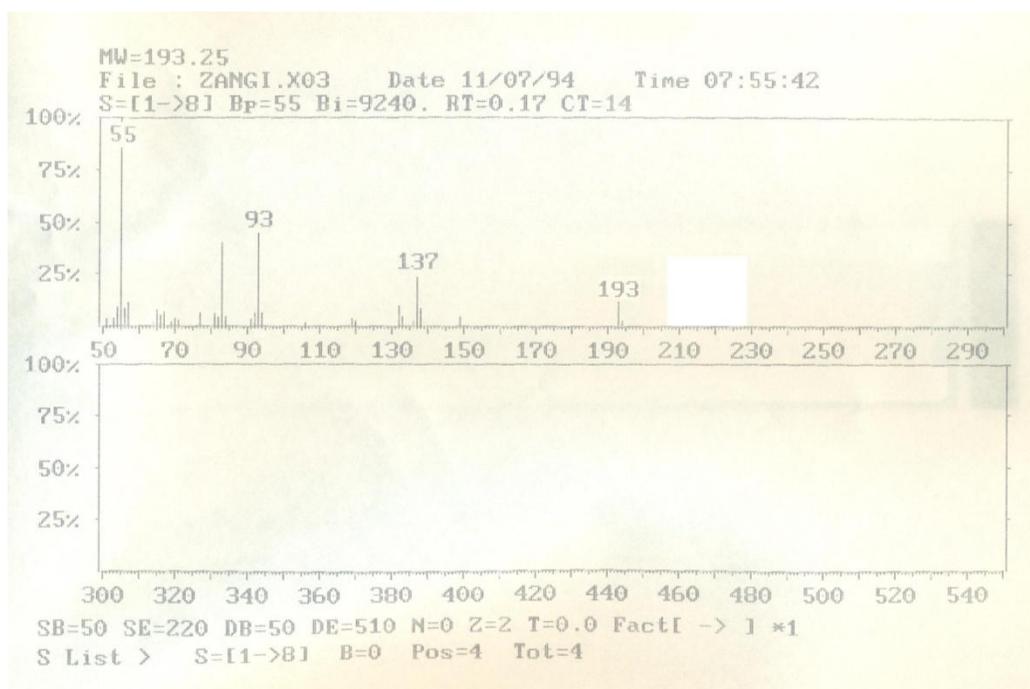
**Figure S21.** FT-IR spectra of *iso*-butyl phenylcarbamate in KBr



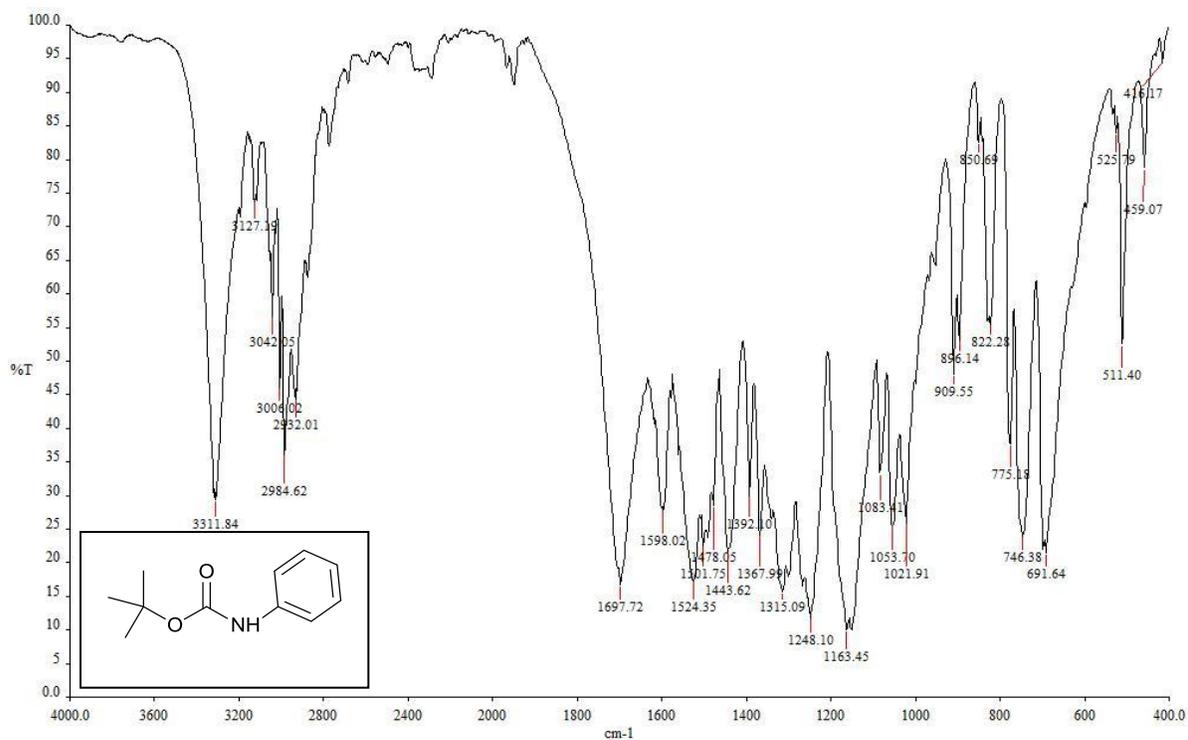
**Figure S22.**  $^{13}\text{C}$ -NMR spectra (63 MHz) of *iso*-butyl phenylcarbamate in  $\text{CDCl}_3$



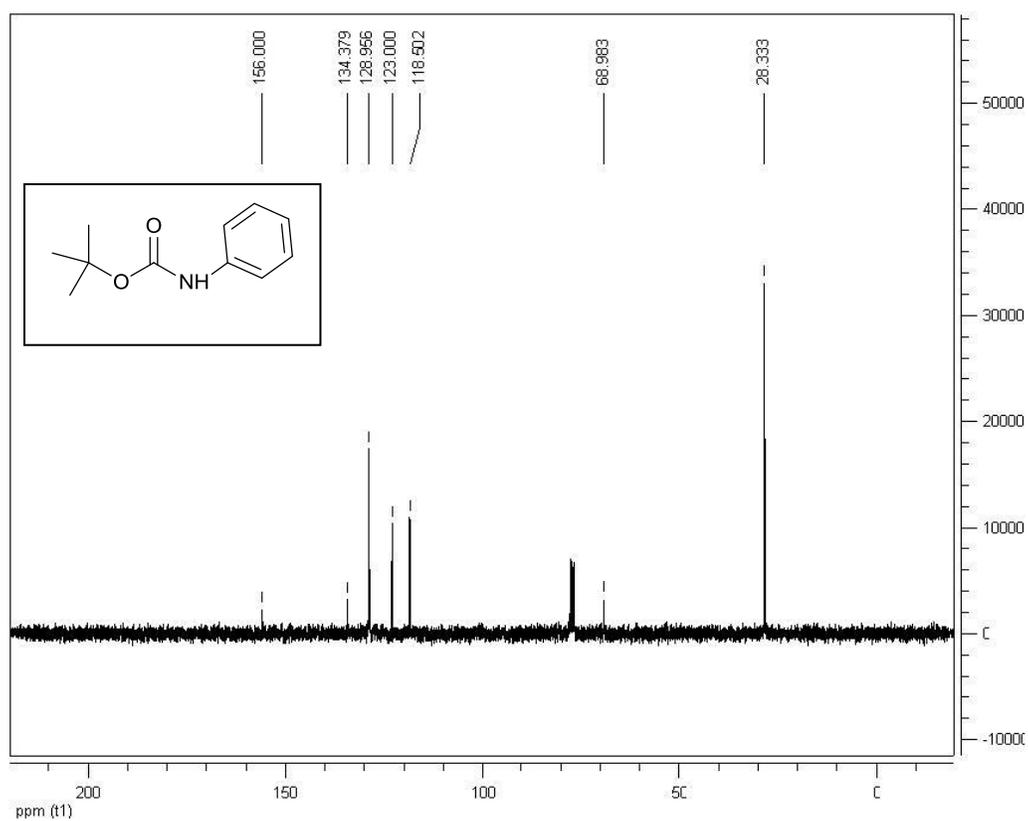
**Figure S23.**  $^1\text{H-NMR}$  spectra (250 MHz) of *iso*-butyl phenylcarbamate in  $\text{CDCl}_3$



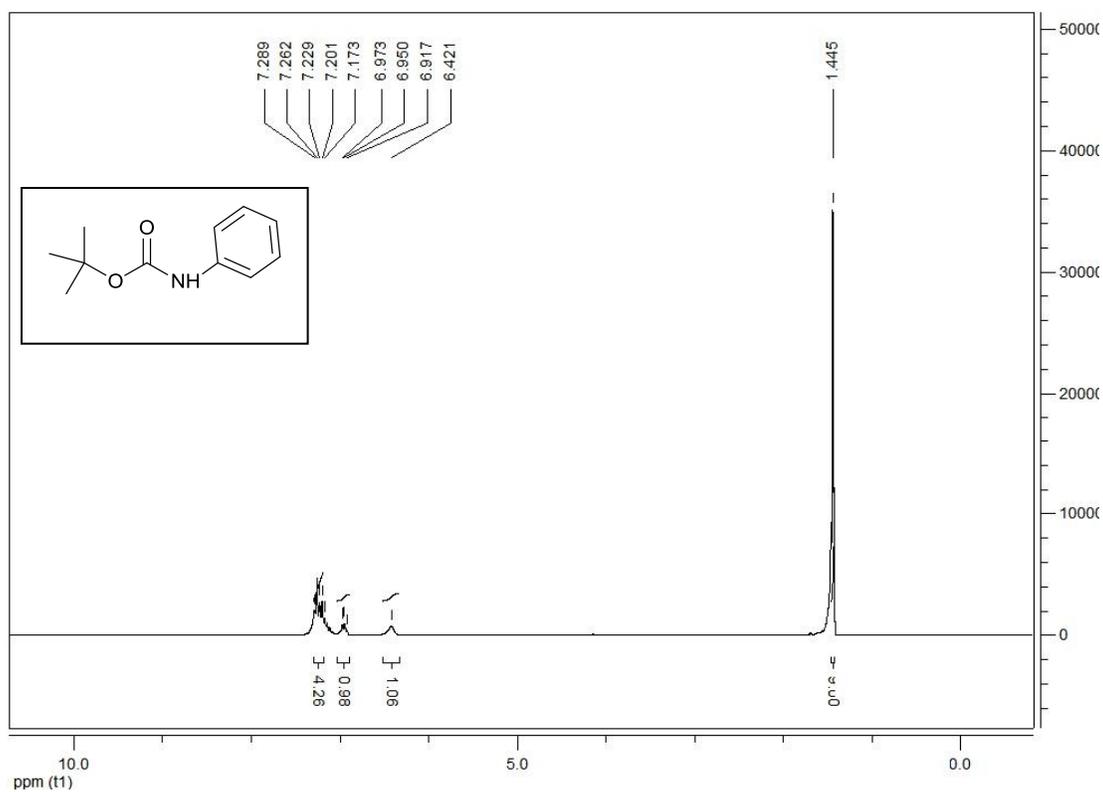
**Figure S24.** MS of *iso*-butyl phenylcarbamate



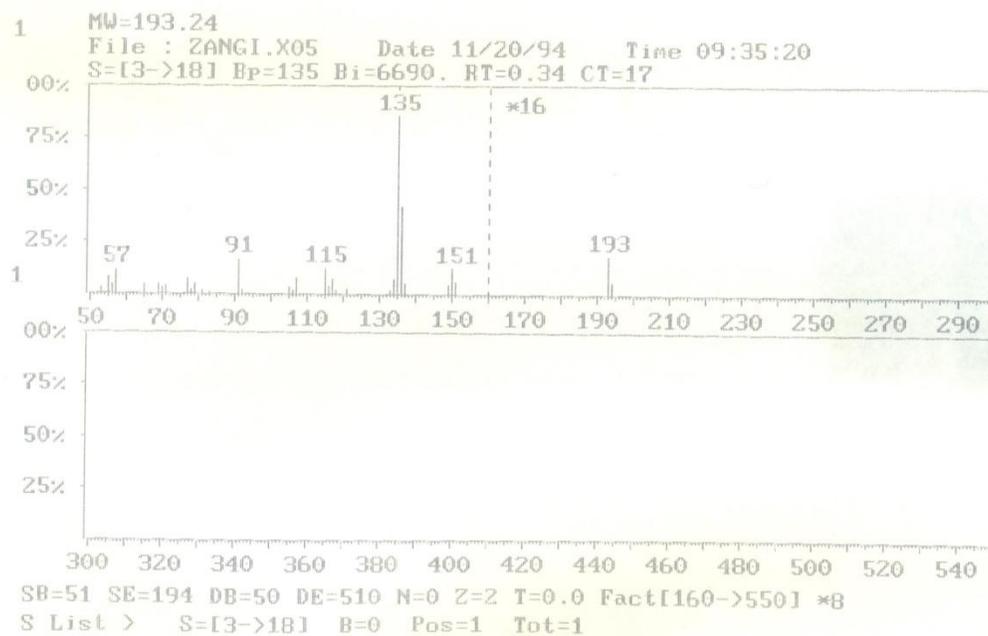
**Figure S25.** FT-IR spectra of *tert*-butyl phenylcarbamate in KBr



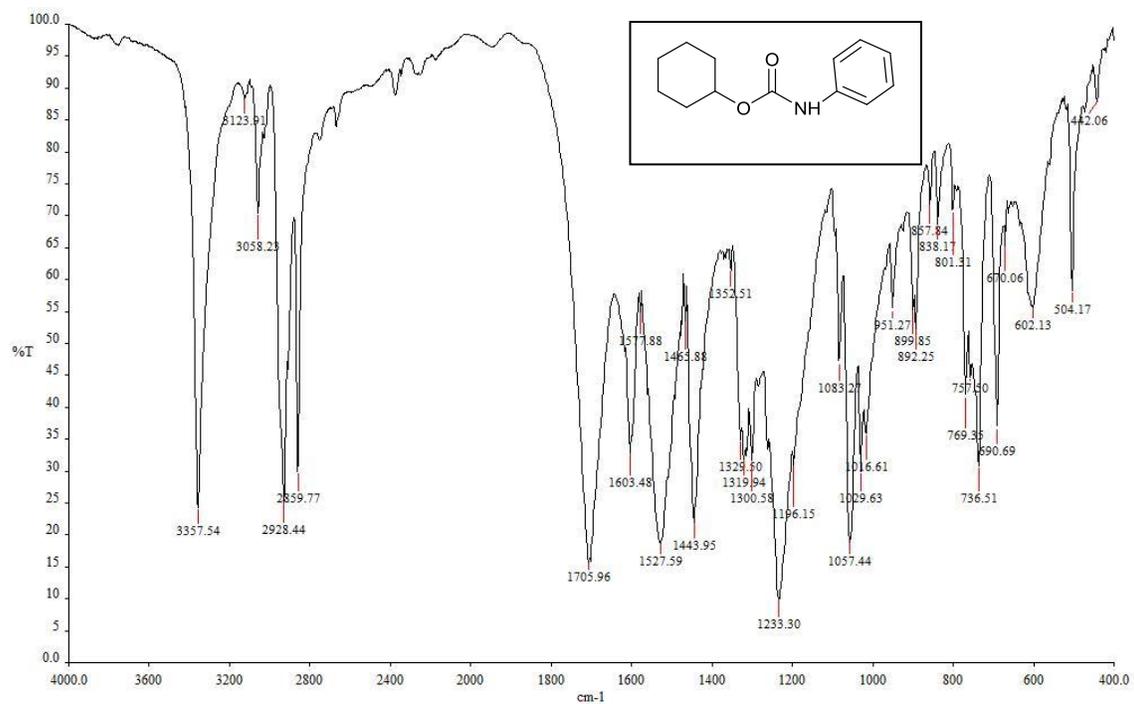
**Figure S26.** <sup>13</sup>C-NMR spectra (63 MHz) of *tert*-butyl phenylcarbamate in CDCl<sub>3</sub>



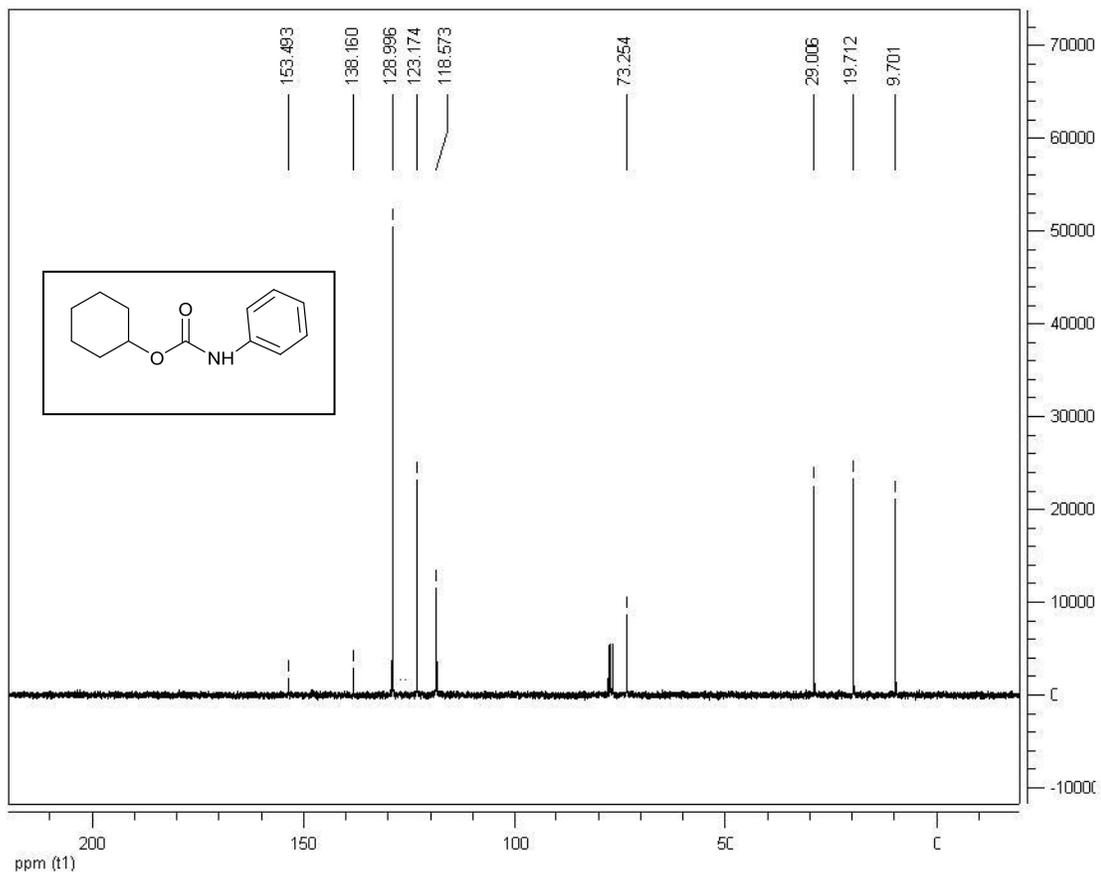
**Figure S27.**  $^1\text{H-NMR}$  spectra (250 MHz) of *tert*-butyl phenylcarbamate in  $\text{CDCl}_3$



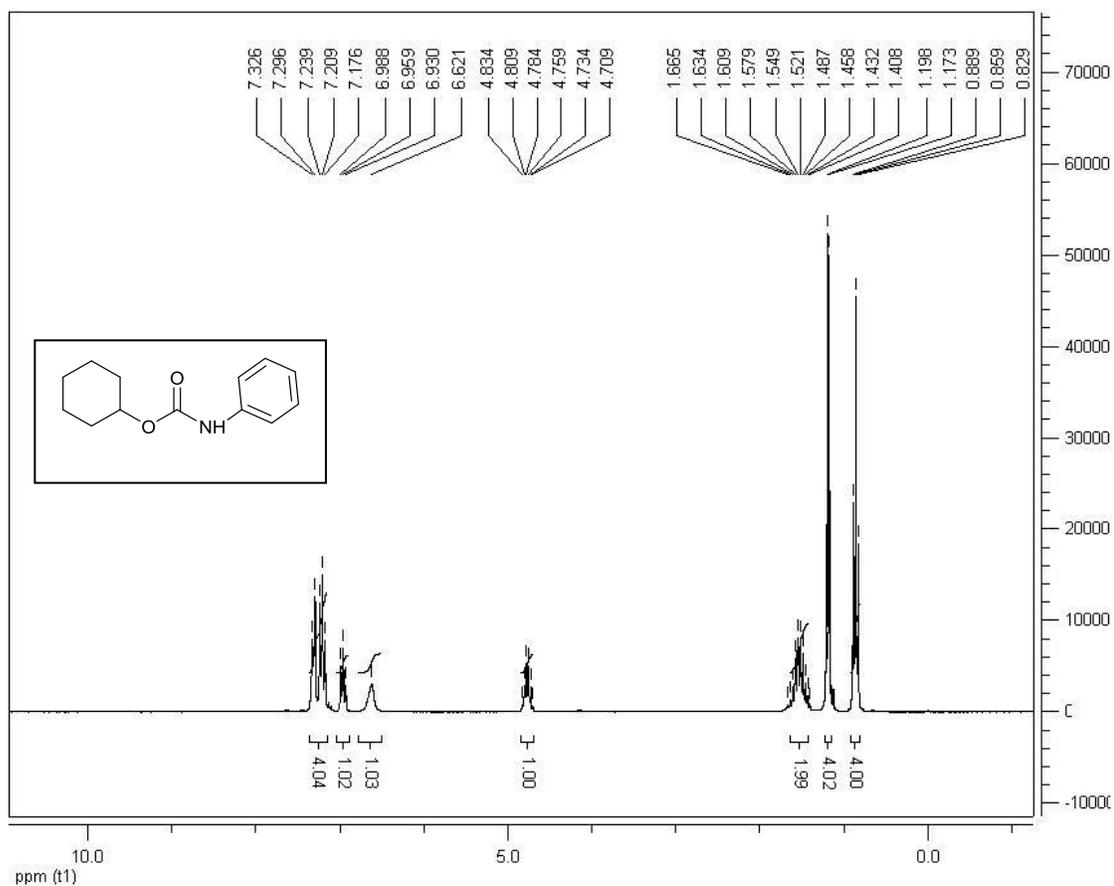
**Figure S28.** MS of *tert*-butyl phenylcarbamate



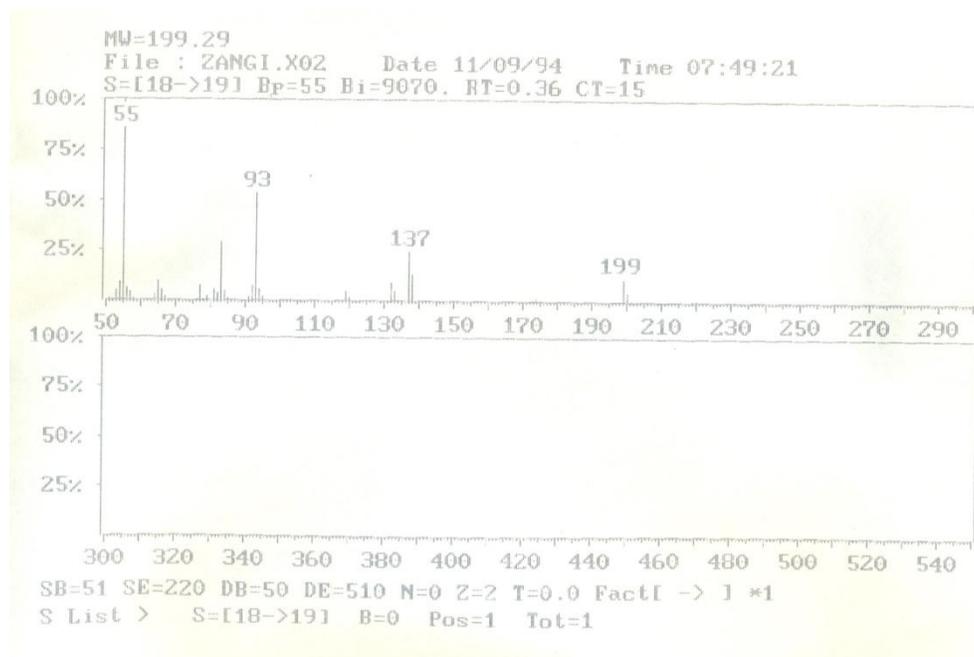
**Figure S29.** FT-IR spectra of cyclohexyl phenylcarbamate in KBr



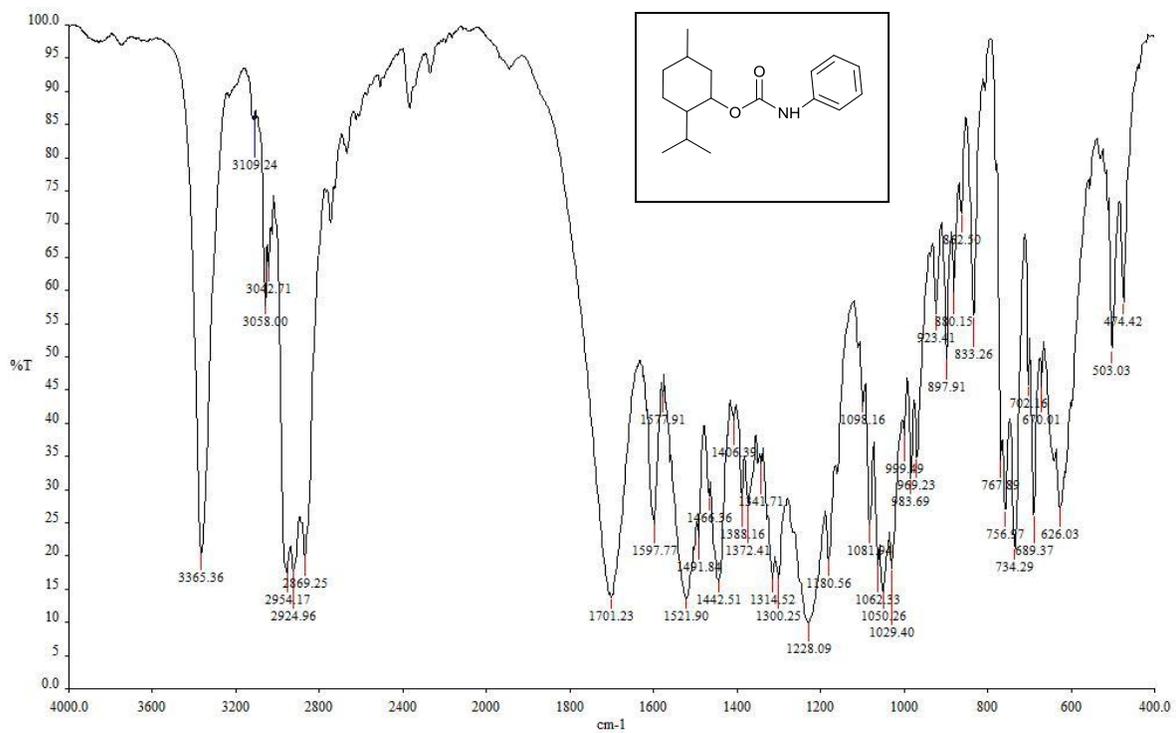
**Figure S30.**  $^{13}\text{C}$ -NMR spectra (63 MHz) of cyclohexyl phenylcarbamate in  $\text{CDCl}_3$



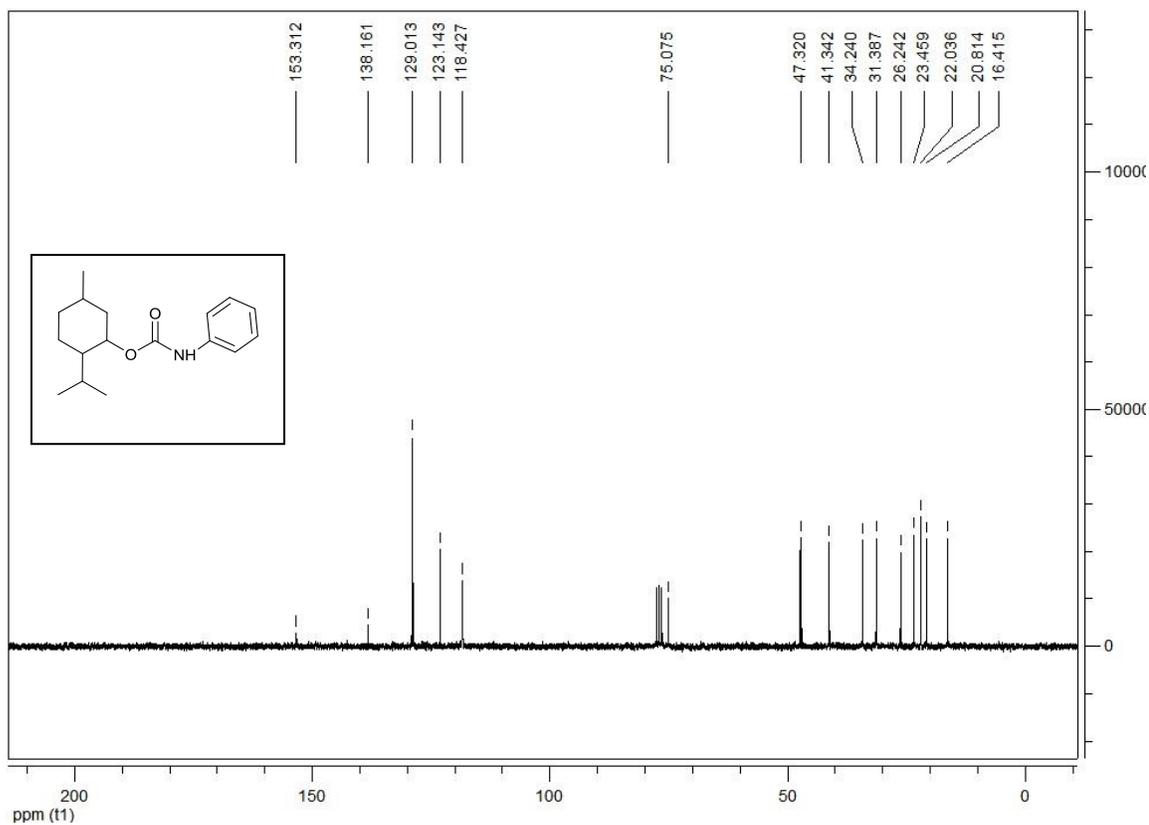
**Figure S31.**  $^1\text{H-NMR}$  spectra (250 MHz) of cyclohexyl phenylcarbamate in  $\text{CDCl}_3$



**Figure S32.** MS of cyclohexyl phenylcarbamate



**Figure S33.** FT-IR spectra of (-) menthyl phenylcarbamate in KBr



**Figure S34.** <sup>13</sup>C-NMR spectra (63 MHz) of (-) menthyl phenylcarbamate in CDCl<sub>3</sub>

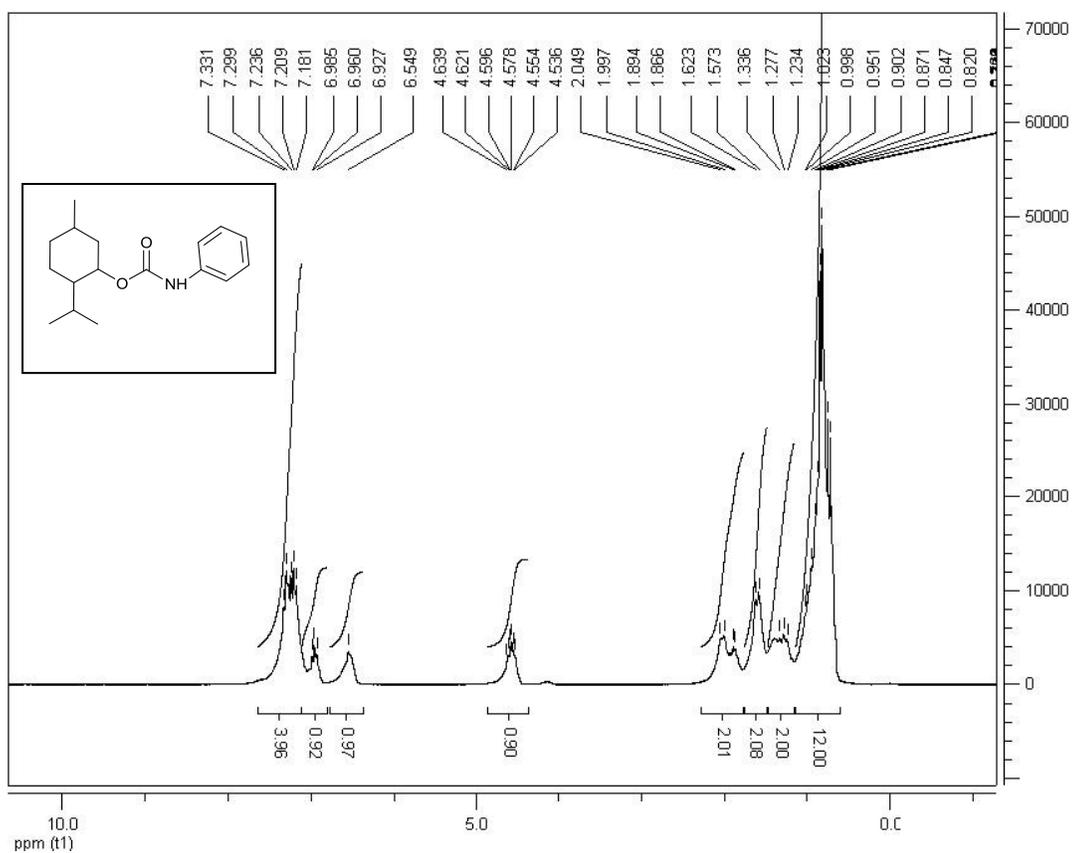


Figure S35. <sup>1</sup>H-NMR spectra (250 MHz) of (-) menthyl phenylcarbamate in CDCl<sub>3</sub>

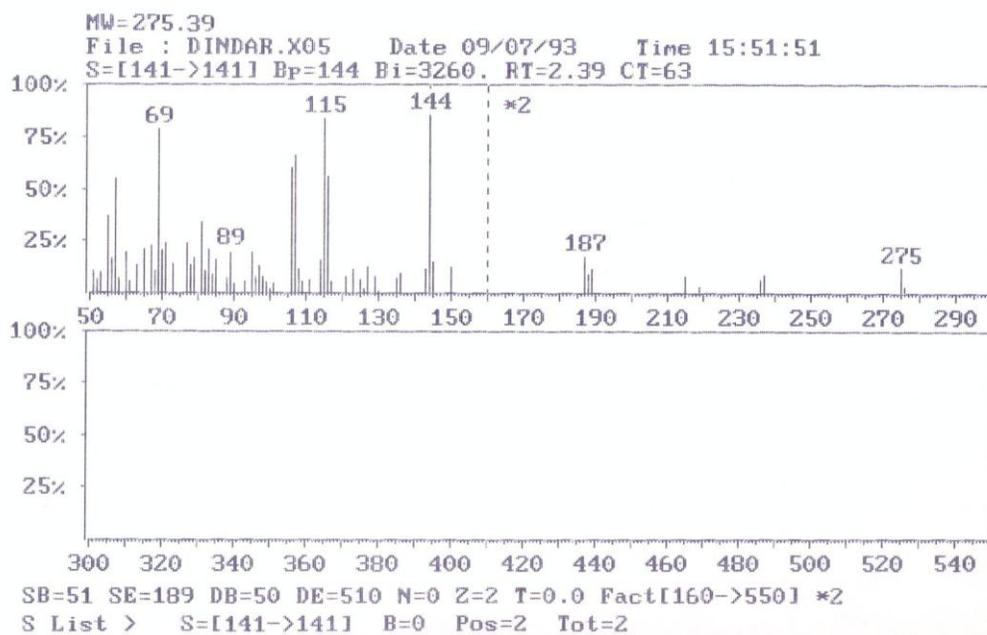
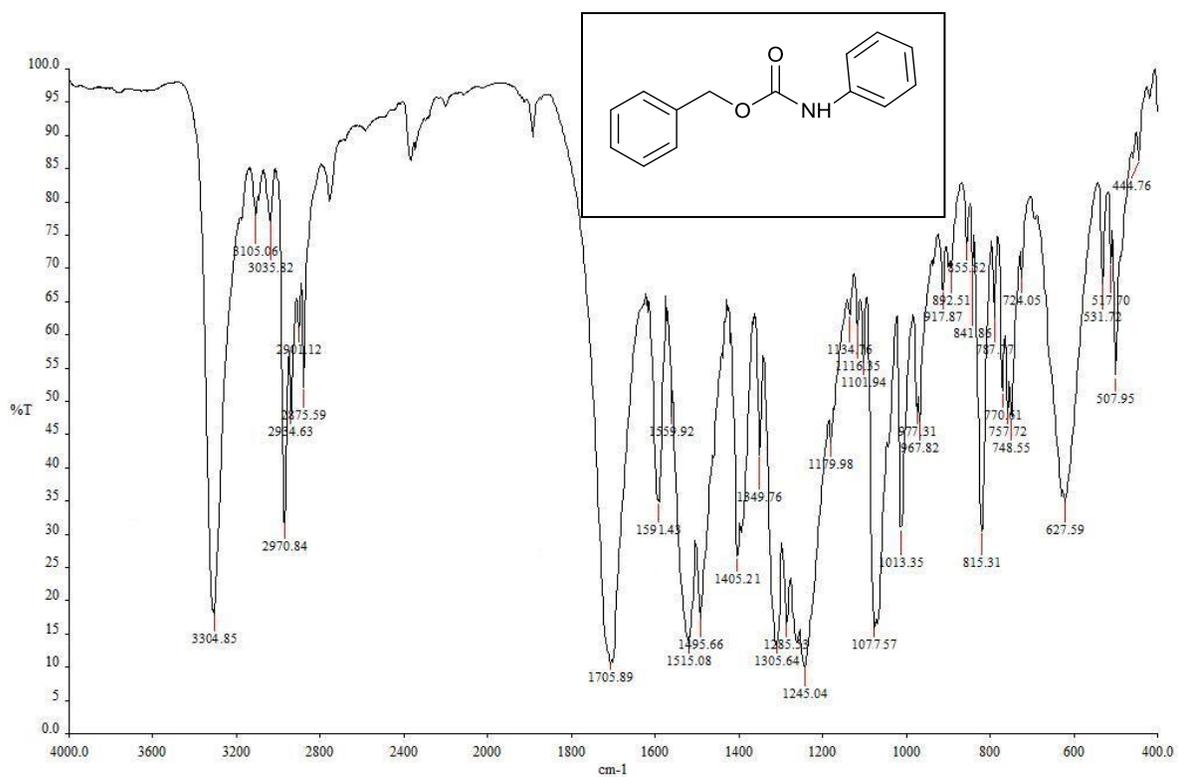
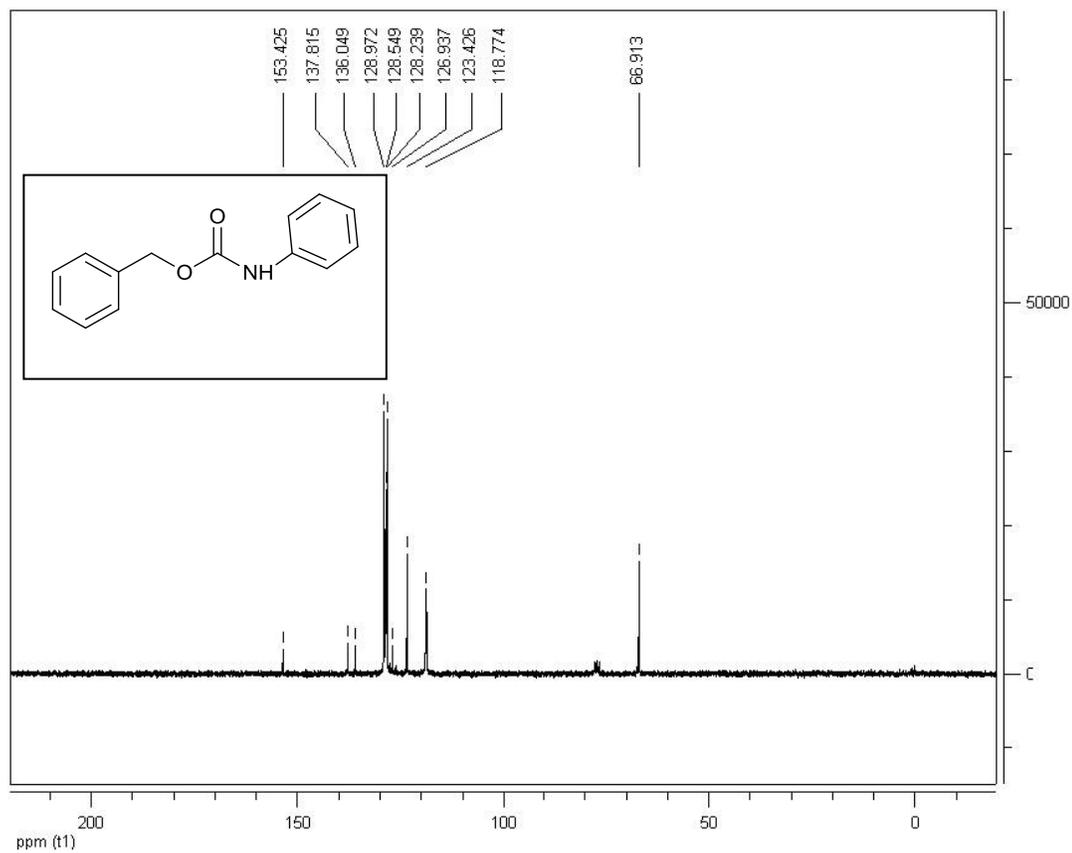


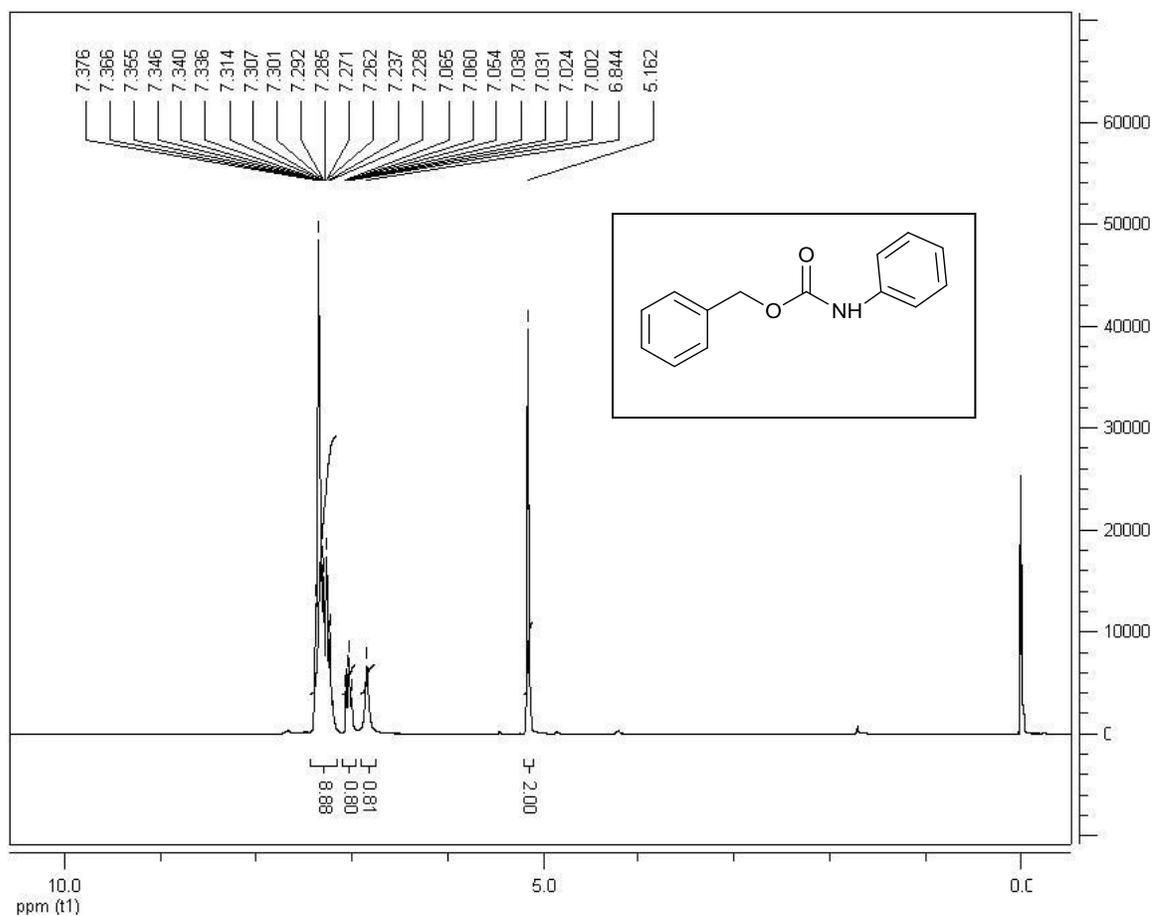
Figure S36. MS of (-) menthyl phenylcarbamate



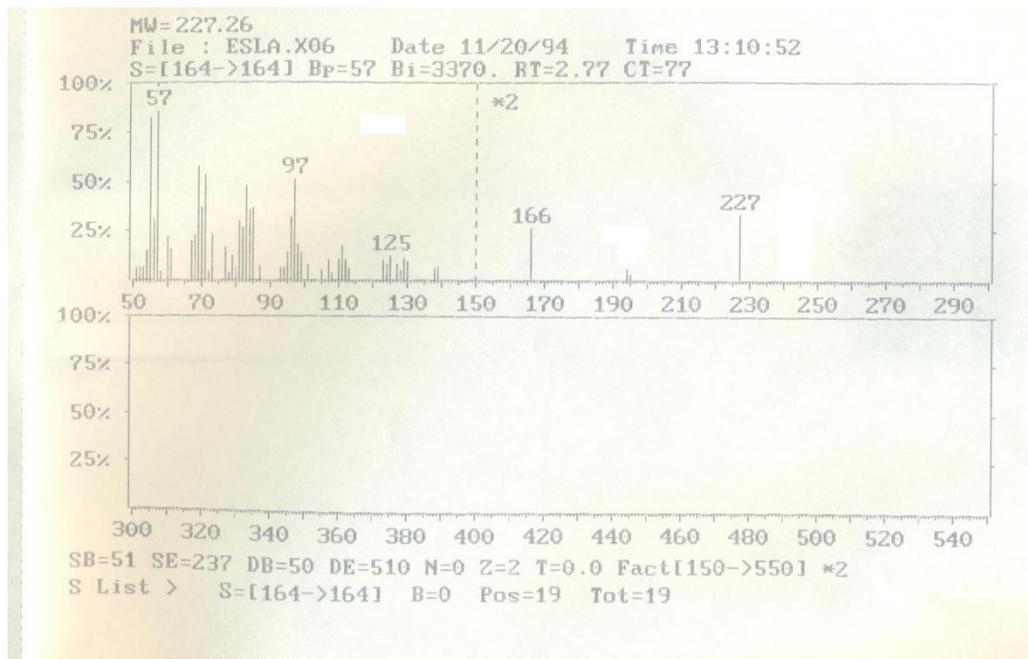
**Figure S37.** FT-IR spectra of benzyl phenylcarbamate in KBr



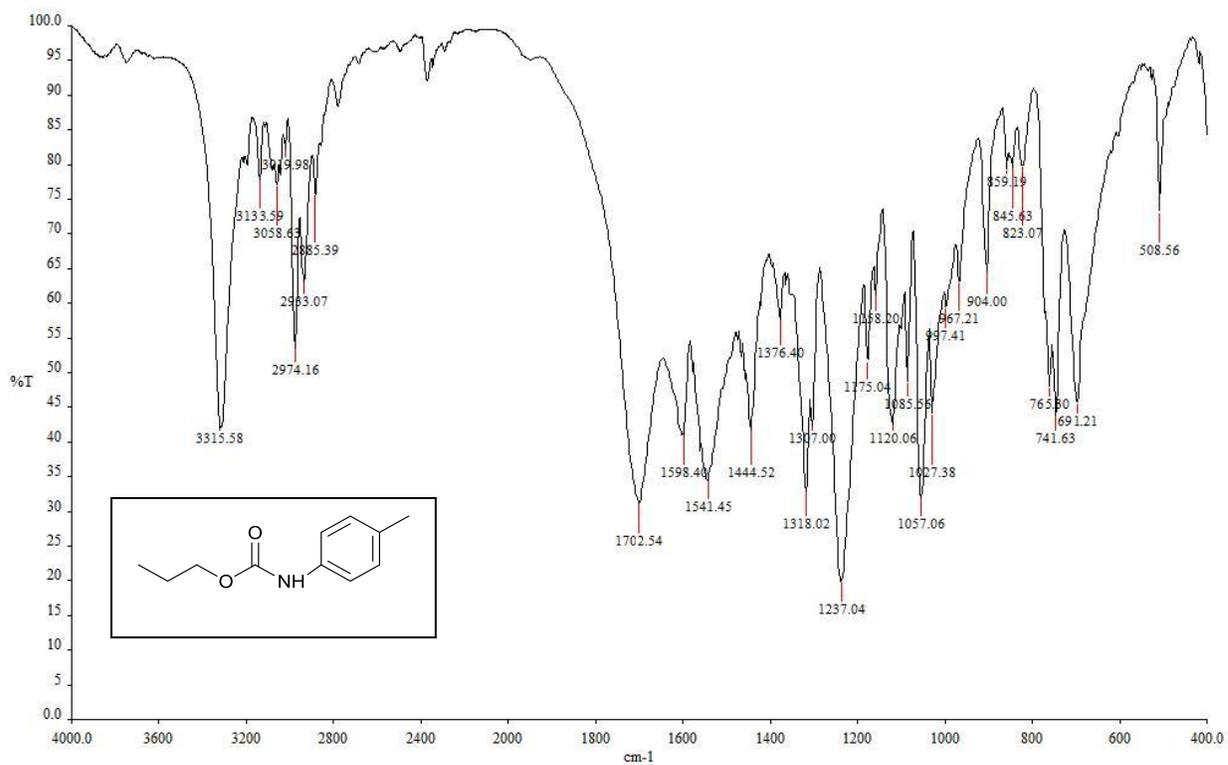
**Figure S38.** <sup>13</sup>C-NMR spectra (63 MHz) of benzyl phenylcarbamate in CDCl<sub>3</sub>



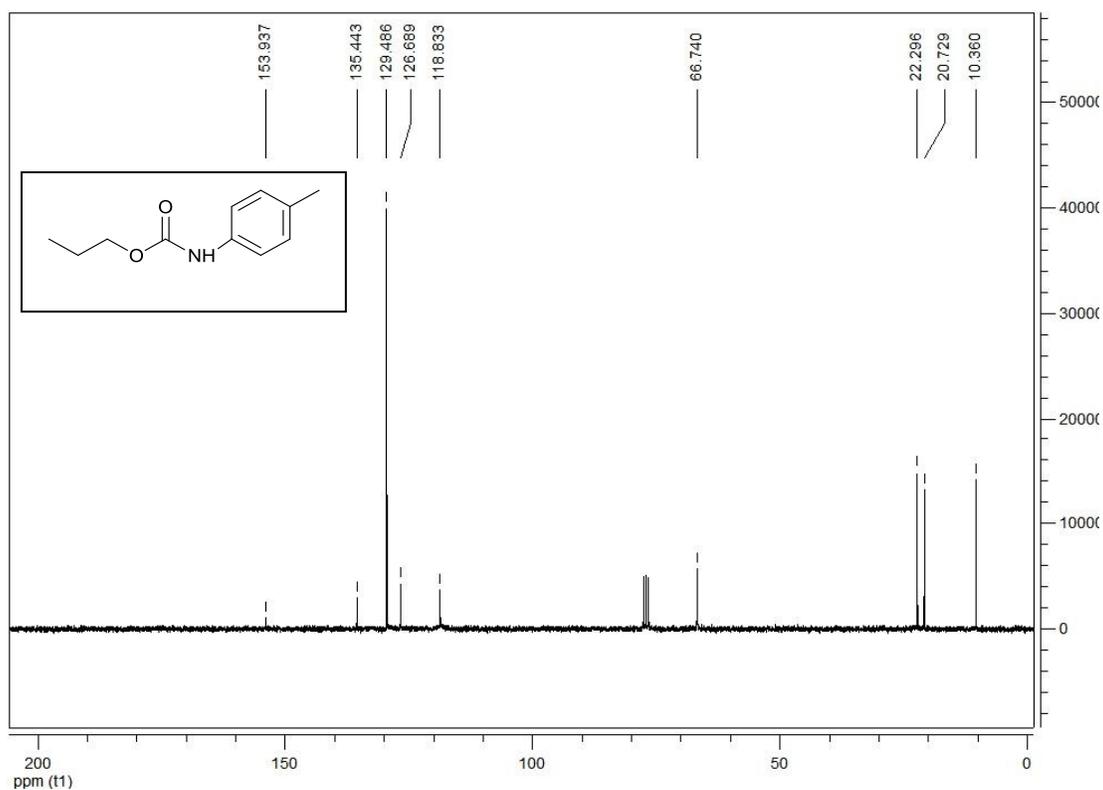
**Figure S39.**  $^1\text{H-NMR}$  spectra (250 MHz) of benzyl phenylcarbamate in  $\text{CDCl}_3$



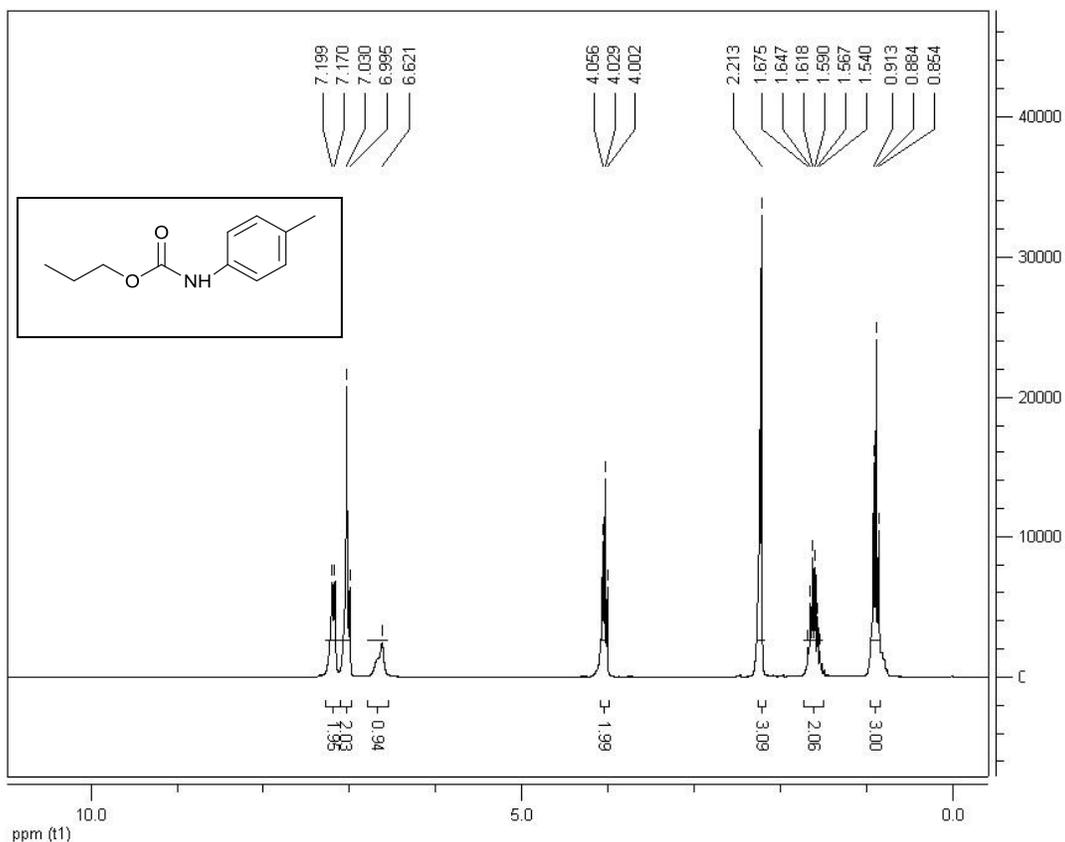
**Figure S40.** MS of benzyl phenylcarbamate



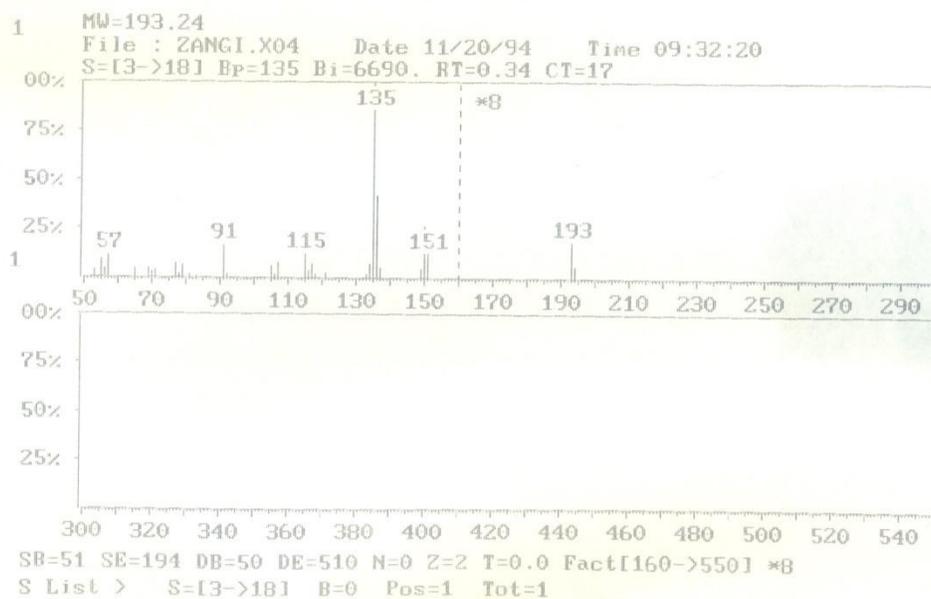
**Figure S41.** FT-IR spectra of propyl (4-methylphenyl)carbamate in KBr



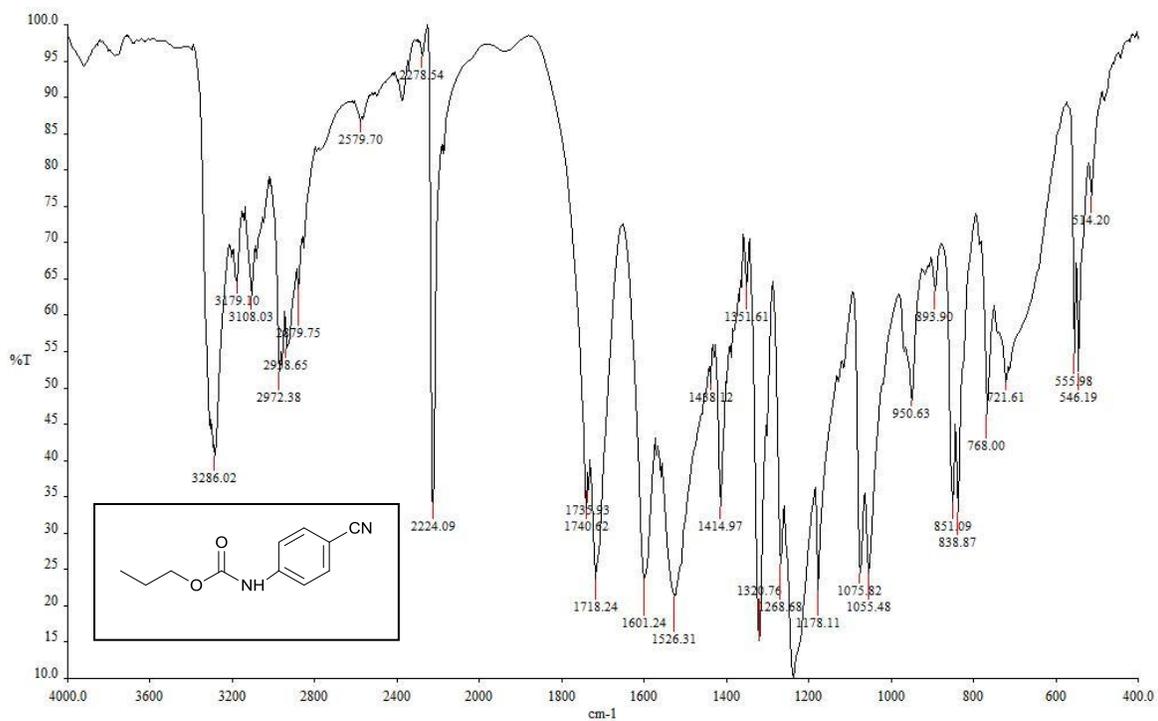
**Figure S42.** <sup>13</sup>C-NMR spectra (63 MHz) of propyl (4-methylphenyl)carbamate in CDCl<sub>3</sub>



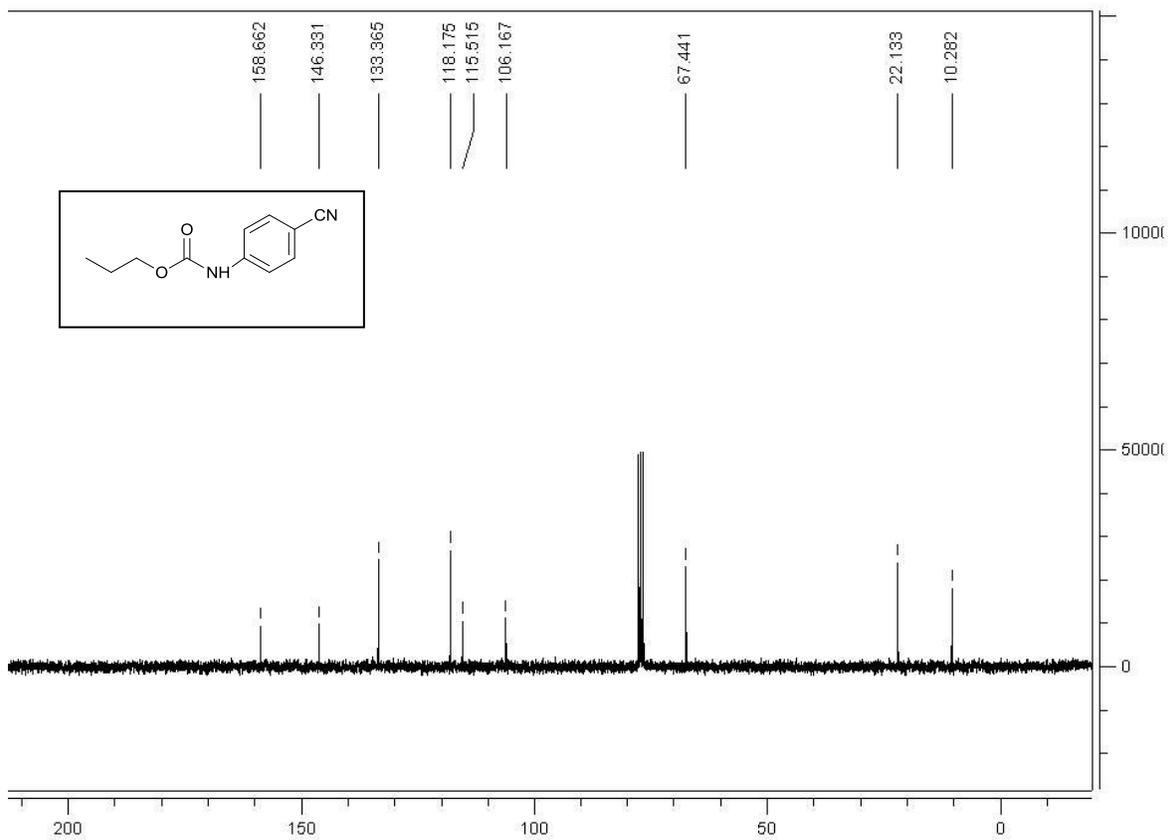
**Figure S43.**  $^1\text{H-NMR}$  spectra (250 MHz) of propyl (4-methylphenyl)carbamate in  $\text{CDCl}_3$



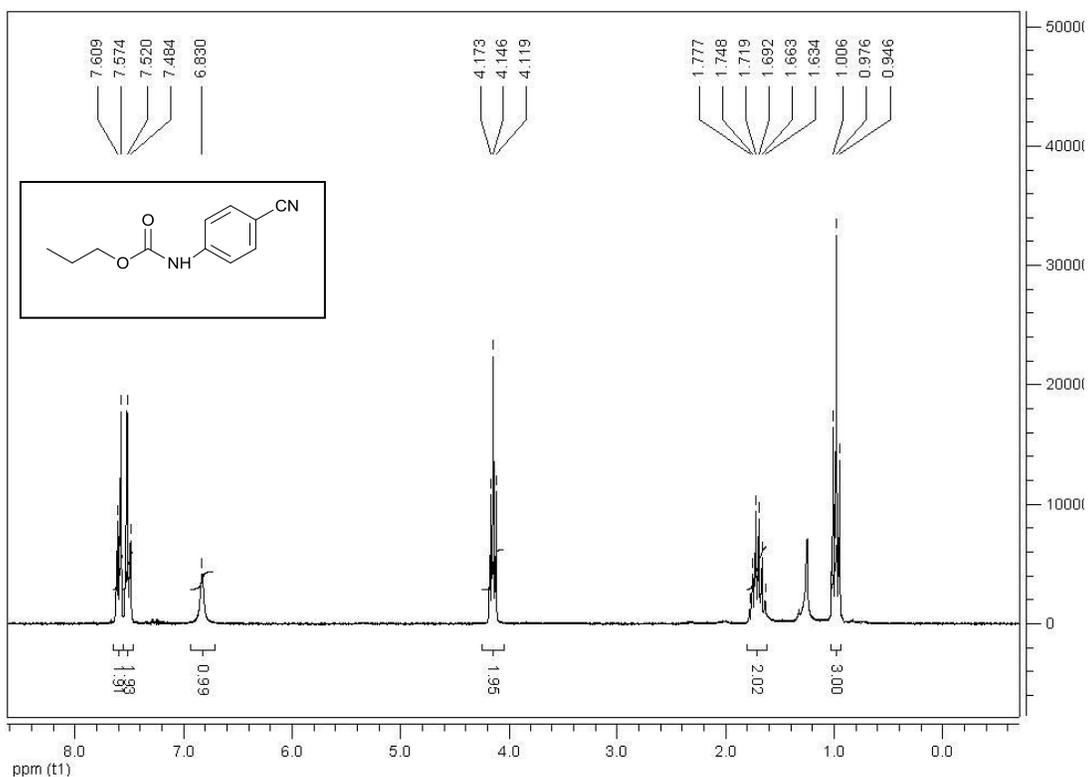
**Figure S44.** MS of propyl (4-methylphenyl)carbamate



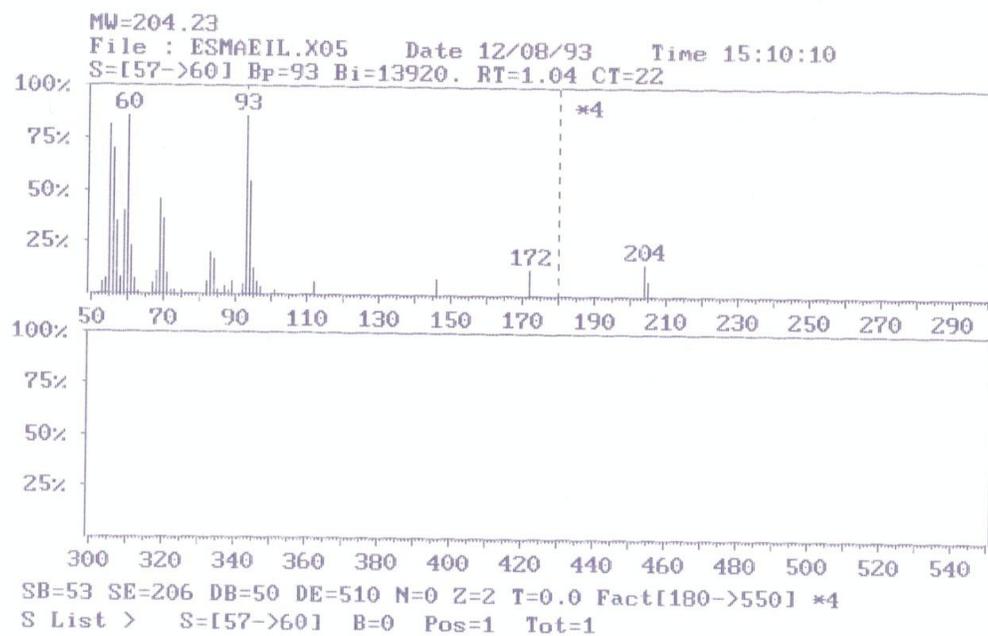
**Figure S45.** FT-IR spectra of propyl (4-cyanophenyl)carbamate in KBr



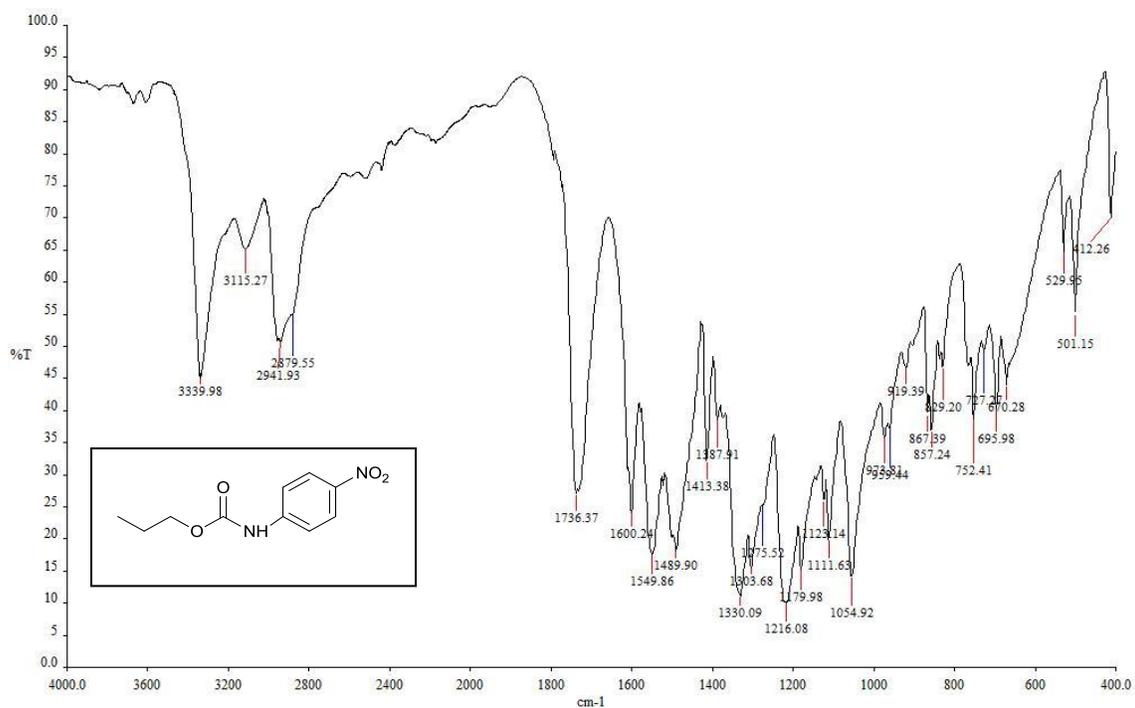
**Figure S46.** <sup>13</sup>C-NMR spectra (63 MHz) of propyl (4-cyanophenyl)carbamate in CDCl<sub>3</sub>



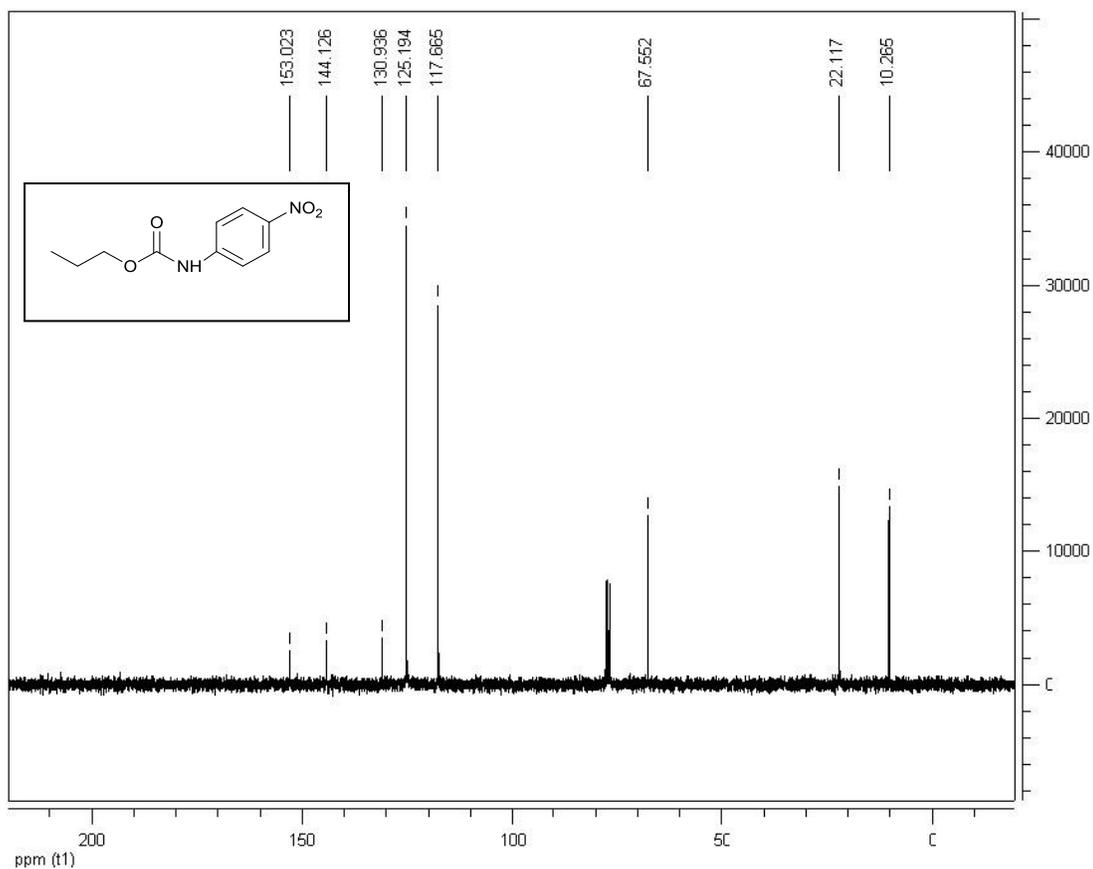
**Figure S47.**  $^1\text{H-NMR}$  spectra (250 MHz) of propyl (4-cyanophenyl)carbamate in  $\text{CDCl}_3$



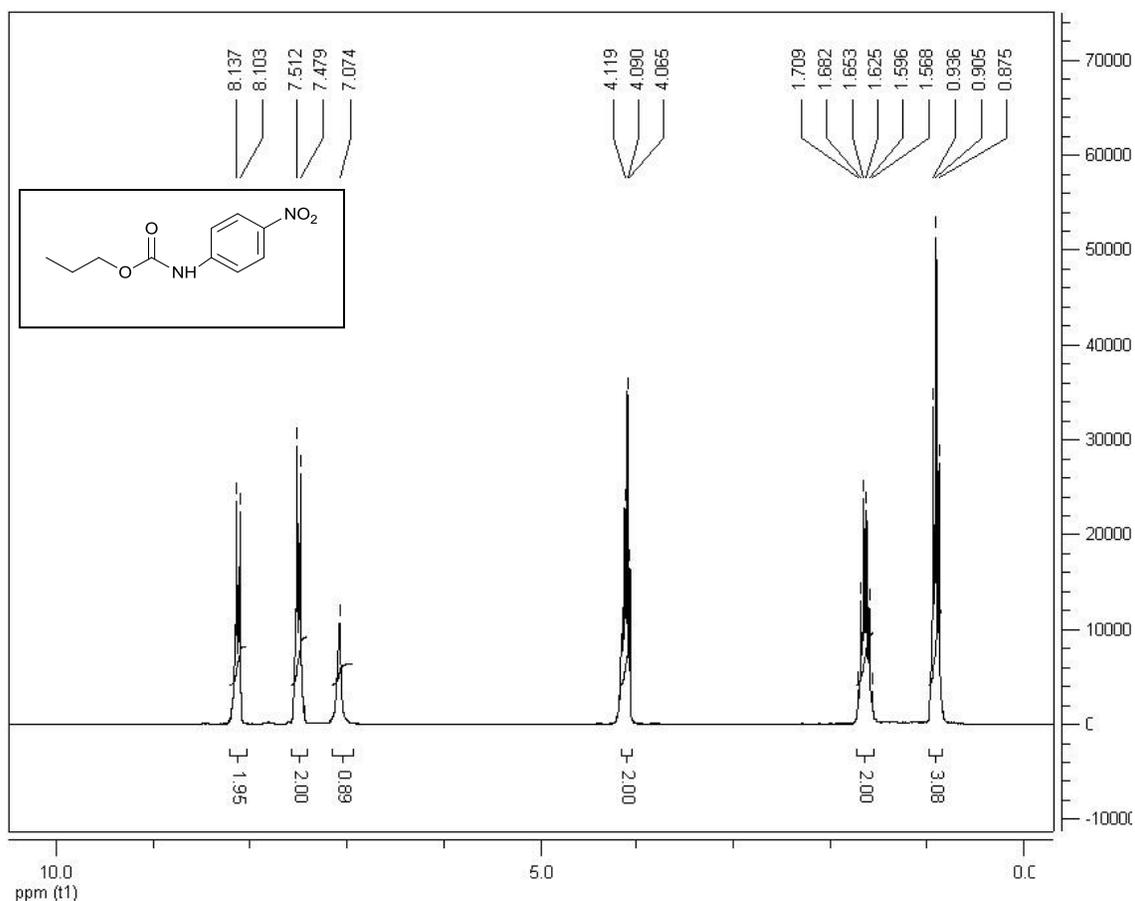
**Figure S48.** MS of propyl (4-cyanophenyl)carbamate



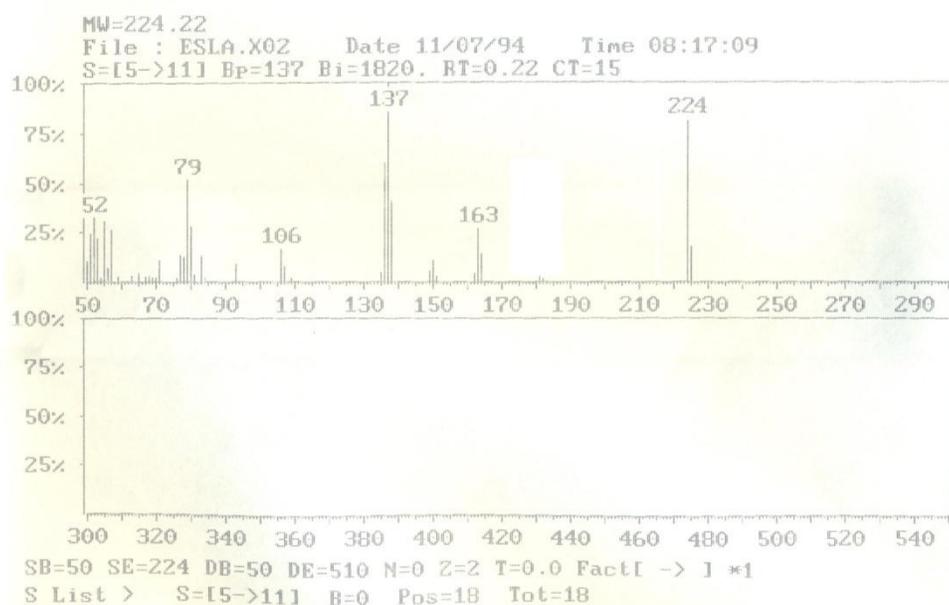
**Figure S49.** FT-IR spectra of propyl (4-nitrophenyl)carbamate in KBr



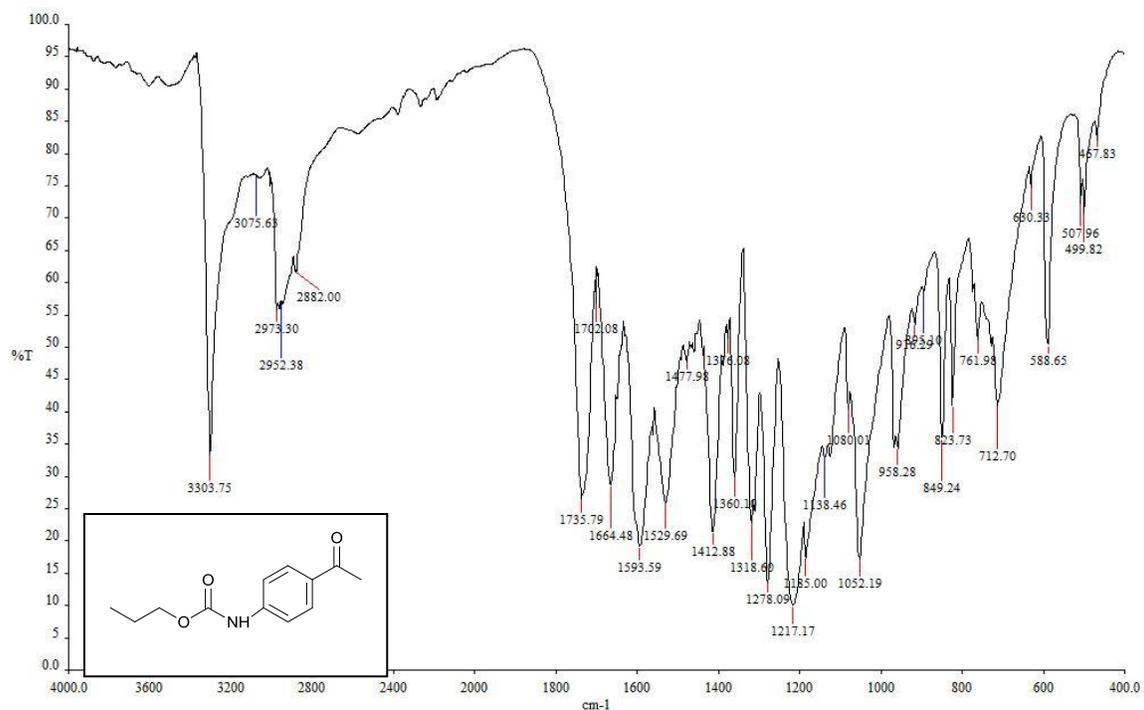
**Figure S50.** <sup>13</sup>C-NMR spectra (63 MHz) of propyl (4-nitrophenyl)carbamate in CDCl<sub>3</sub>



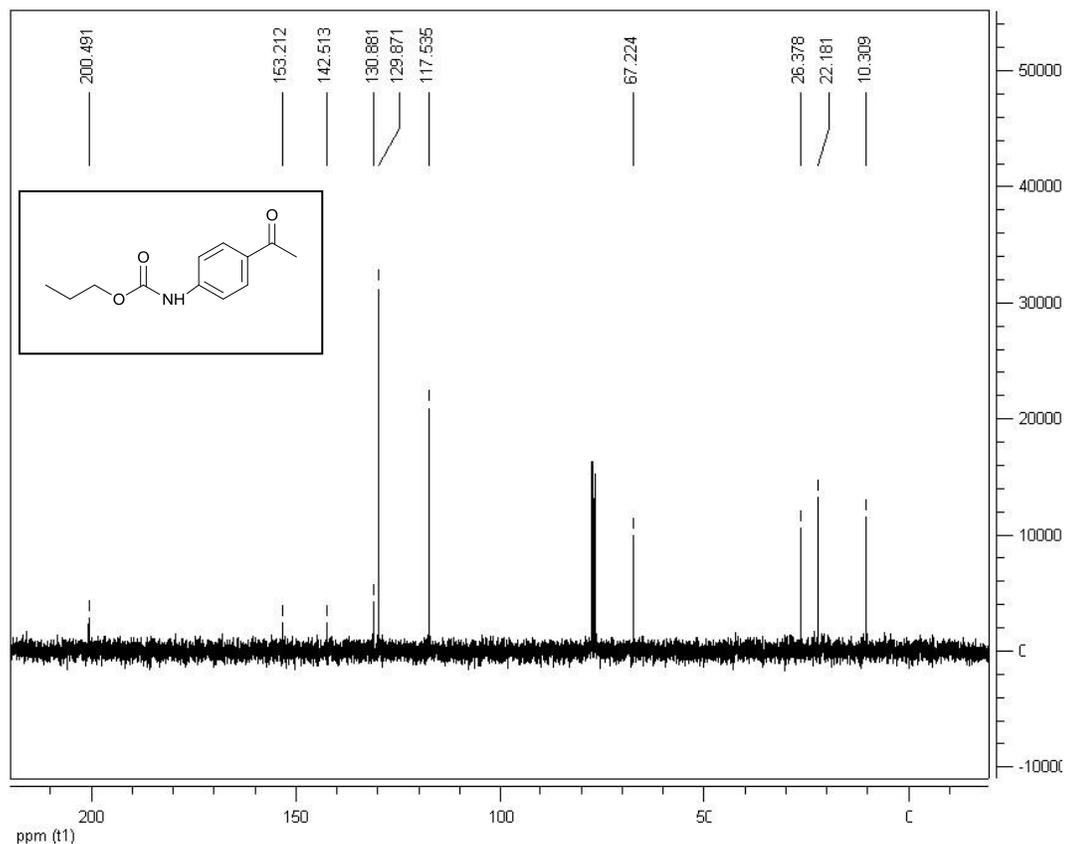
**Figure S51.**  $^1\text{H-NMR}$  spectra (250 MHz) of propyl (4-nitrophenyl)carbamate in  $\text{CDCl}_3$



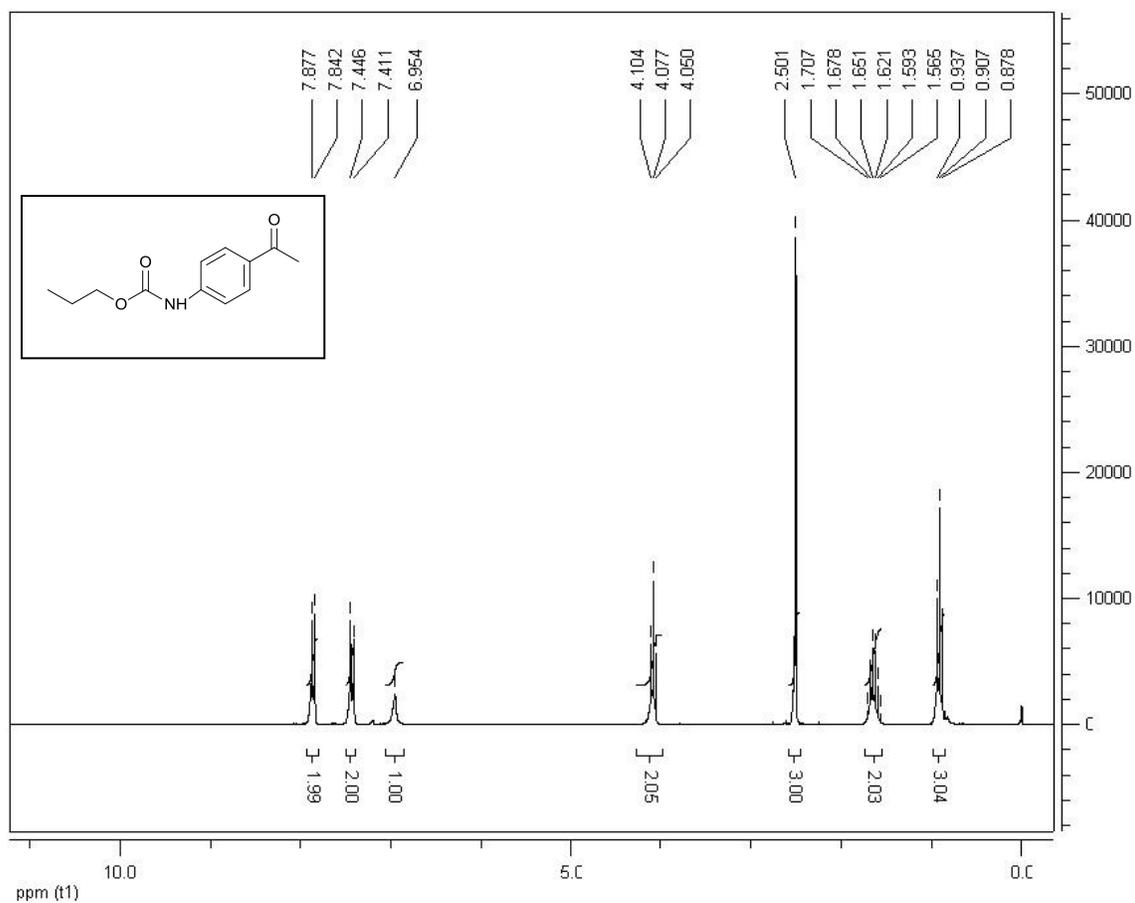
**Figure S52.** MS of propyl (4-nitrophenyl)carbamate



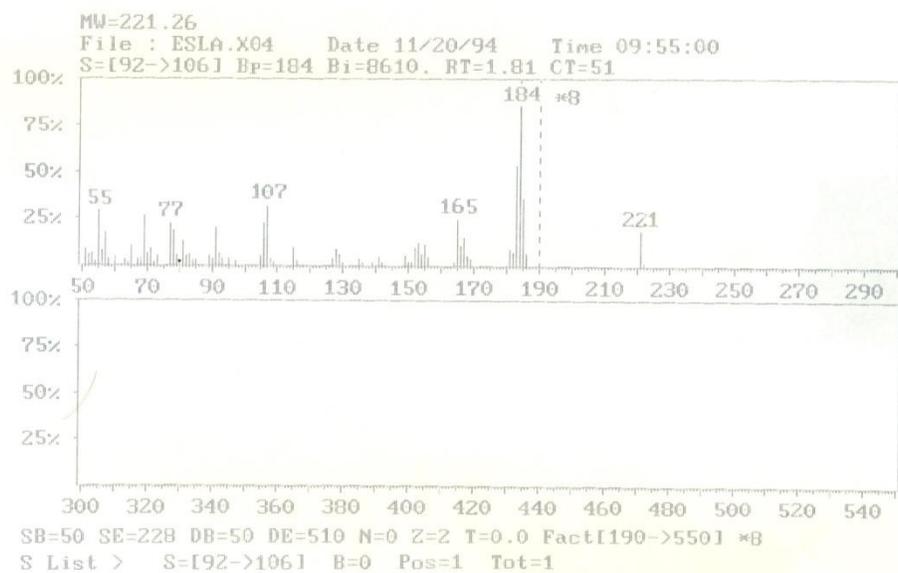
**Figure S53.** FT-IR spectra of propyl (4-acetylphenyl)carbamate in KBr



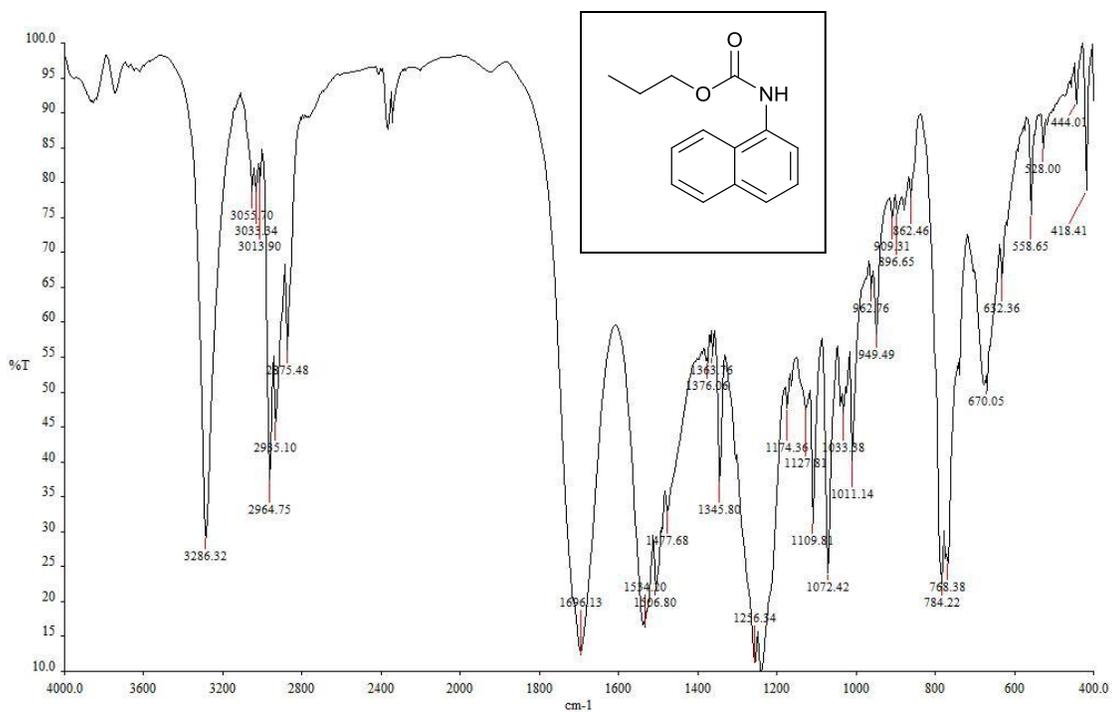
**Figure S54.** <sup>13</sup>C-NMR spectra (63 MHz) of propyl (4-acetylphenyl)carbamate in CDCl<sub>3</sub>



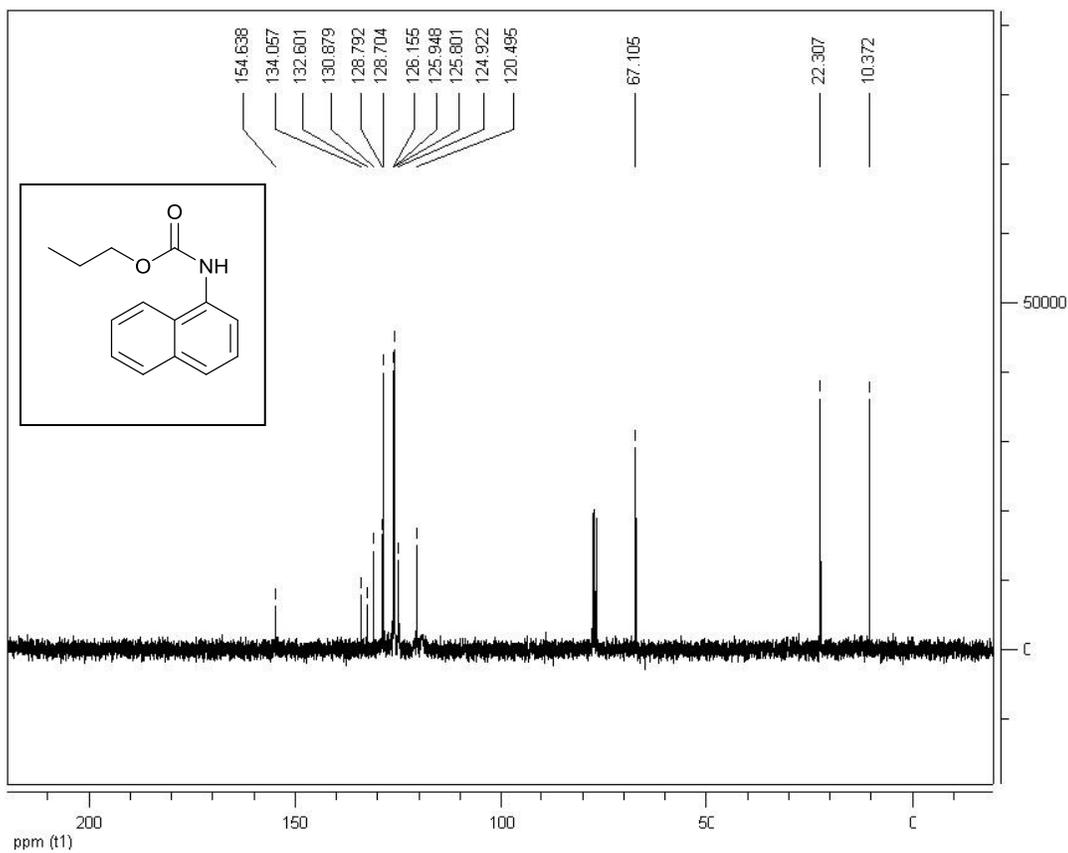
**Figure S55.**  $^1\text{H-NMR}$  spectra (250 MHz) of propyl (4-acetylphenyl)carbamate in  $\text{CDCl}_3$



**Figure S56.** MS of propyl (4-acetylphenyl)carbamate



**Figure S57.** FT-IR spectra of propyl (naphthalen-1-yl)carbamate in KBr



**Figure S58.** <sup>13</sup>C-NMR spectra (63 MHz) of propyl (naphthalen-1-yl)carbamate in CDCl<sub>3</sub>

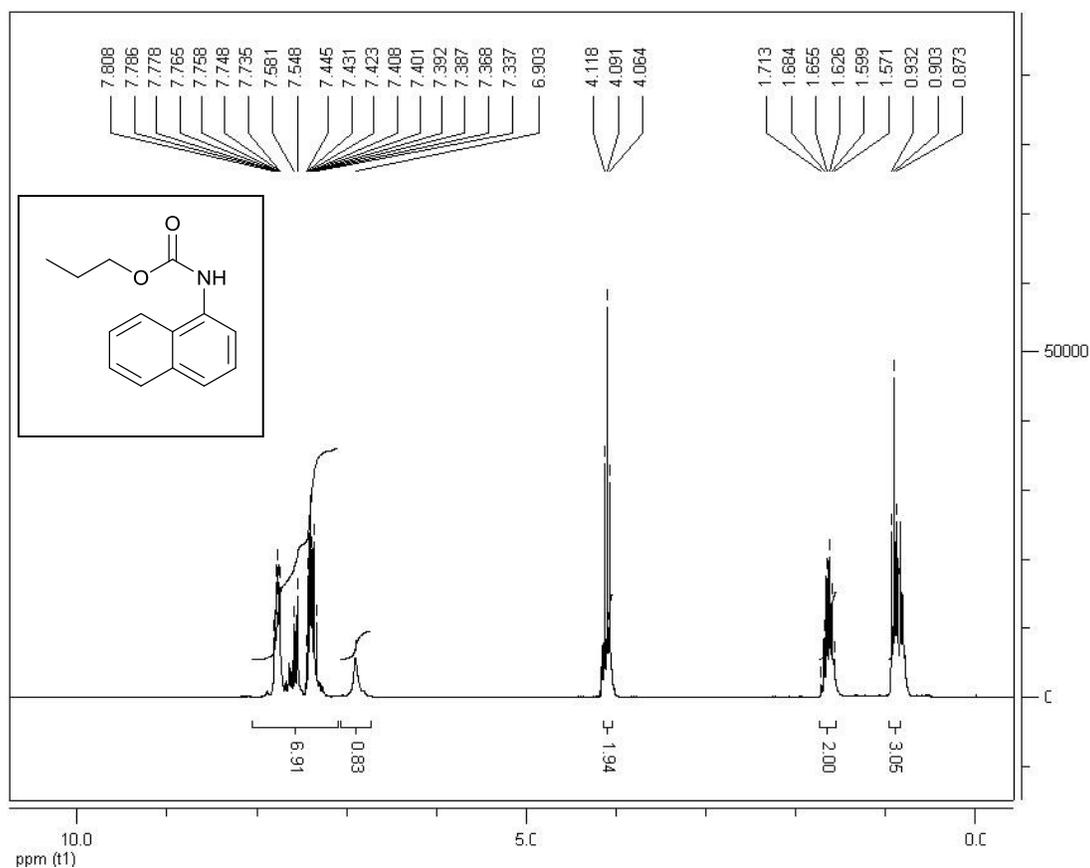


Figure S59.  $^1\text{H-NMR}$  spectra (250 MHz) of propyl (naphthalen-1-yl)carbamate in  $\text{CDCl}_3$

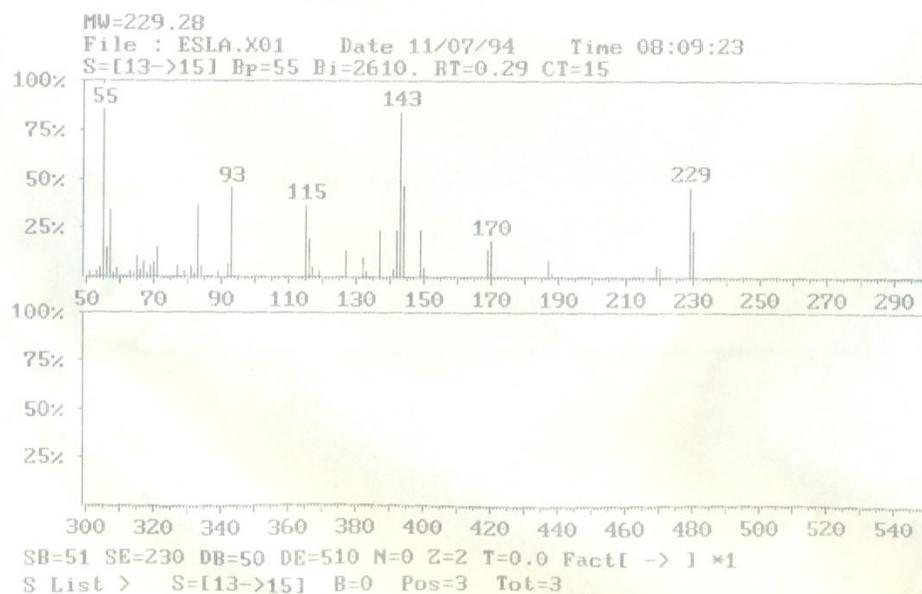
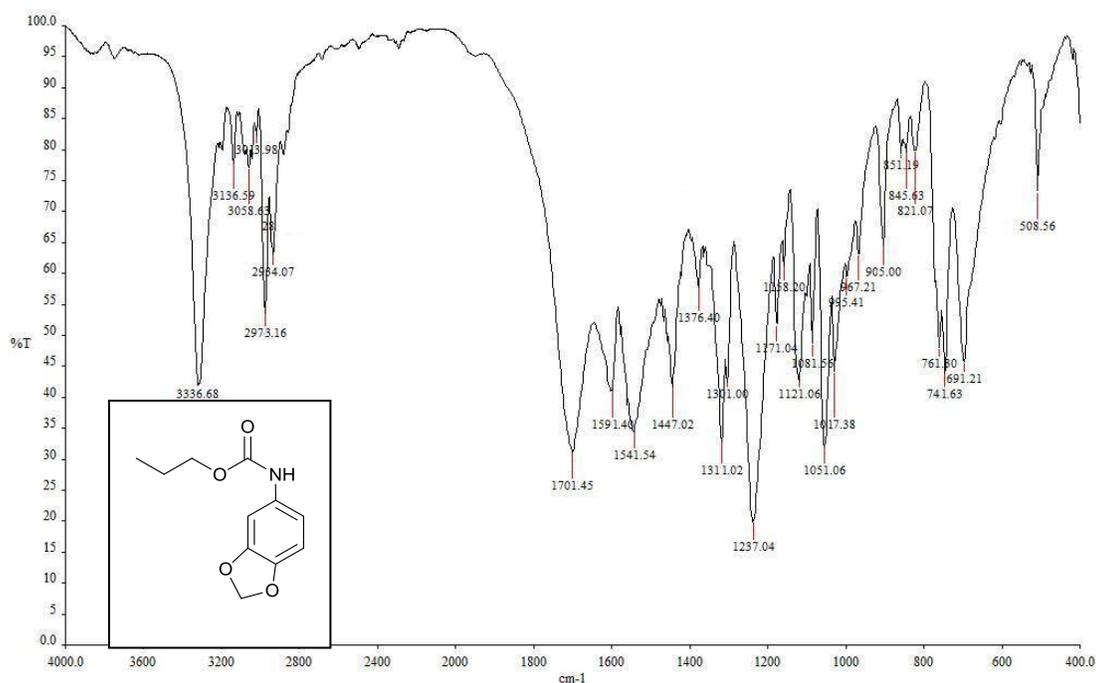
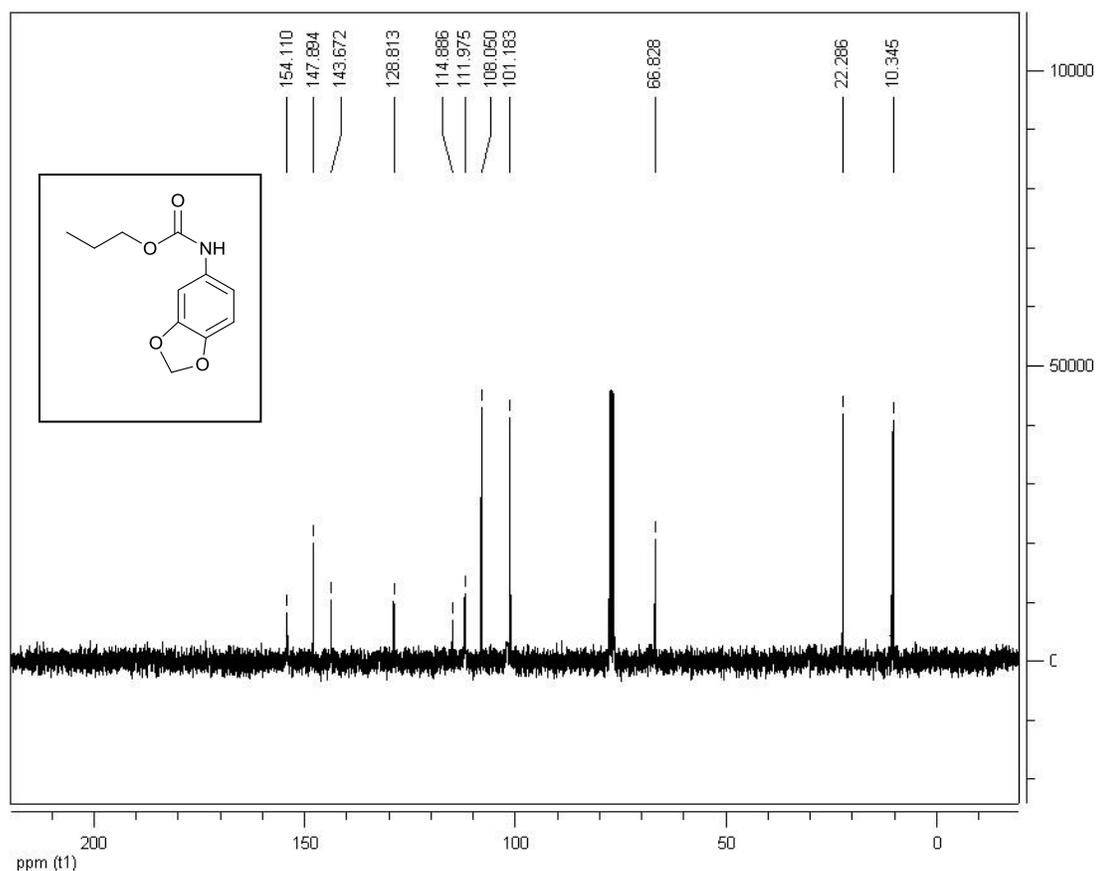


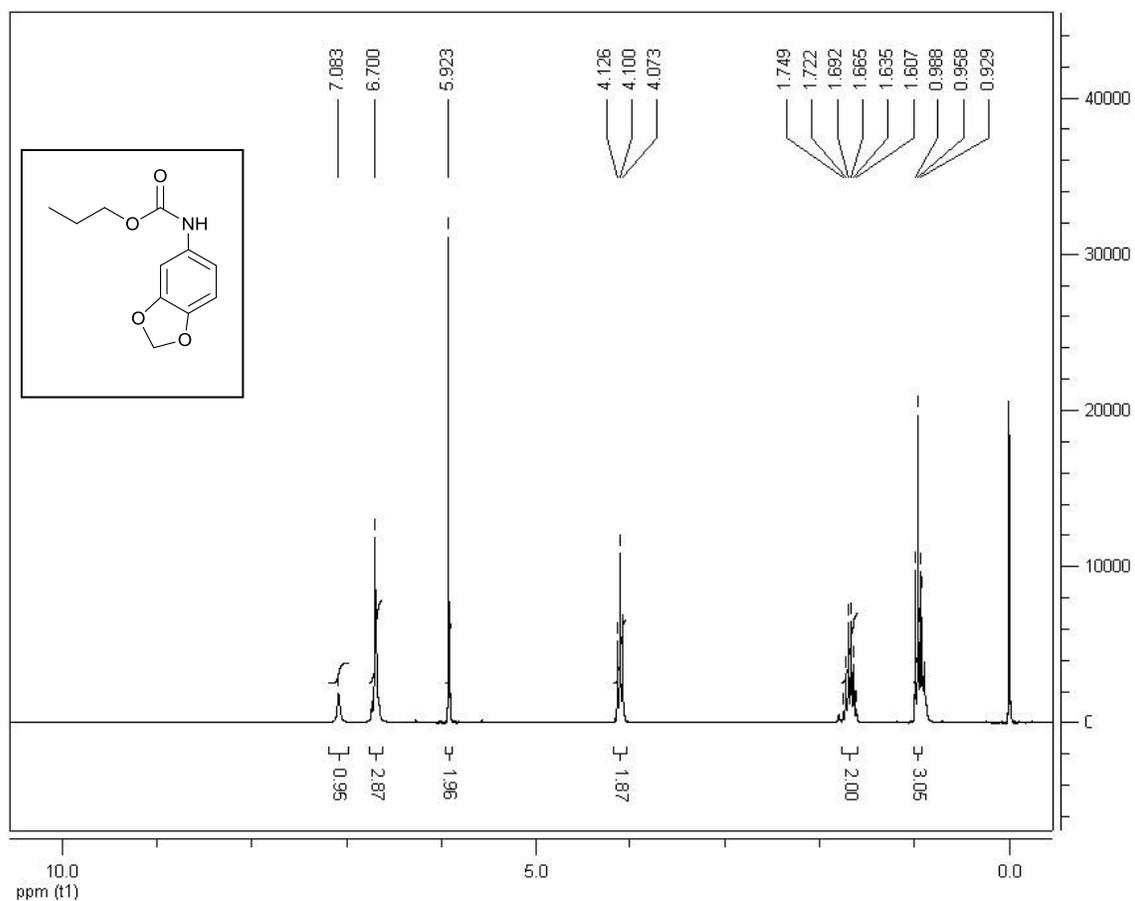
Figure S60. MS of propyl (naphthalen-1-yl)carbamate



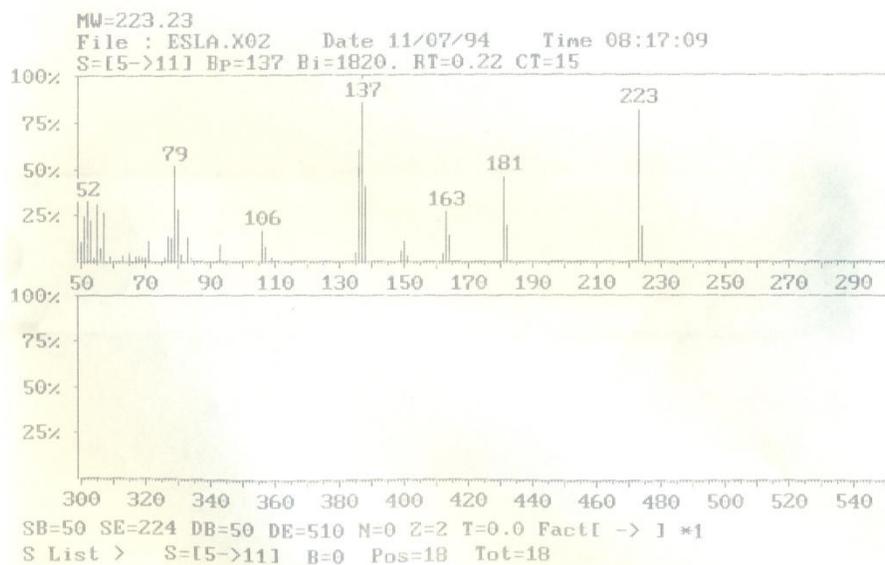
**Figure S61.** FT-IR spectra of propyl (benzo[d][1,3]dioxol-5-yl)carbamate in KBr



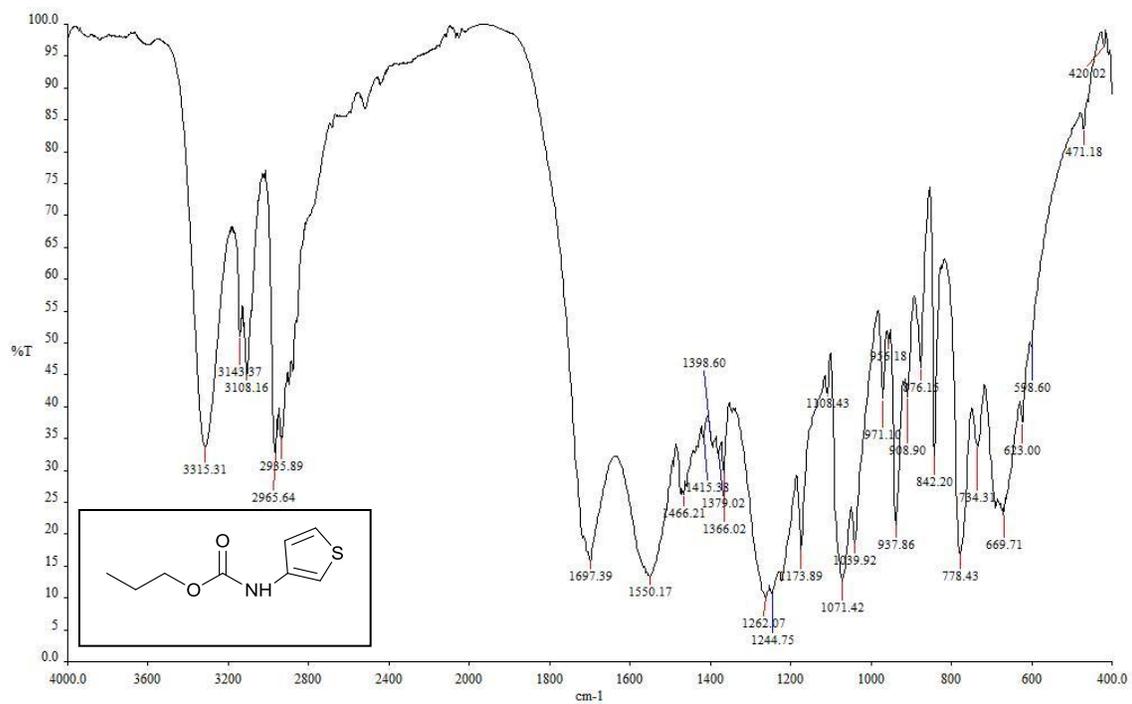
**Figure S62.** <sup>13</sup>C-NMR spectra (63 MHz) of propyl (benzo[d][1,3]dioxol-5-yl)carbamate in CDCl<sub>3</sub>



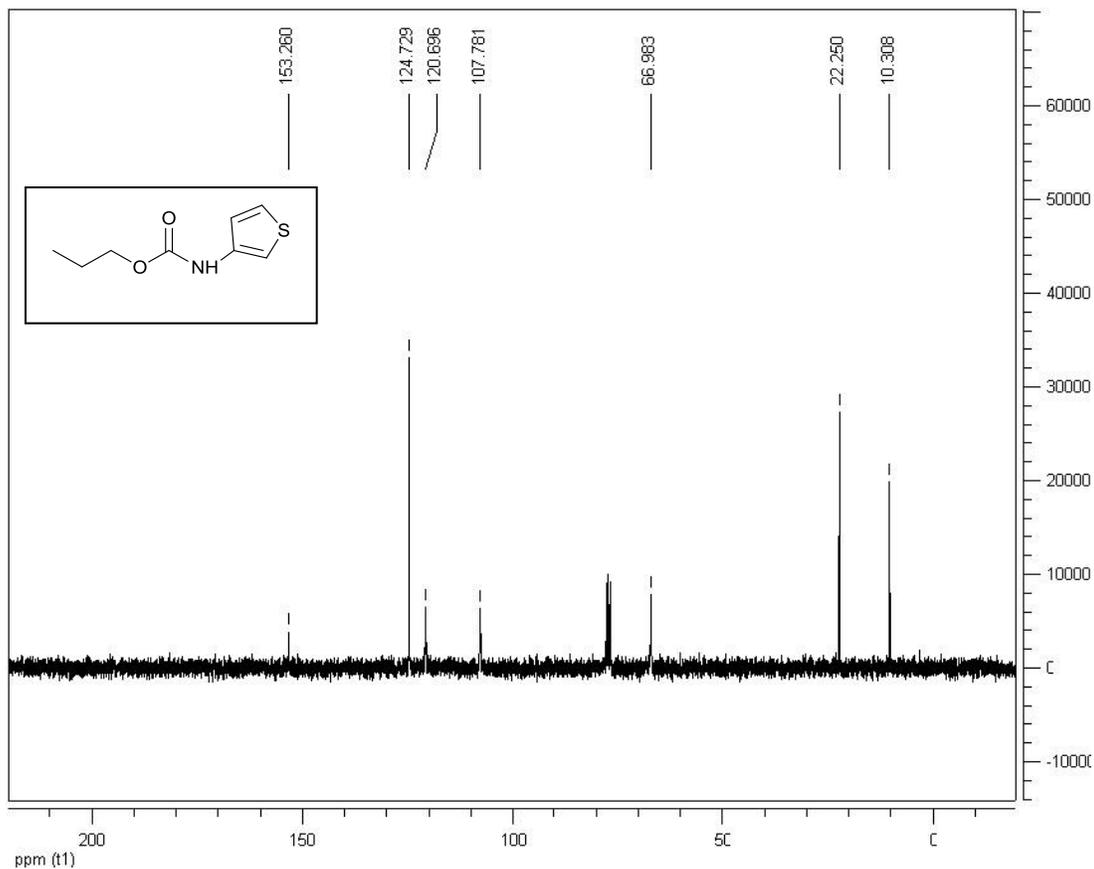
**Figure S63.**  $^1\text{H-NMR}$  spectra (250 MHz) of propyl (benzo[d][1,3]dioxol-5-yl)carbamate in  $\text{CDCl}_3$



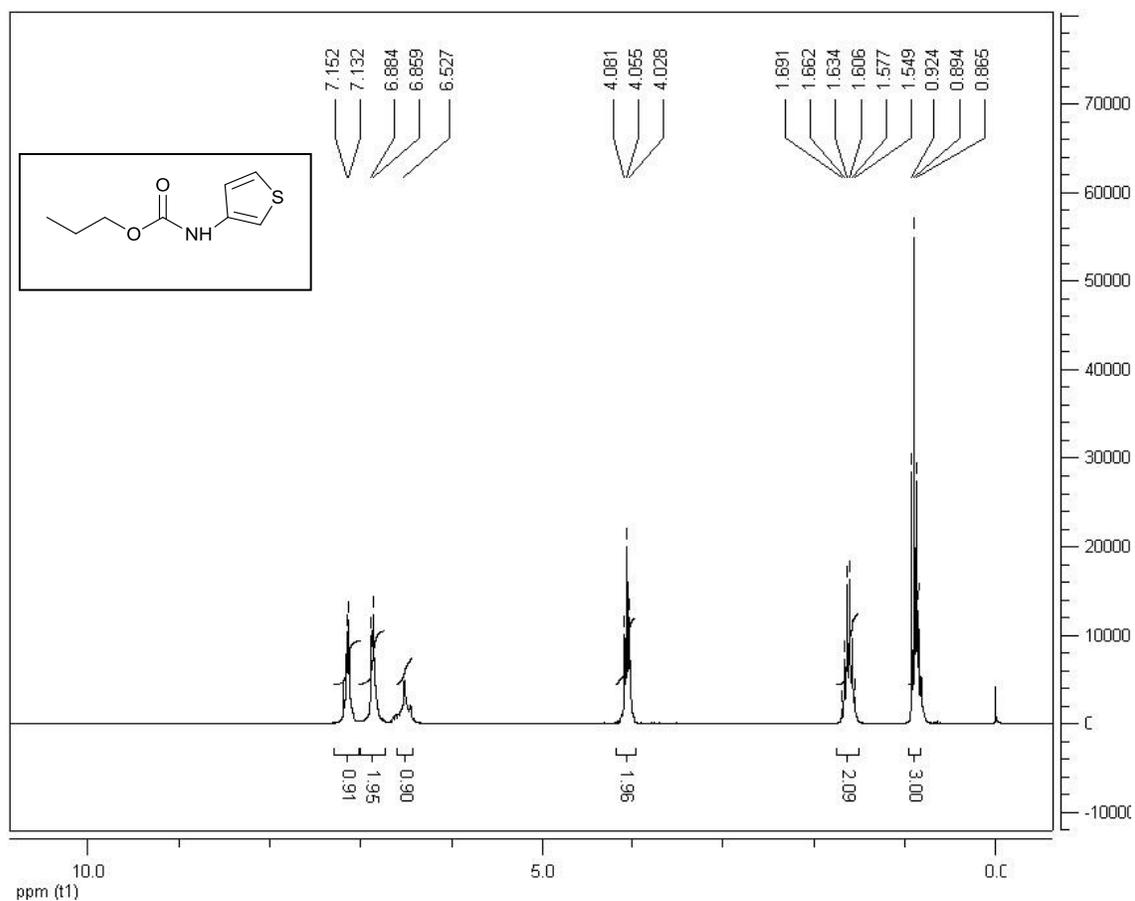
**Figure S64.** MS of propyl (benzo[d][1,3]dioxol-5-yl)carbamate



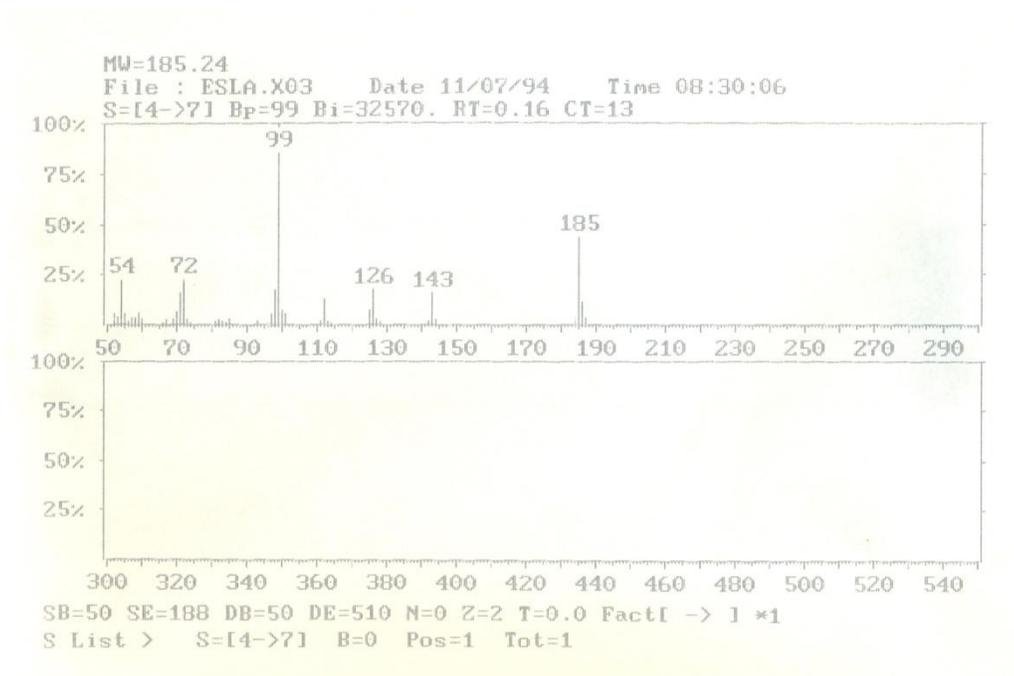
**Figure S65.** FT-IR spectra of propyl (thiophen-3-yl)carbamate in KBr



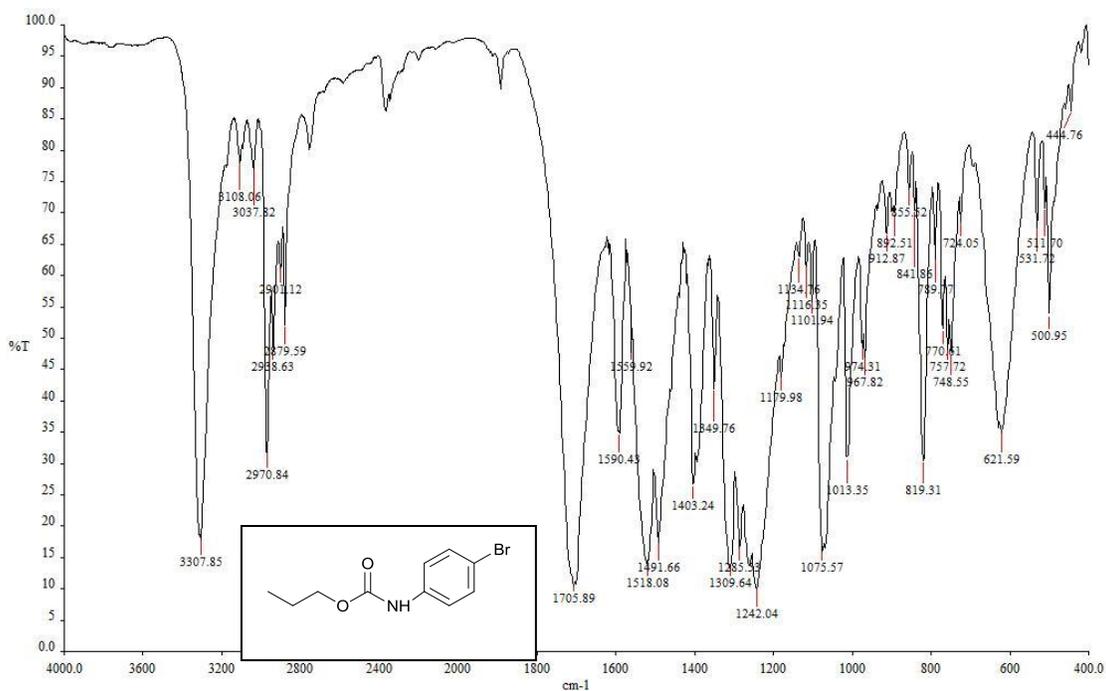
**Figure S66.** <sup>13</sup>C-NMR spectra (63 MHz) of propyl (thiophen-3-yl)carbamate in CDCl<sub>3</sub>



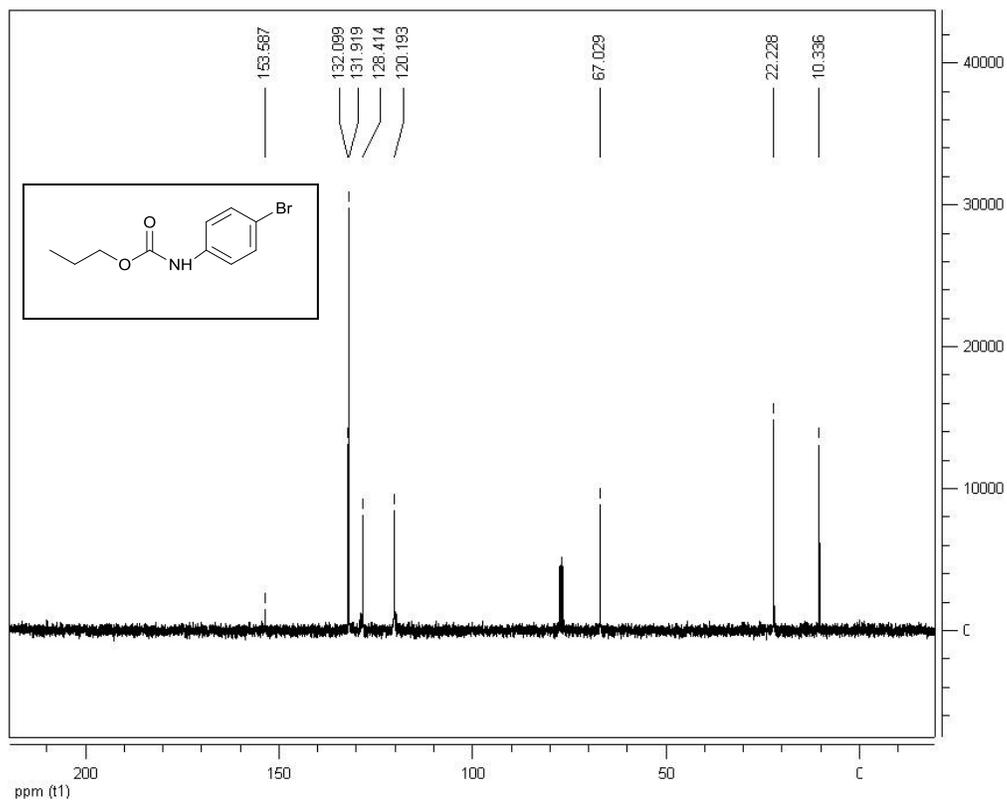
**Figure S67.**  $^1\text{H-NMR}$  spectra (250 MHz) of propyl (thiophen-3-yl)carbamate in  $\text{CDCl}_3$



**Figure S68.** MS of propyl (thiophen-3-yl)carbamate



**Figure S69.** FT-IR spectra of propyl (4-bromophenyl)carbamate in KBr



**Figure S70.** <sup>13</sup>C-NMR spectra (63 MHz) of propyl (4-bromophenyl)carbamate in CDCl<sub>3</sub>

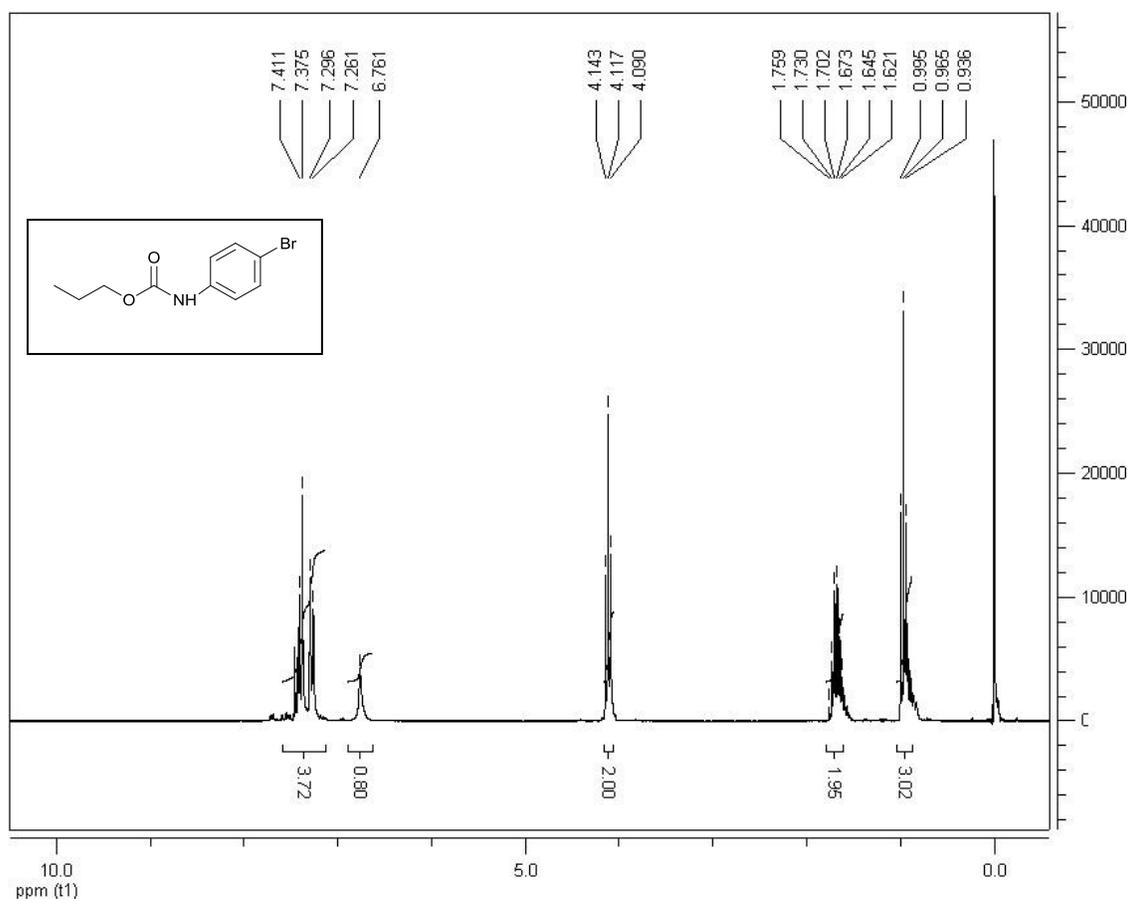


Figure S71. <sup>1</sup>H-NMR spectra (250 MHz) of propyl (4-bromophenyl)carbamate in CDCl<sub>3</sub>

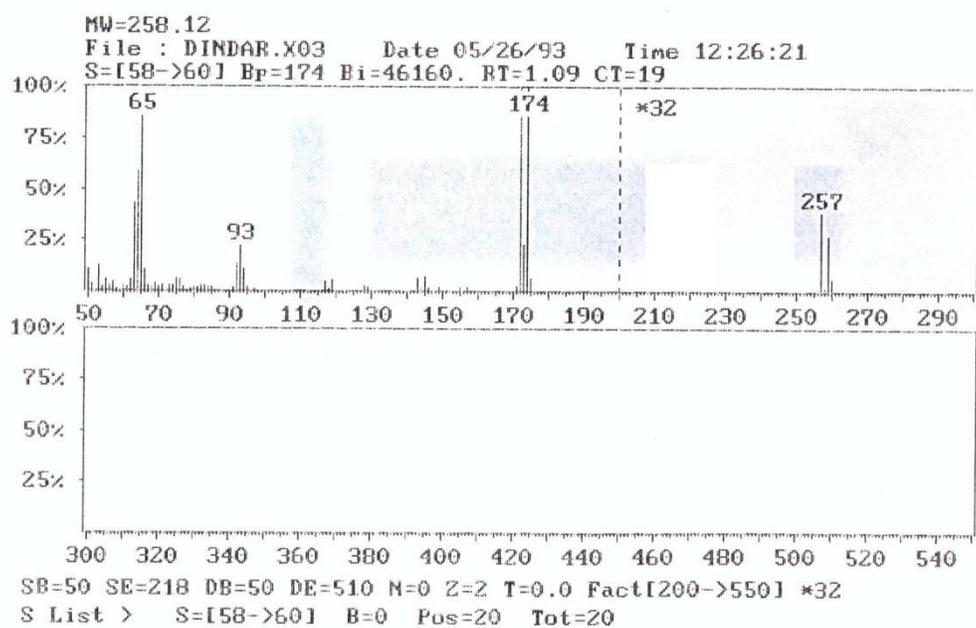
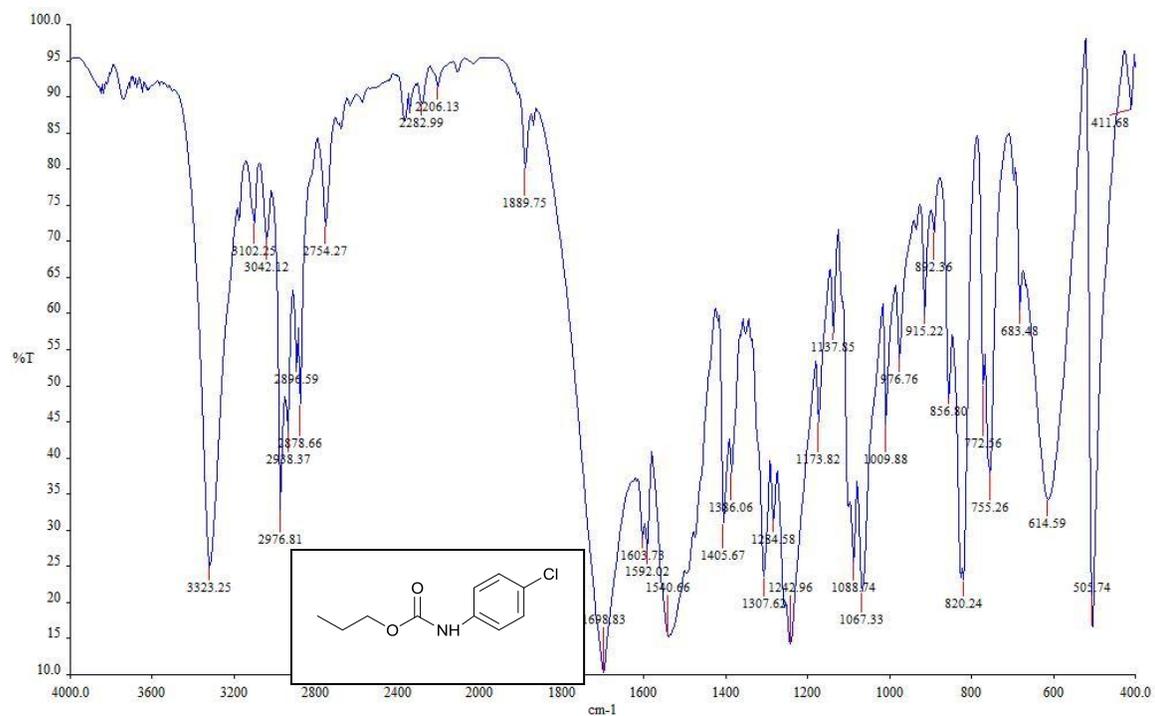
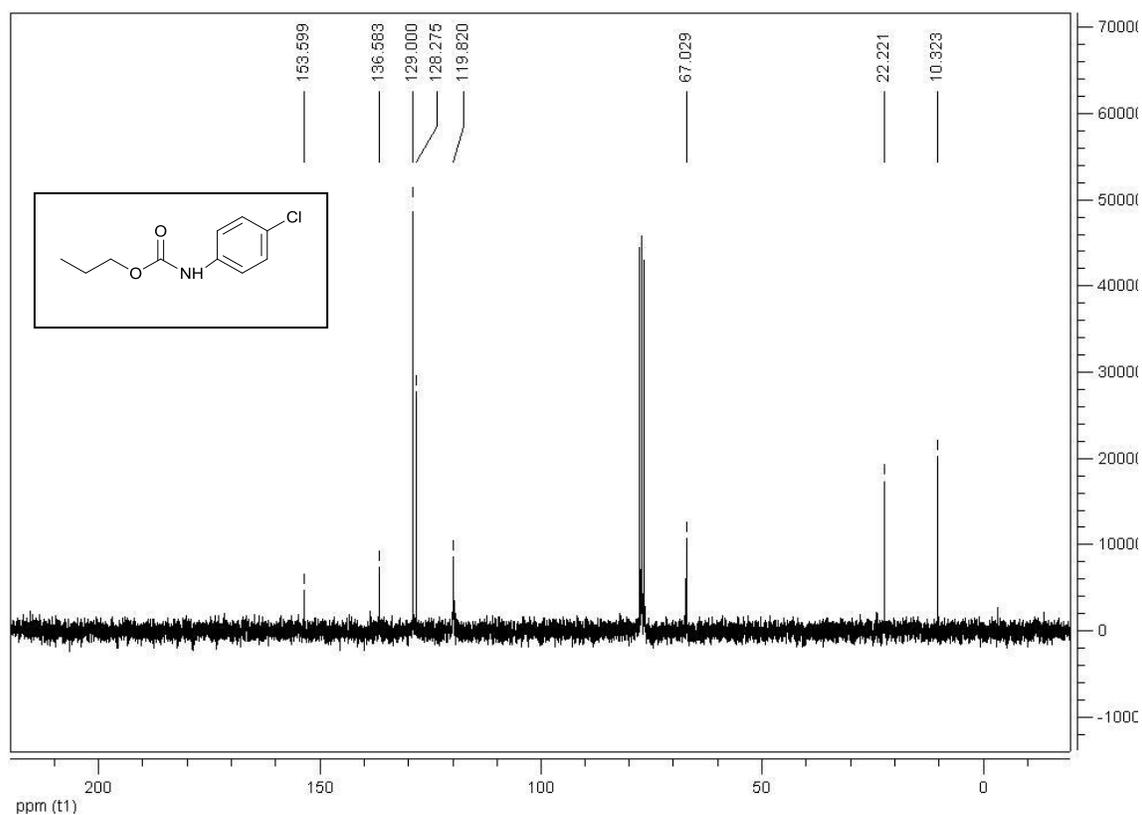


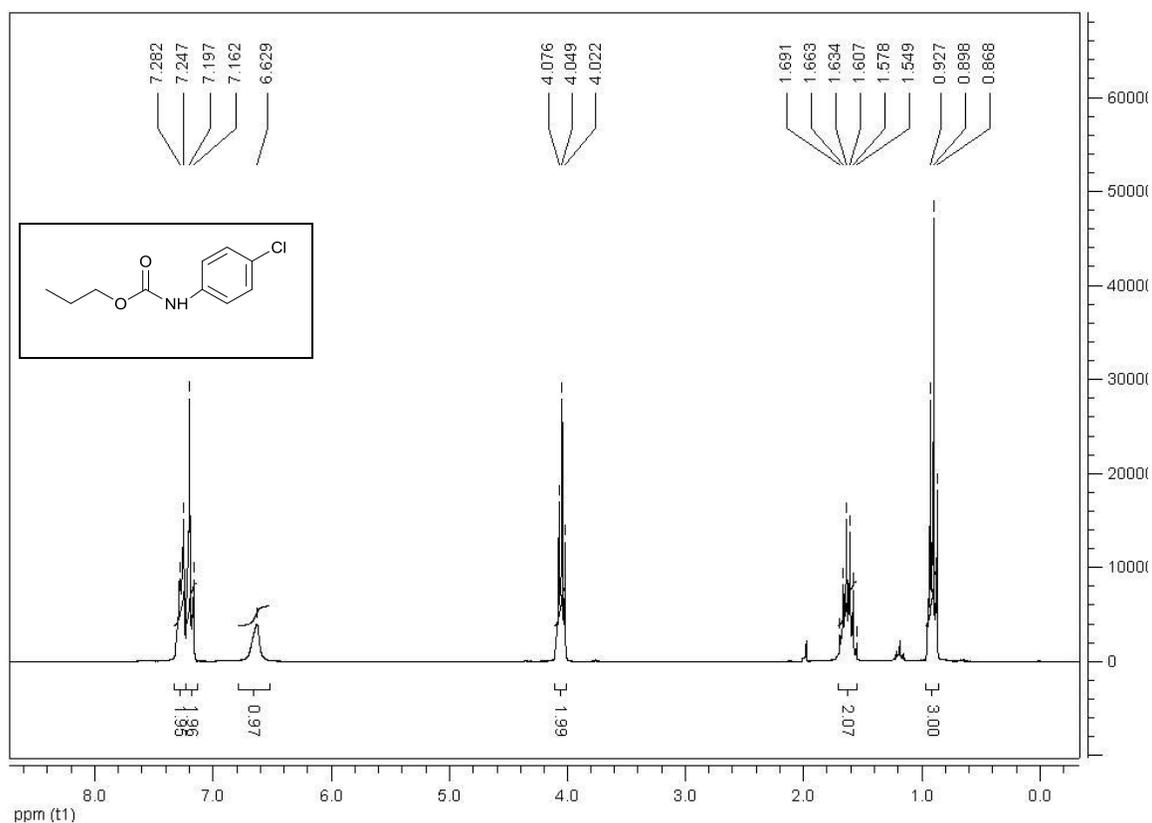
Figure S72. MS of propyl (4-bromophenyl)carbamate



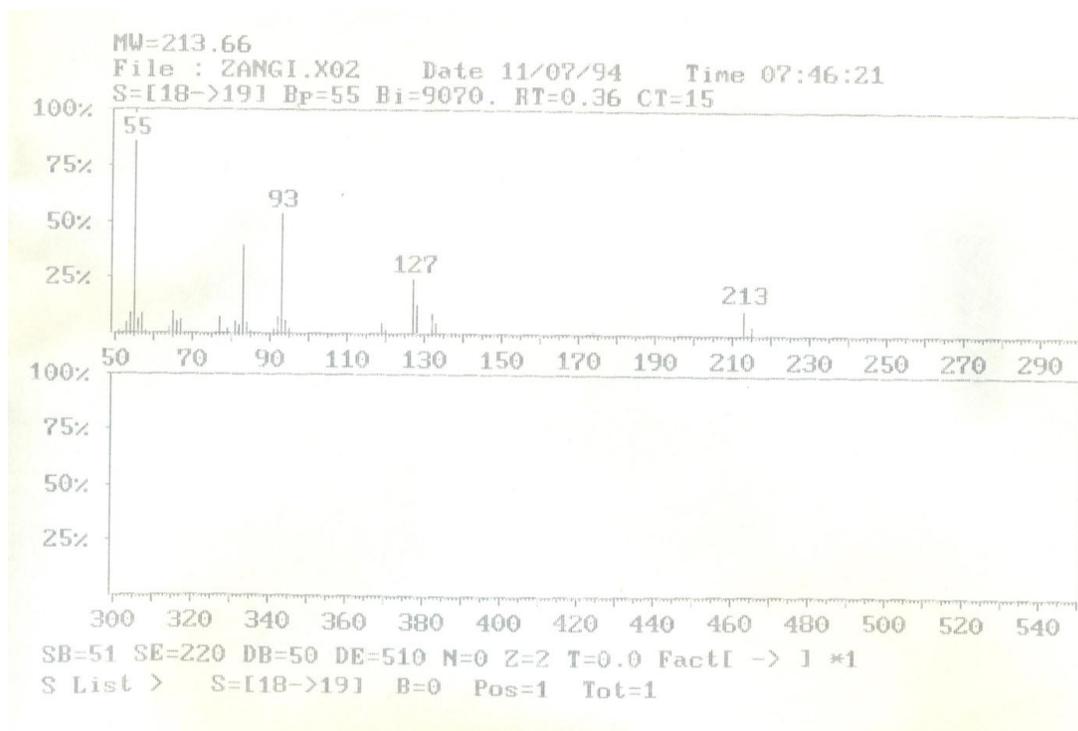
**Figure S73.** FT-IR spectra of propyl (4-chlorophenyl)carbamate in KBr



**Figure S74.**  $^{13}\text{C}$ -NMR spectra (63 MHz) of propyl (4-chlorophenyl)carbamate in  $\text{CDCl}_3$



**Figure S75.**  $^1\text{H-NMR}$  spectra (250 MHz) of propyl (4-chlorophenyl)carbamate in  $\text{CDCl}_3$



**Figure S76.** MS of propyl (4-chlorophenyl)carbamate