

**Multicomponent synthesis of Pyridines *via* diamine functionalized  
mesoporous ZrO<sub>2</sub> domino Intramolecular tandem Michael type addition**

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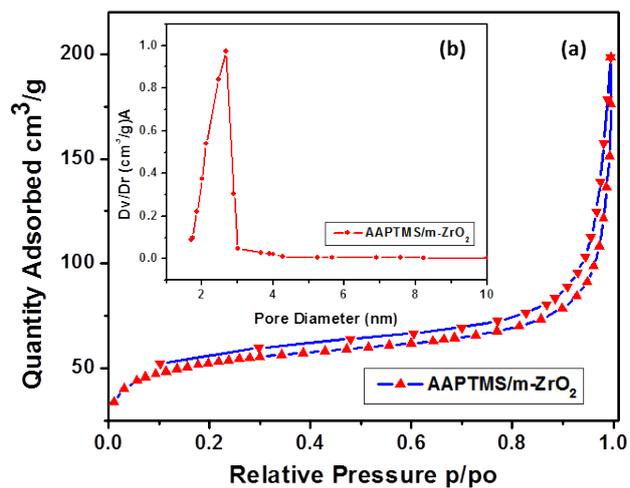
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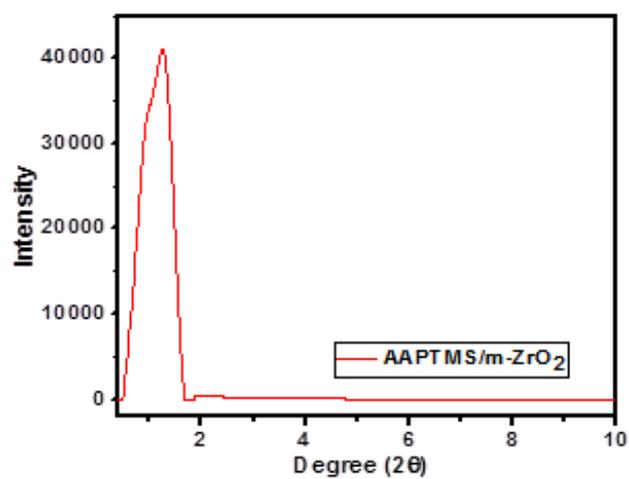
**Materials and methods**

***Apparatus and analysis***

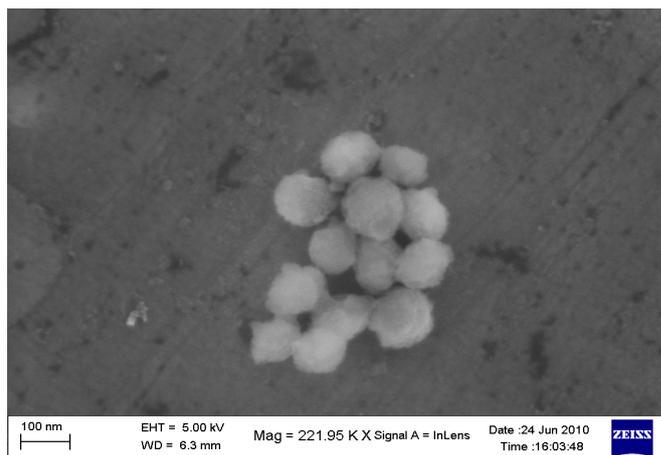
All chemicals used were reagent grade and were used as received without further purification. <sup>1</sup>H NMR and <sup>13</sup>C NMR spectra were recorded at 25 °C at 400 MHz and 100 MHz (Bruker Avance) respectively, using TMS as internal standard. Chemical shifts are given in parts per million (ppm). FT-IR spectroscopy was performed on a Perkin-Elmer Precisely 100 FT-IR spectrometer in the 400-40000 cm<sup>-1</sup> region. ESI-MS spectra were determined on a LCQ ion trap mass spectrometer (Thermo Fisher, San Jose, CA, USA), equipped with an ESI source. Melting points were recorded on a hot stage melting point apparatus Ernst Leitz Wetzlar, Germany and were uncorrected. All the reactions and the purity of products were monitored using thin layer chromatography (TLC) on aluminum-backed plates coated with Merck Kieselgel 60 F254 silica gel, visualizing the spots under ultraviolet light and iodine chamber.



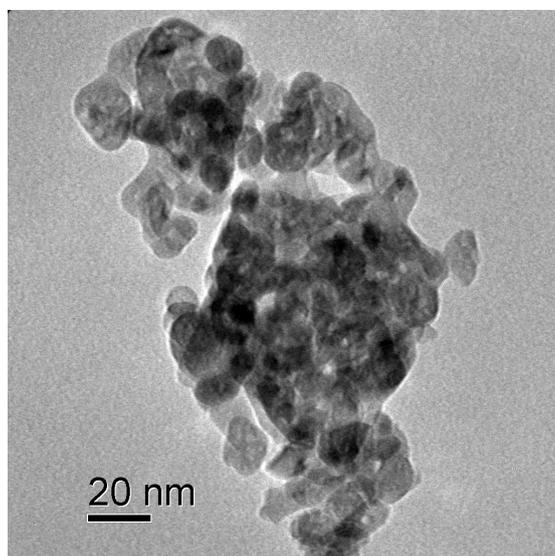
**Figure S1** (a) N<sub>2</sub>-adsorption-desorption isotherm of AAPTMS/m-ZrO<sub>2</sub> and (b) pore size distribution of AAPTMS/m-ZrO<sub>2</sub> MAS NMR spectra of DF/m-ZrO<sub>2</sub>



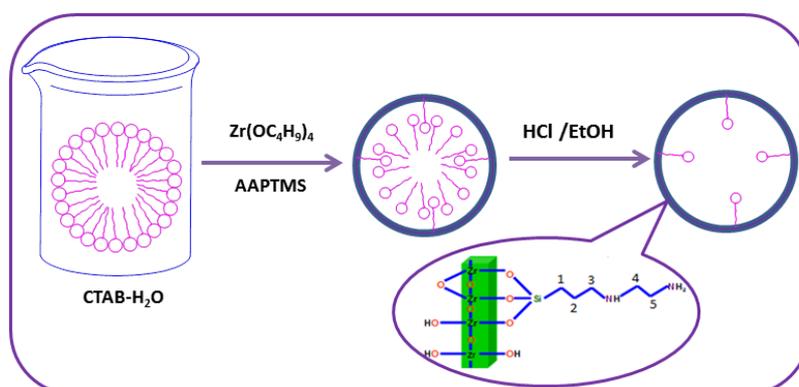
**Figure S2.** Small angle XRD spectra of DF/m-ZrO<sub>2</sub>



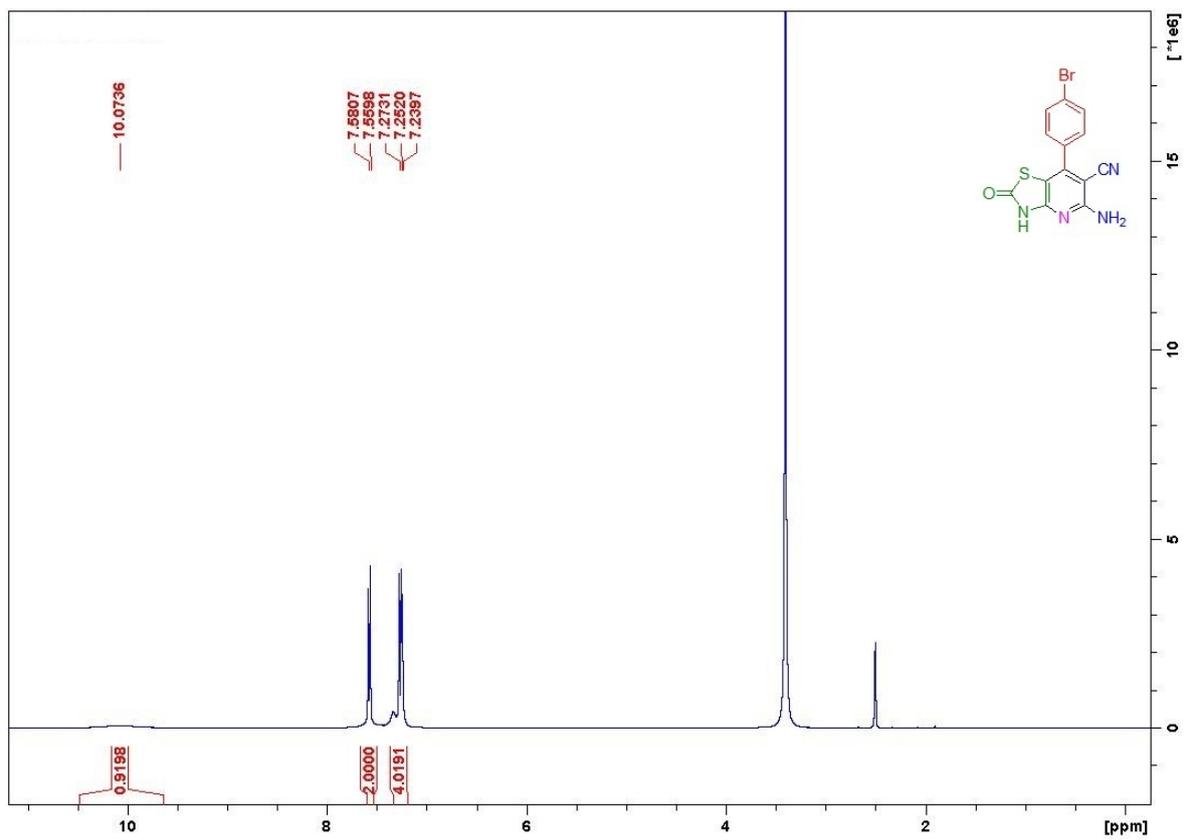
**Figure S3.** Scanning electron micrograph of AAPTMS/m-ZrO<sub>2</sub> sample



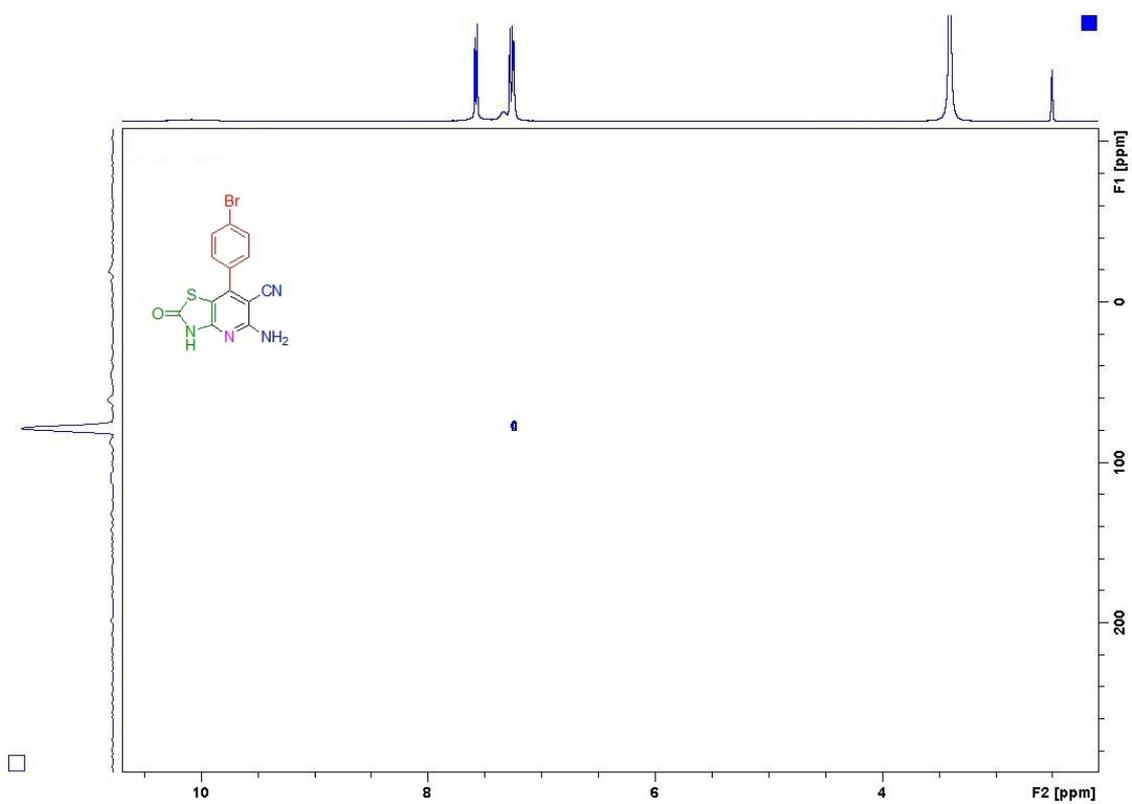
**Figure S4.** TEM image of AAPTMS/m-ZrO<sub>2</sub> sample



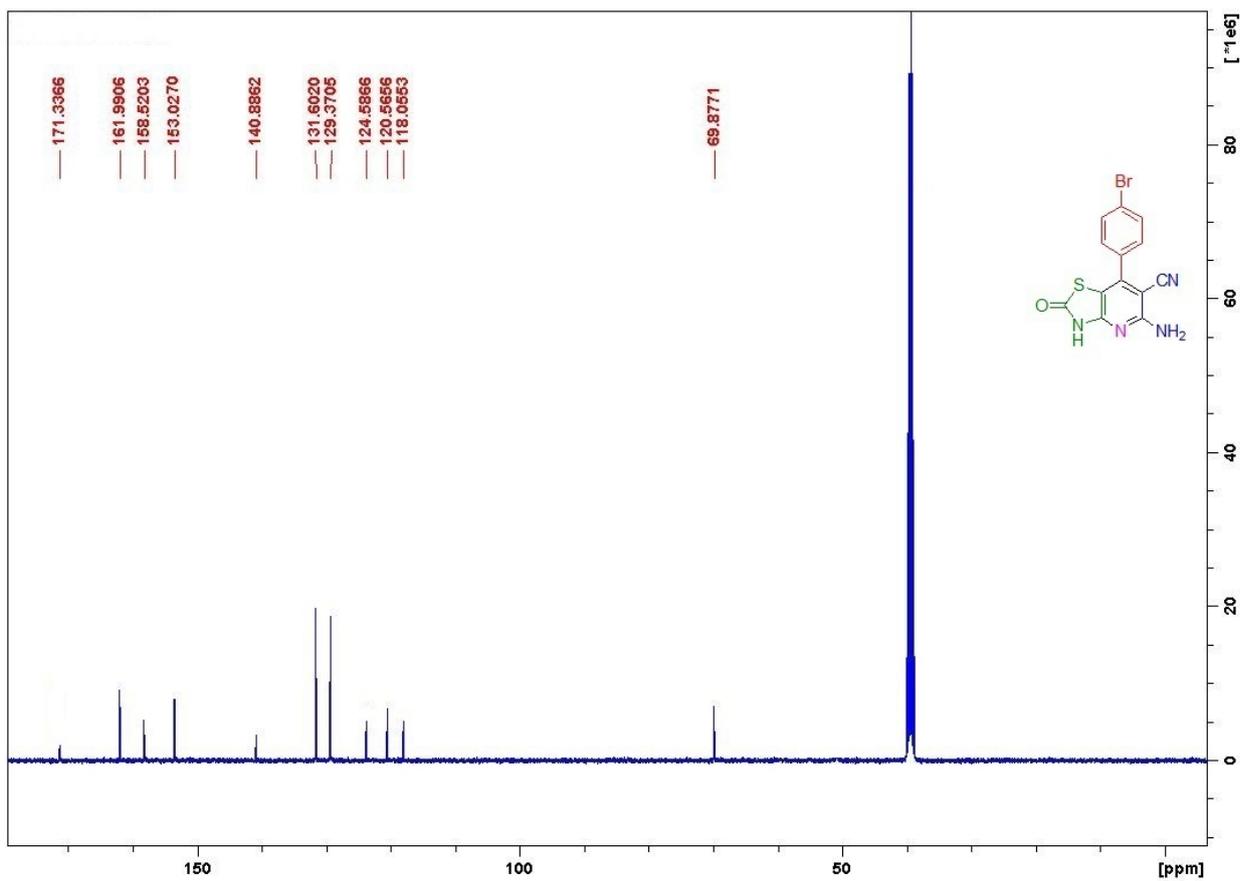
**Figure S5.** The schematic diagram for the synthesis of AAPTMS/m-ZrO<sub>2</sub> catalyst



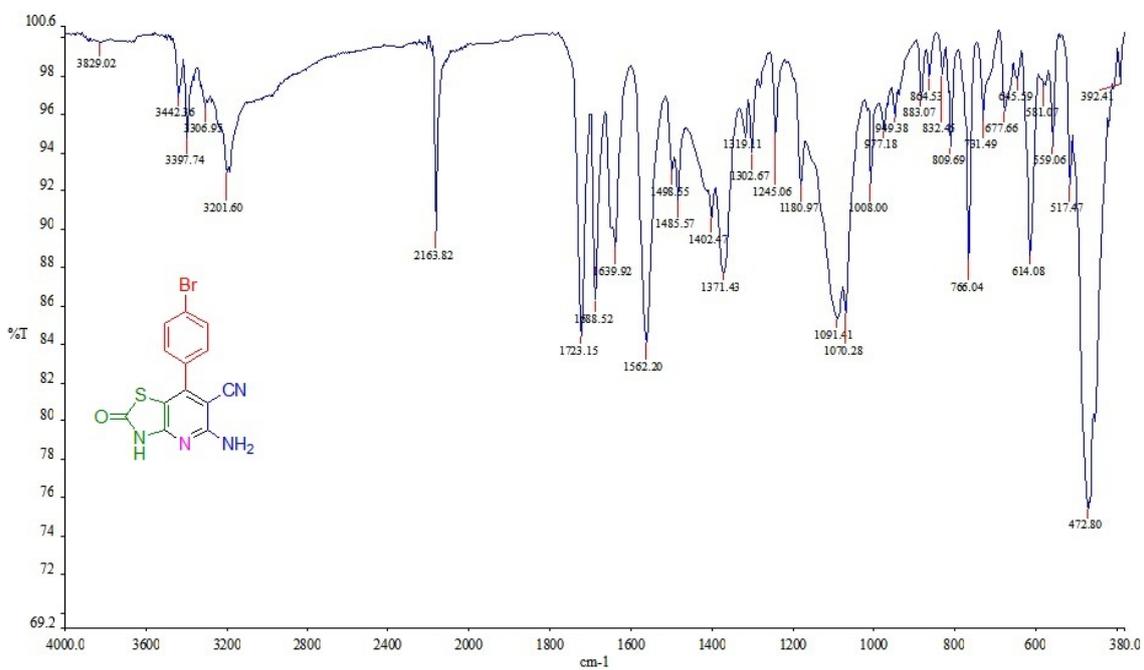
<sup>1</sup>H NMR spectra of compound **5a**



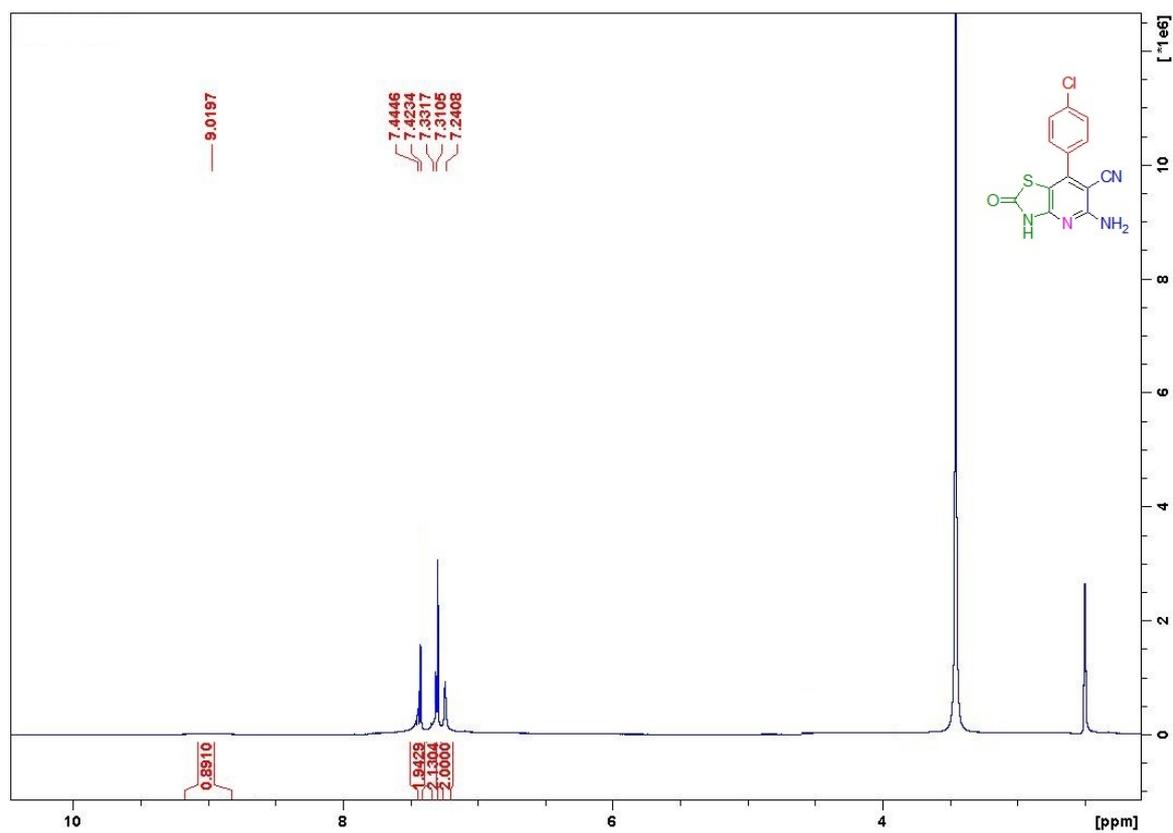
<sup>15</sup>N NMR (ghsqc) spectra of compound **5a**



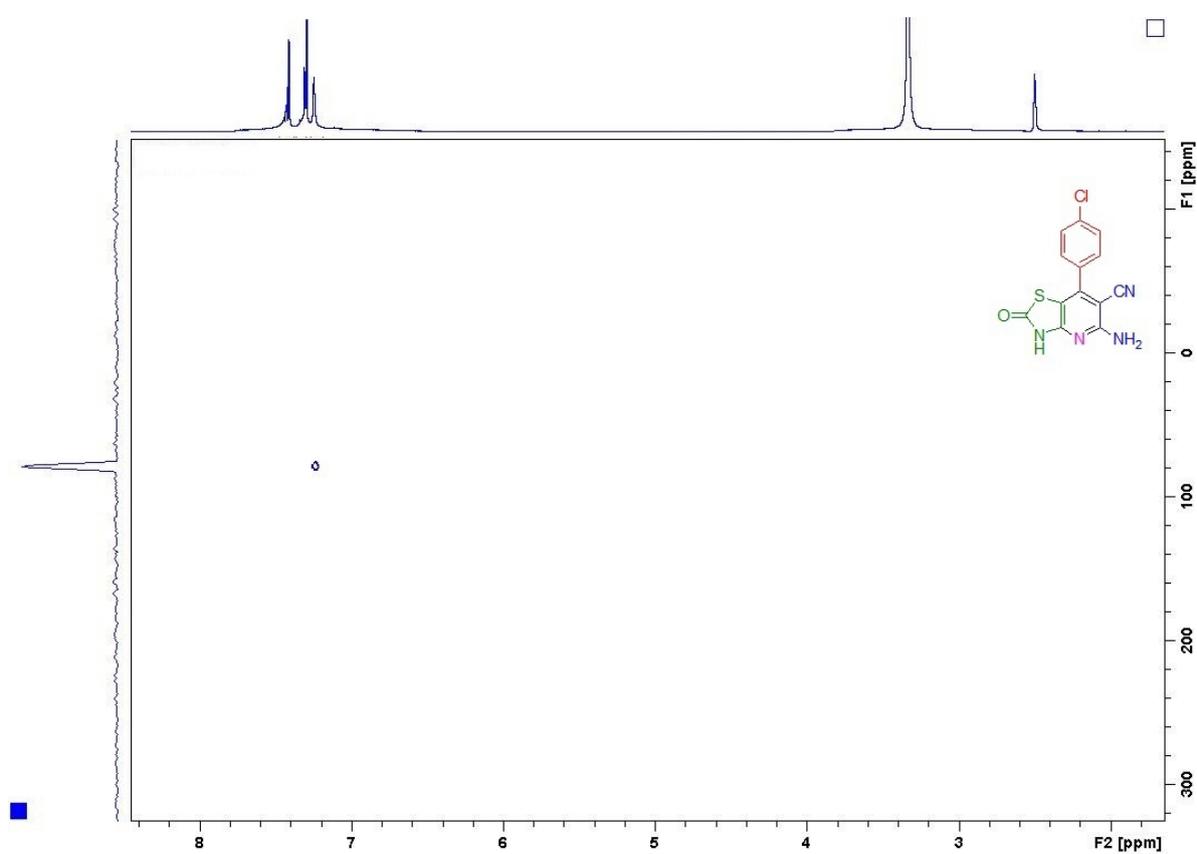
<sup>13</sup>C NMR spectra of compound 5a



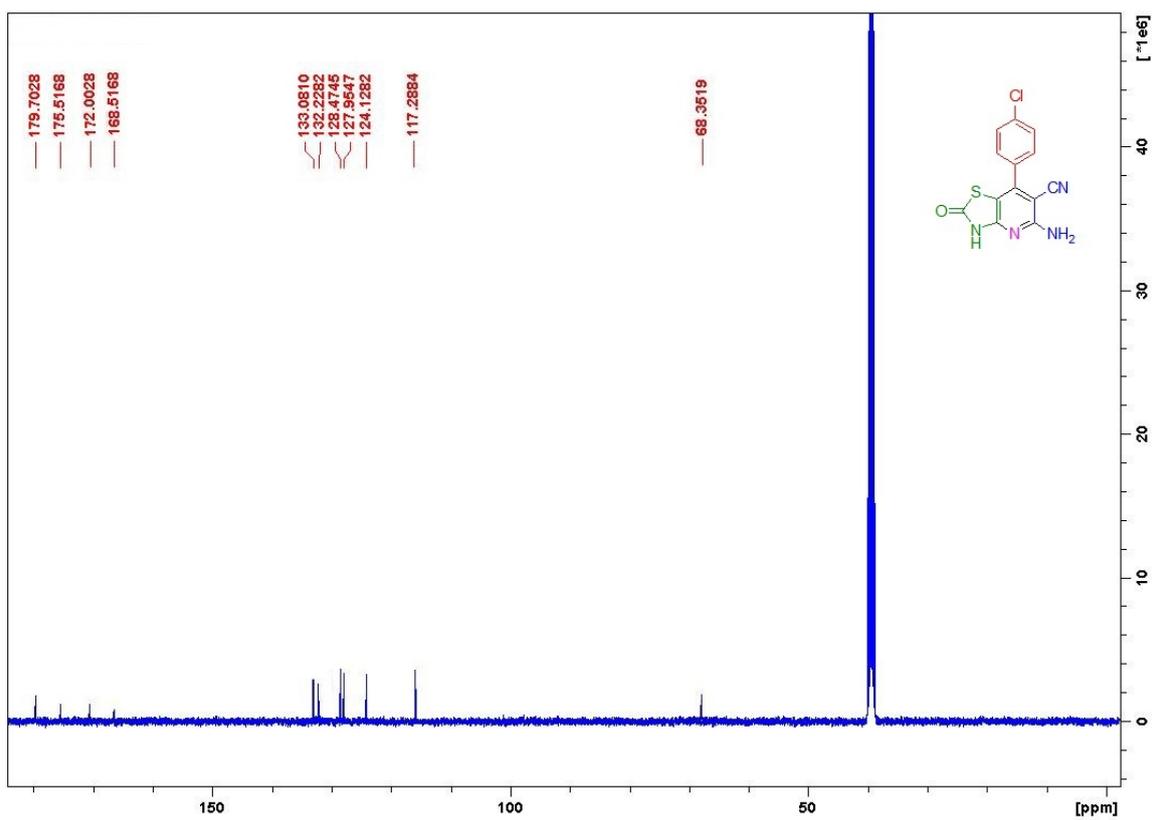
FTIR spectra of compound 5a



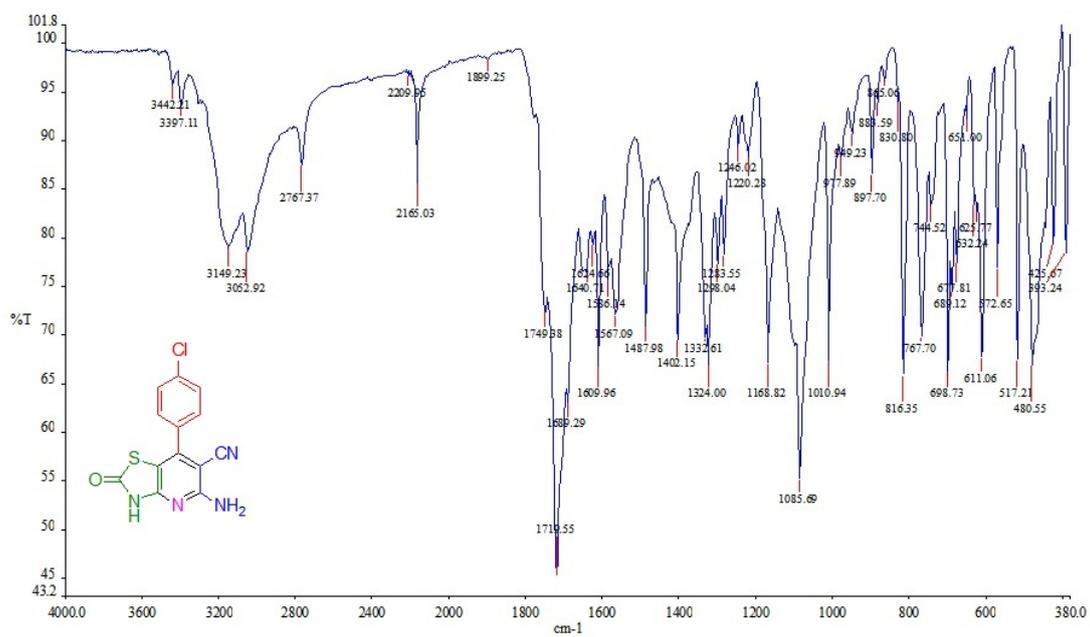
<sup>1</sup>H NMR spectra of compound **5b**



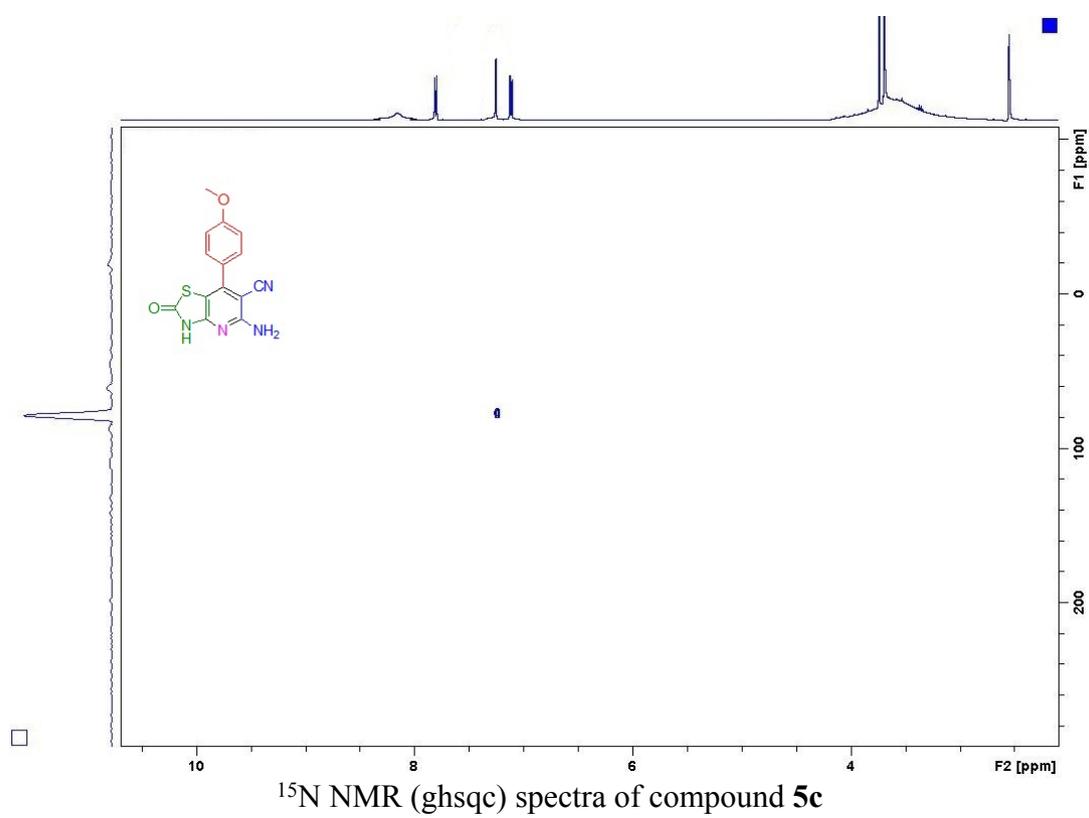
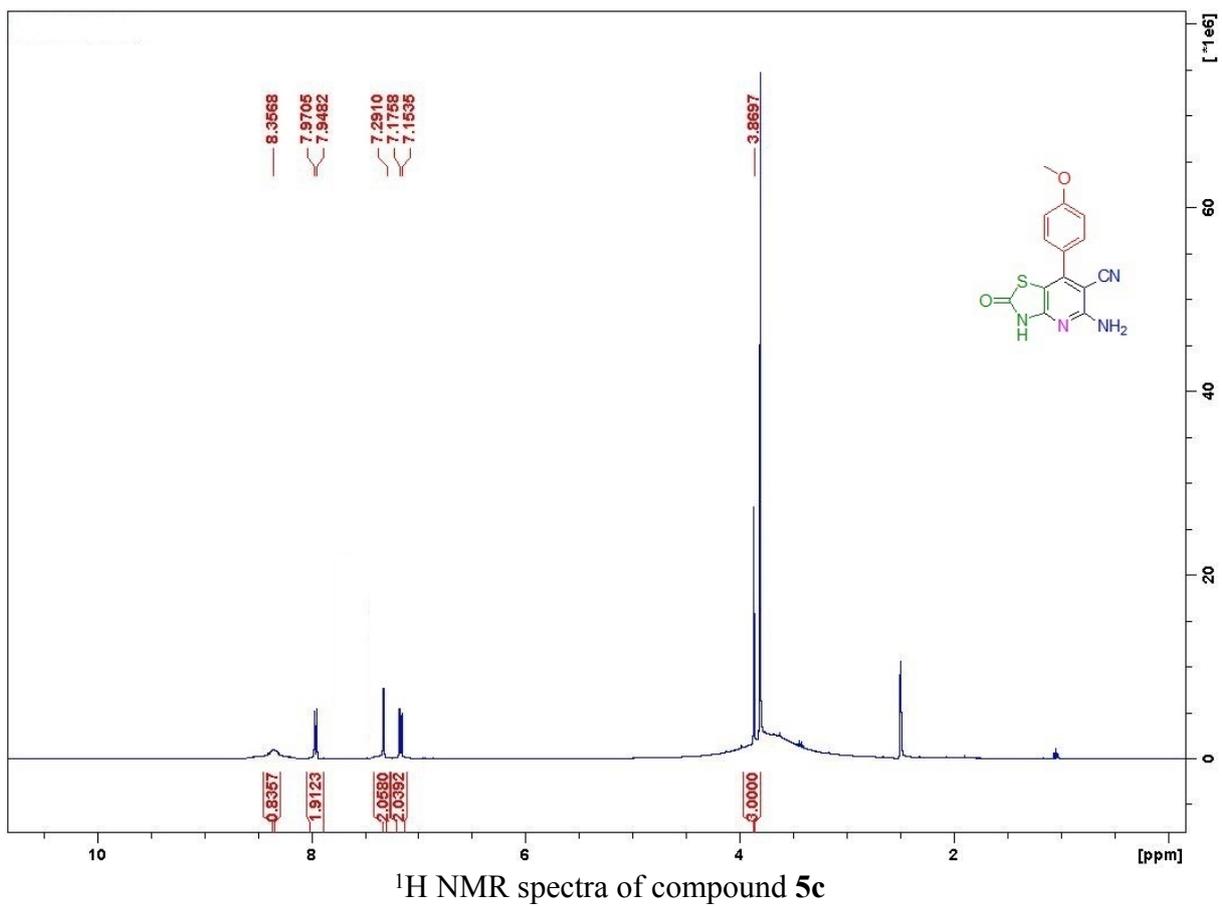
<sup>15</sup>N NMR (ghsqc) spectra of compound **5b**

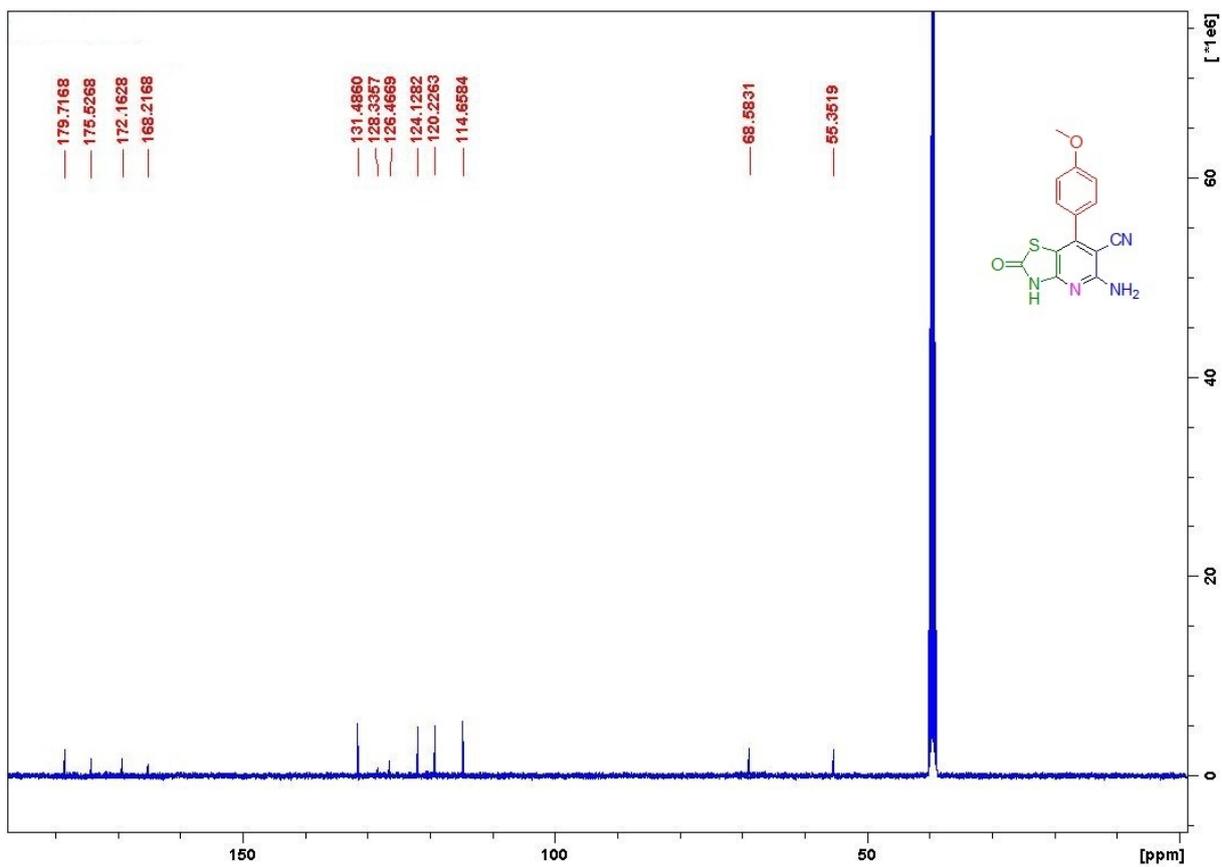


$^{13}\text{C}$  NMR spectra of compound **5b**

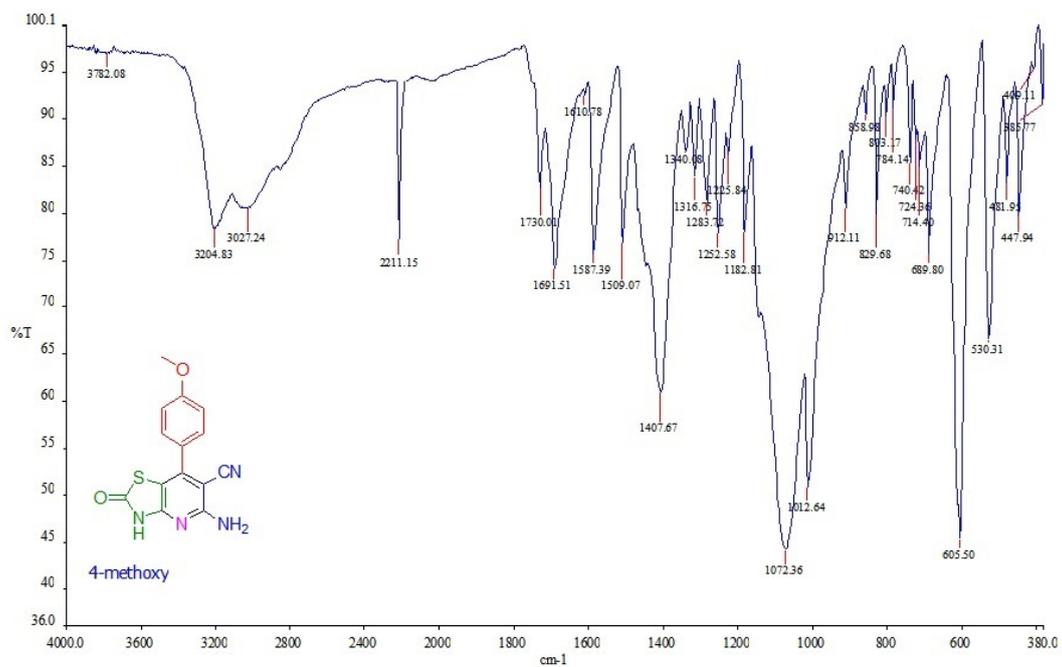


FTIR spectra of compound **5b**

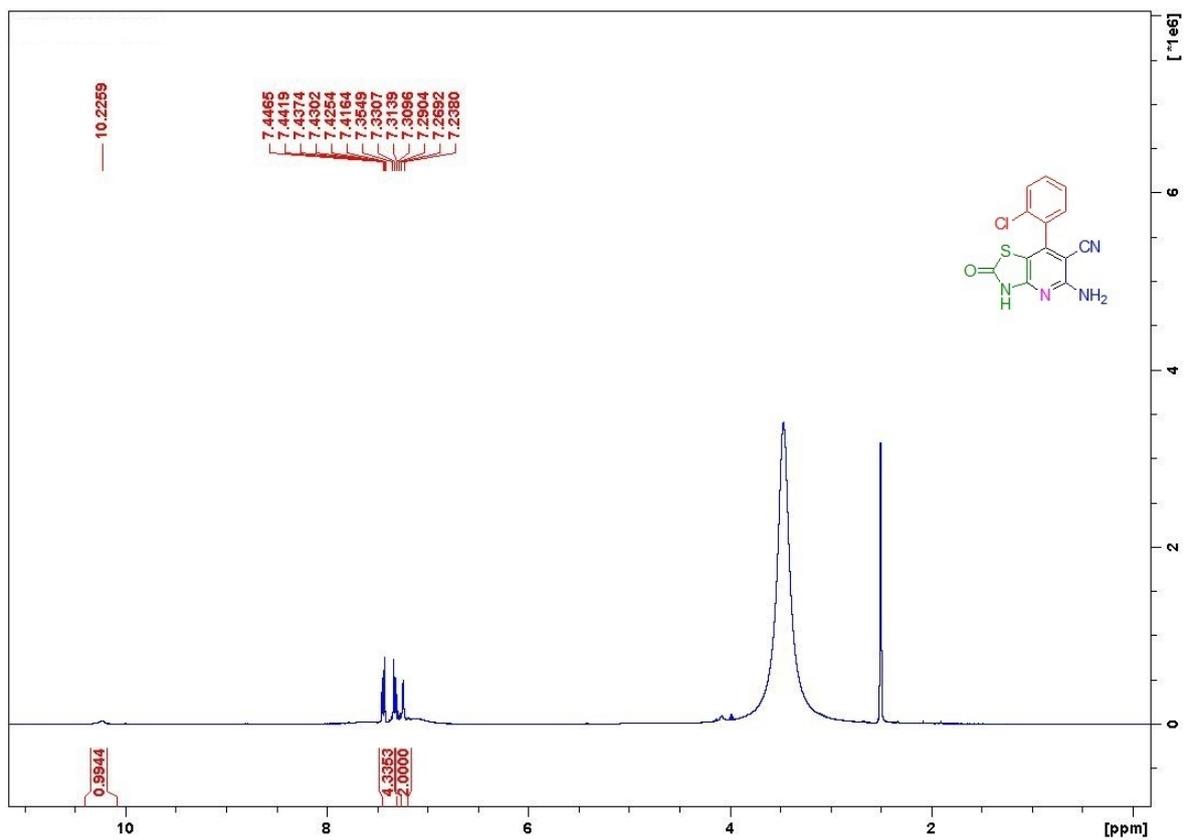




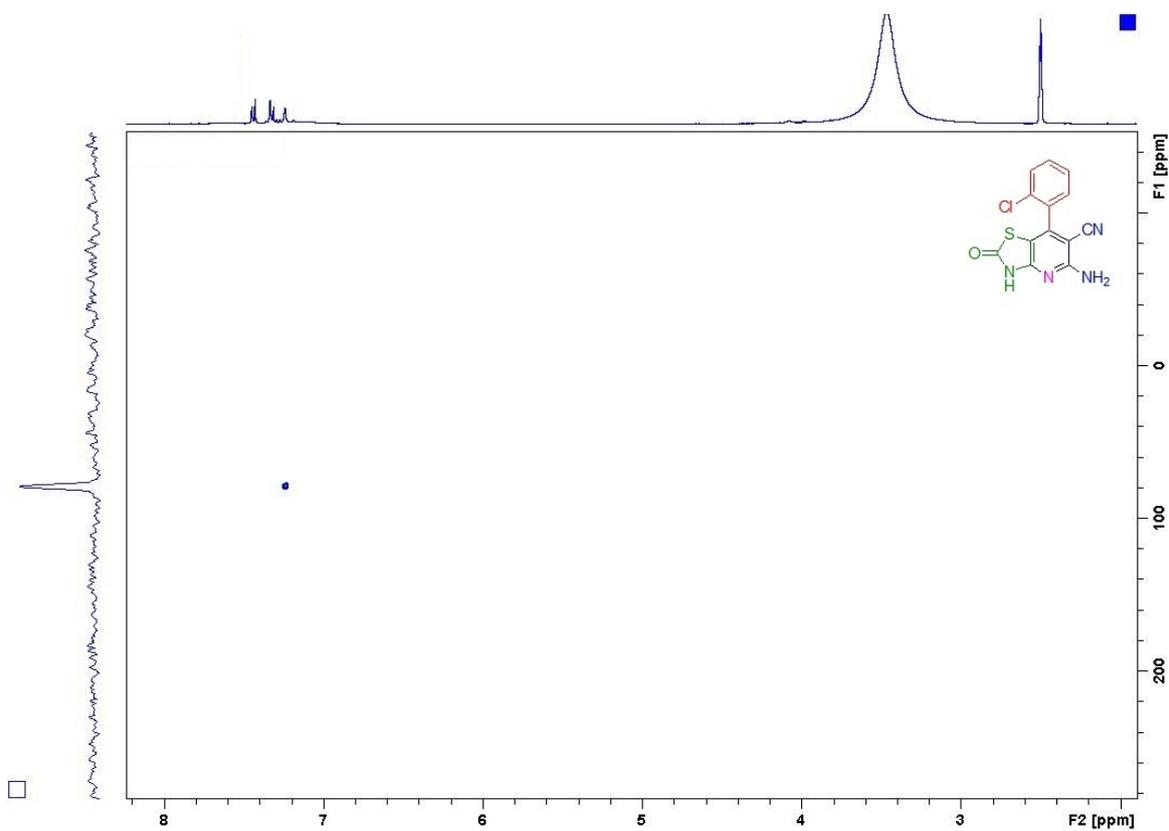
<sup>13</sup>C NMR spectra of compound 5c



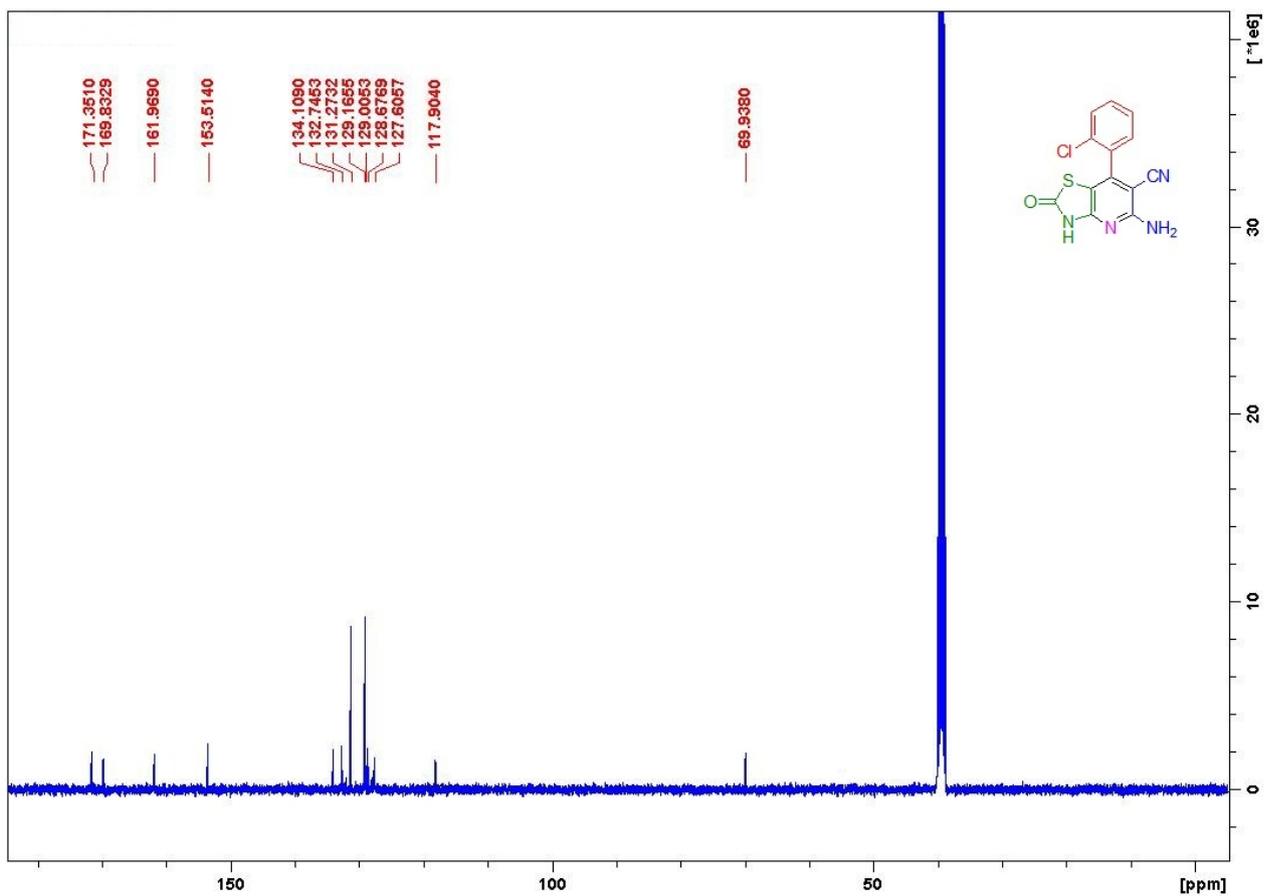
FTIR spectra of compound 5c



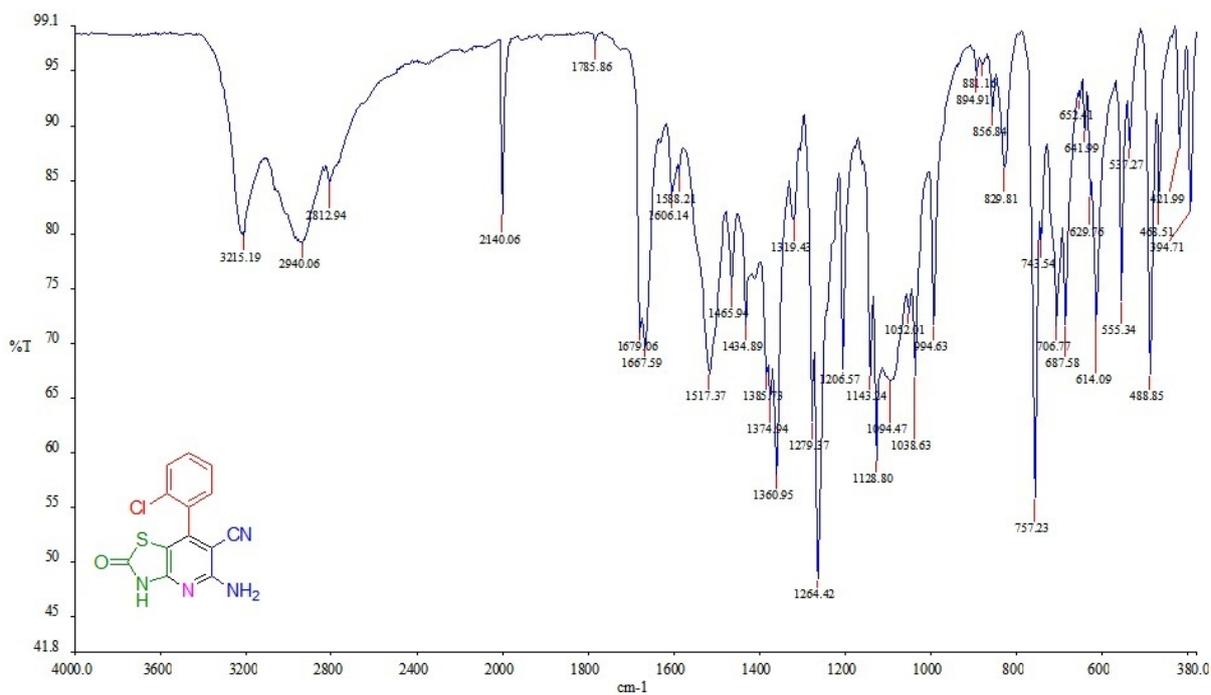
<sup>1</sup>H NMR spectra of compound **5d**



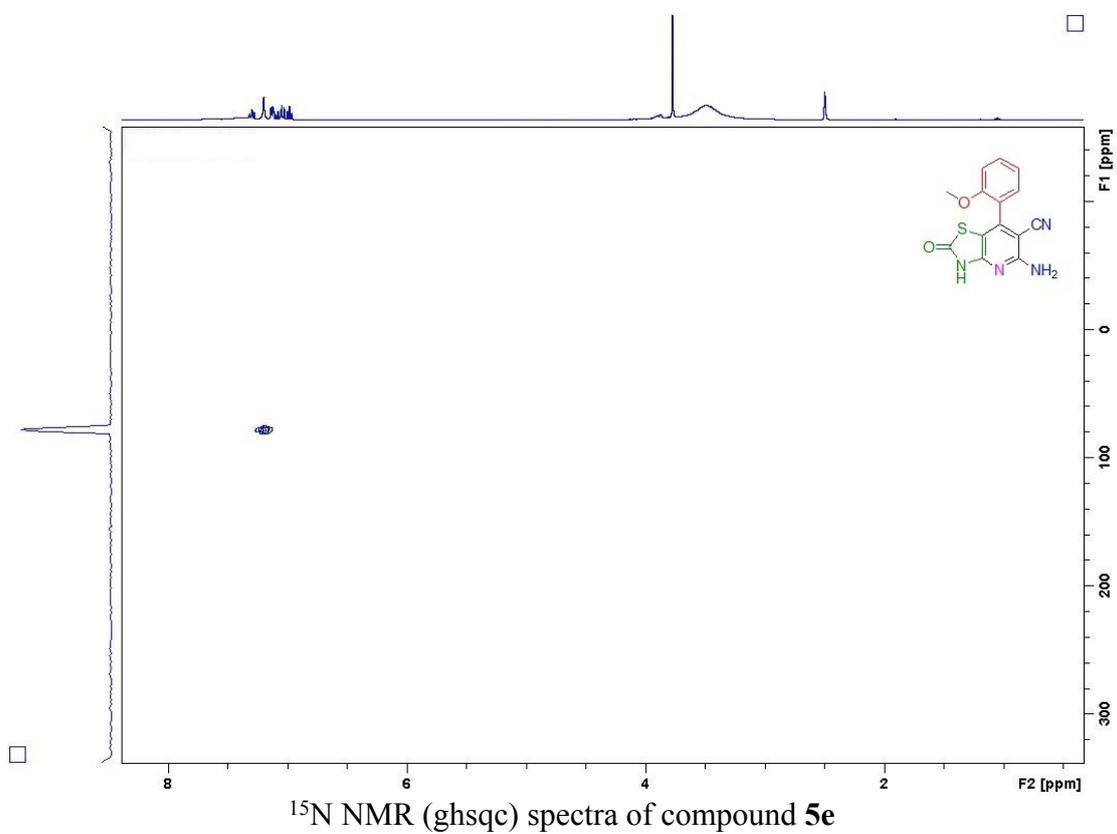
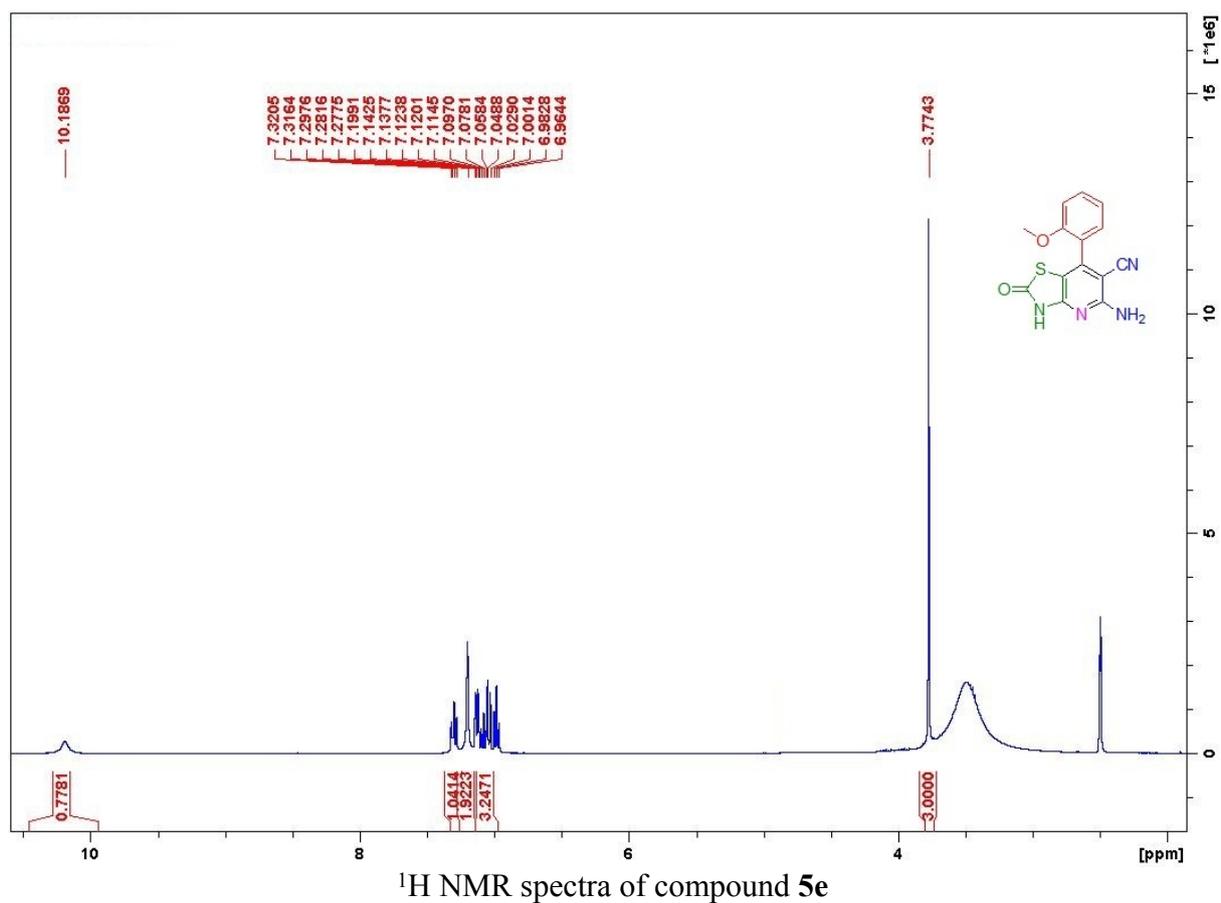
<sup>15</sup>N NMR (ghsqc) spectra of compound **5d**

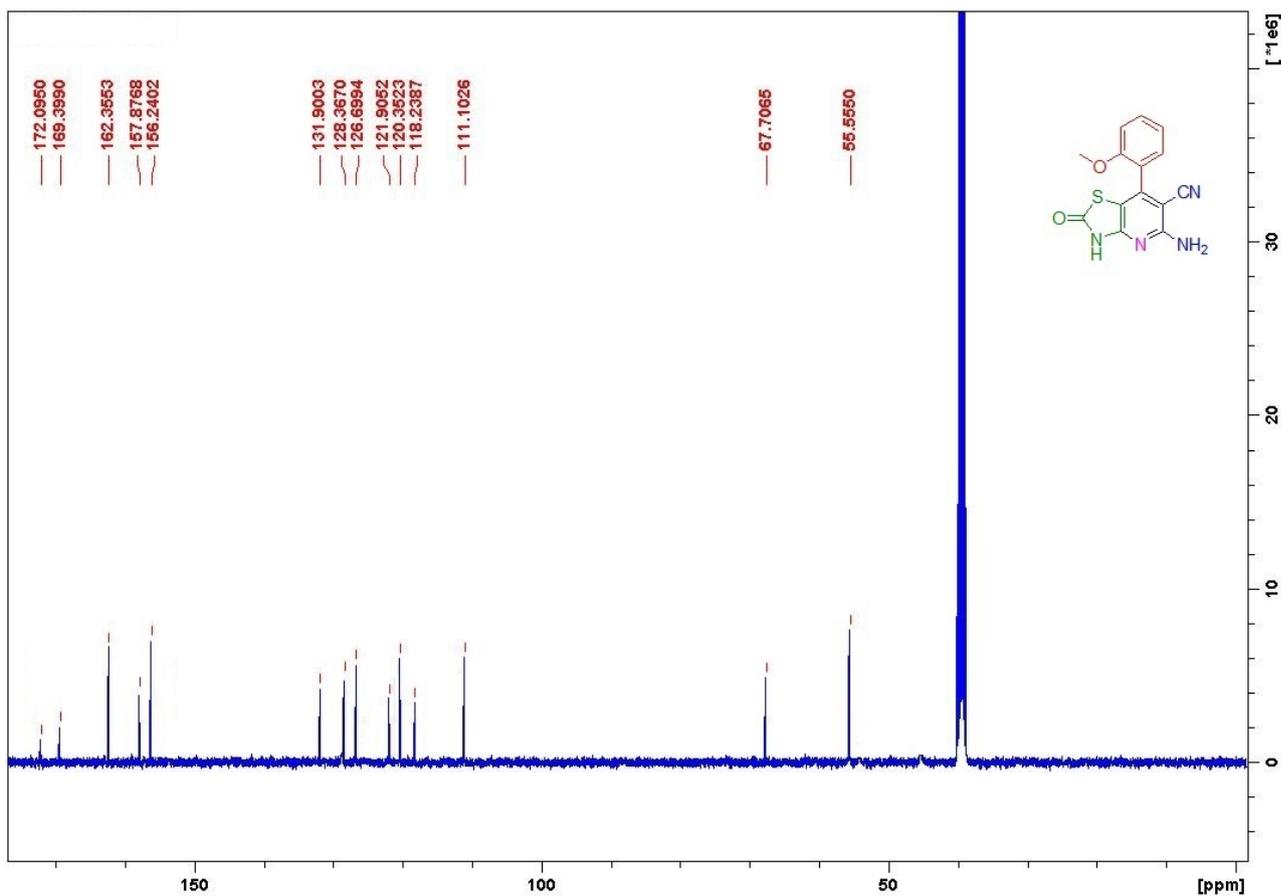


<sup>13</sup>C NMR spectra of compound **5d**

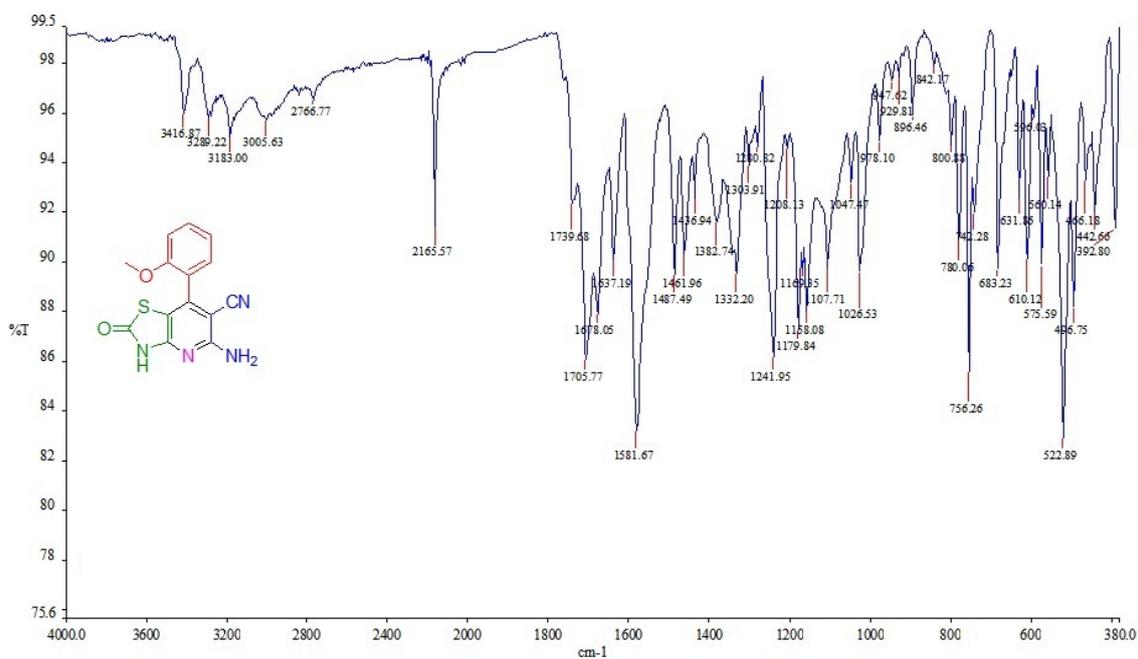


FTIR spectra of compound **5d**

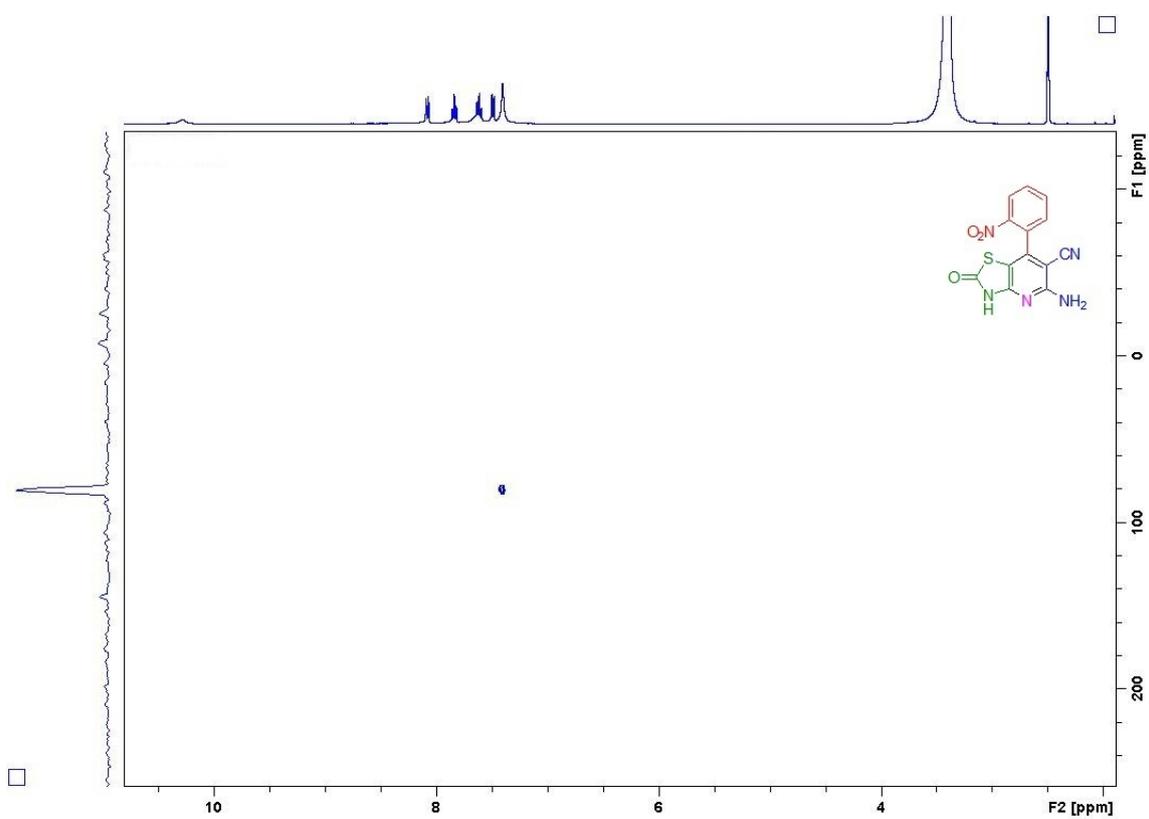
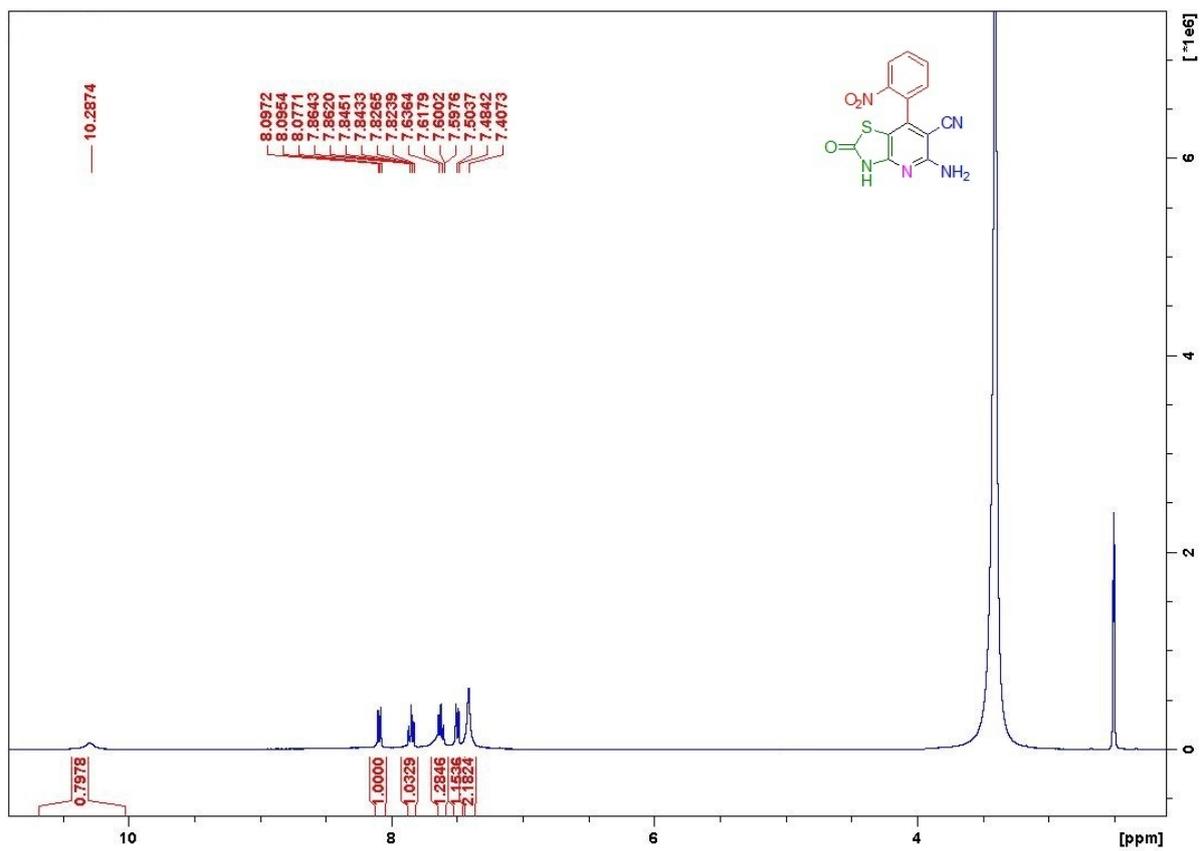


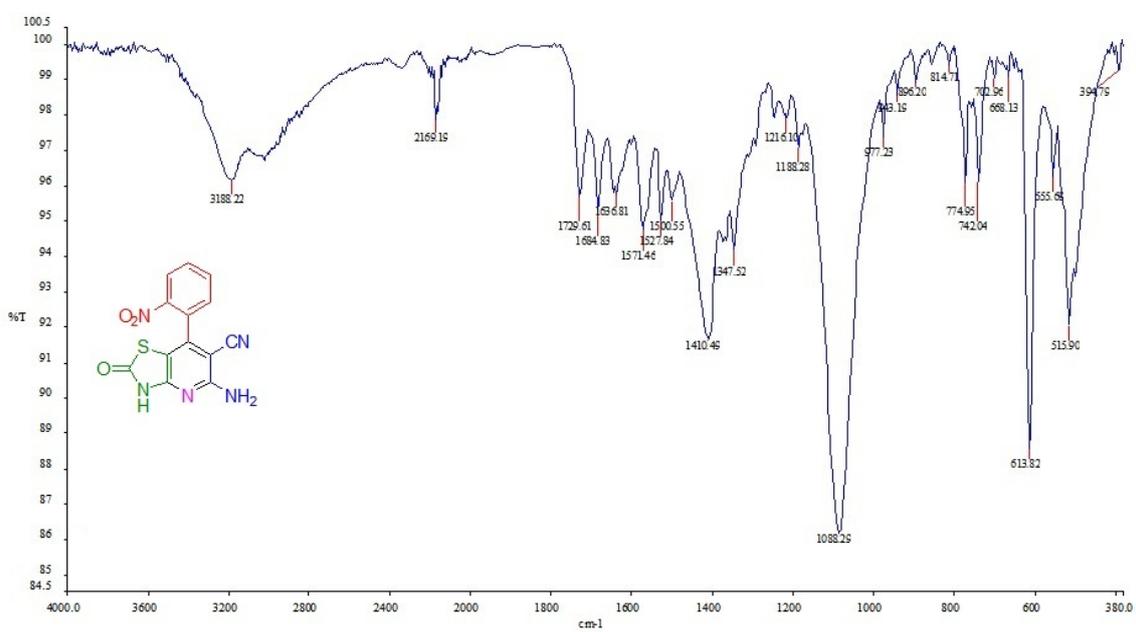
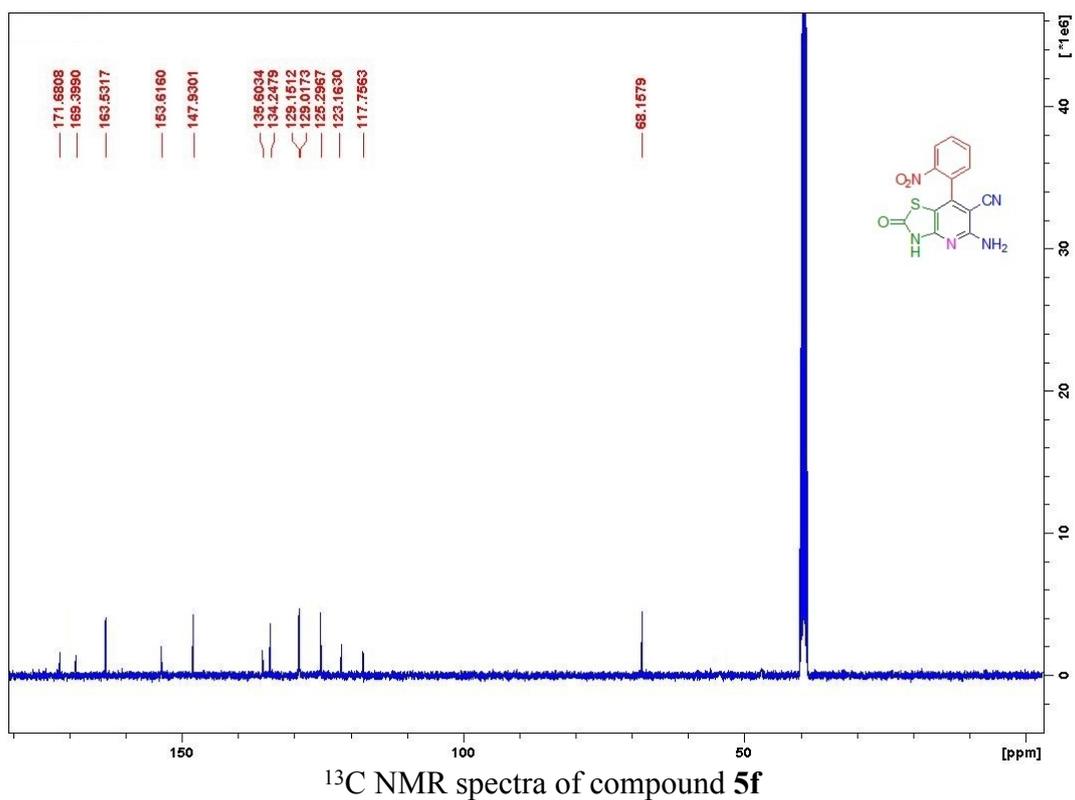


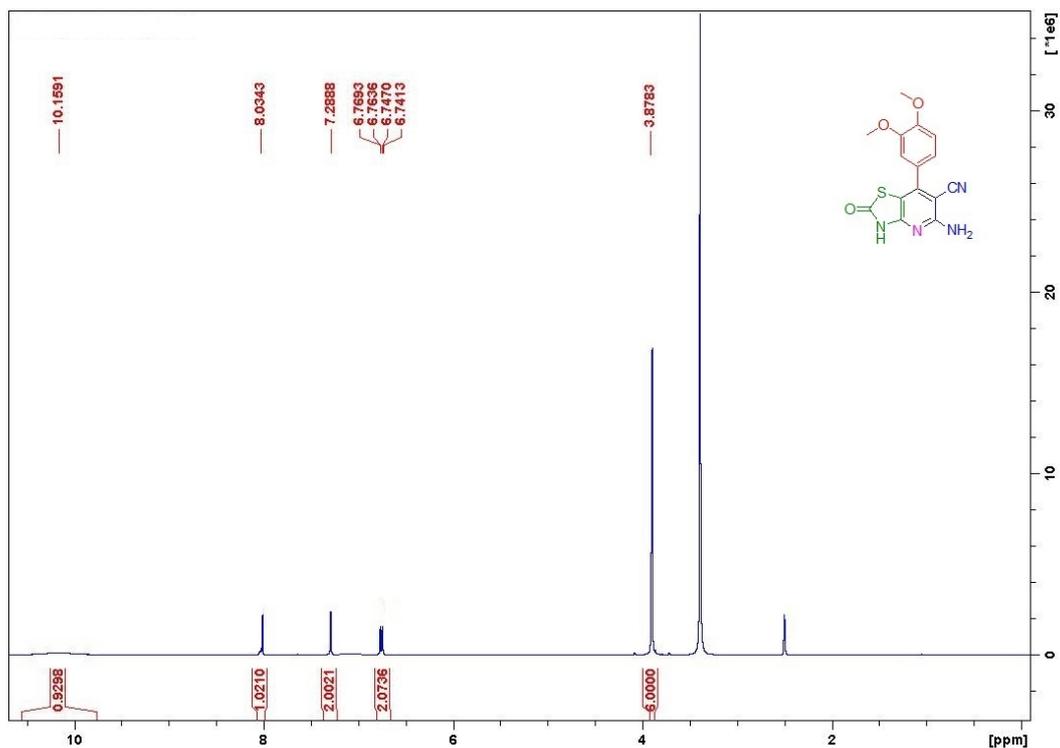
<sup>13</sup>C NMR spectra of compound 5e



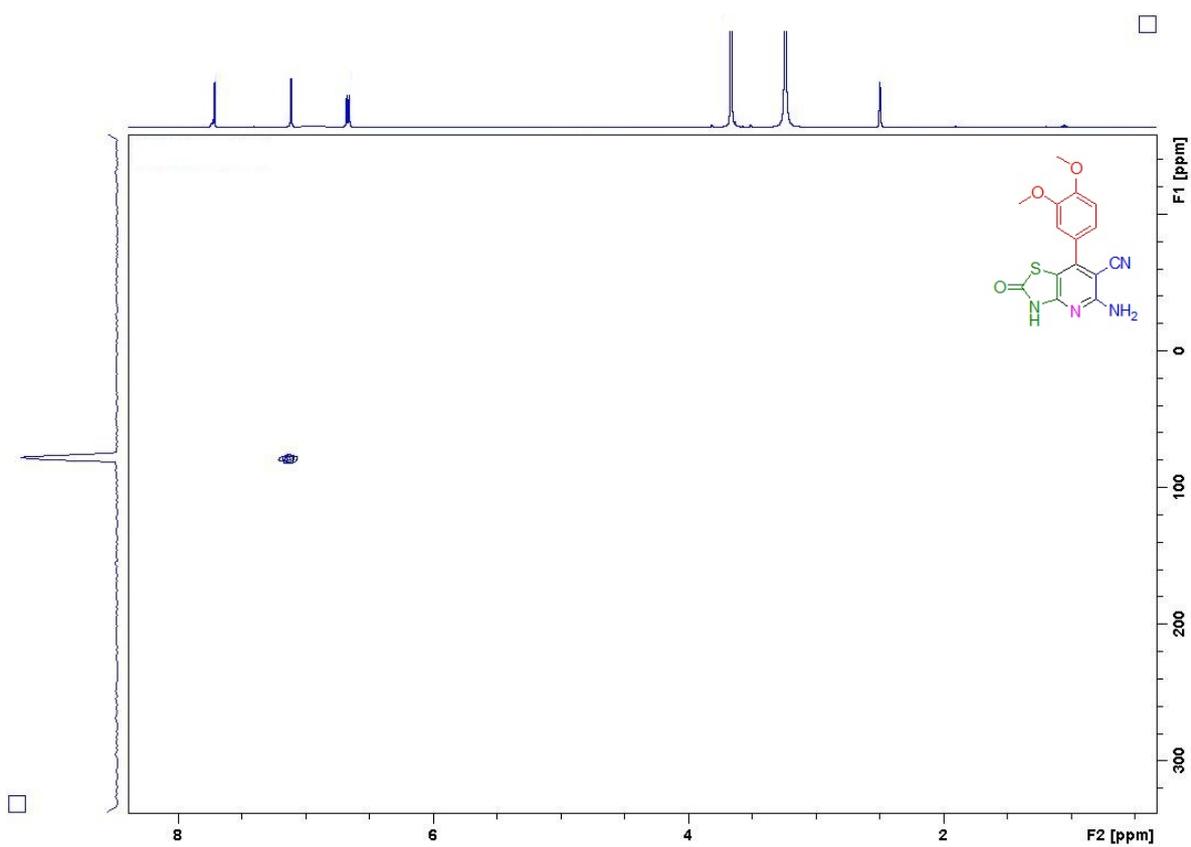
FTIR spectra of compound 5e



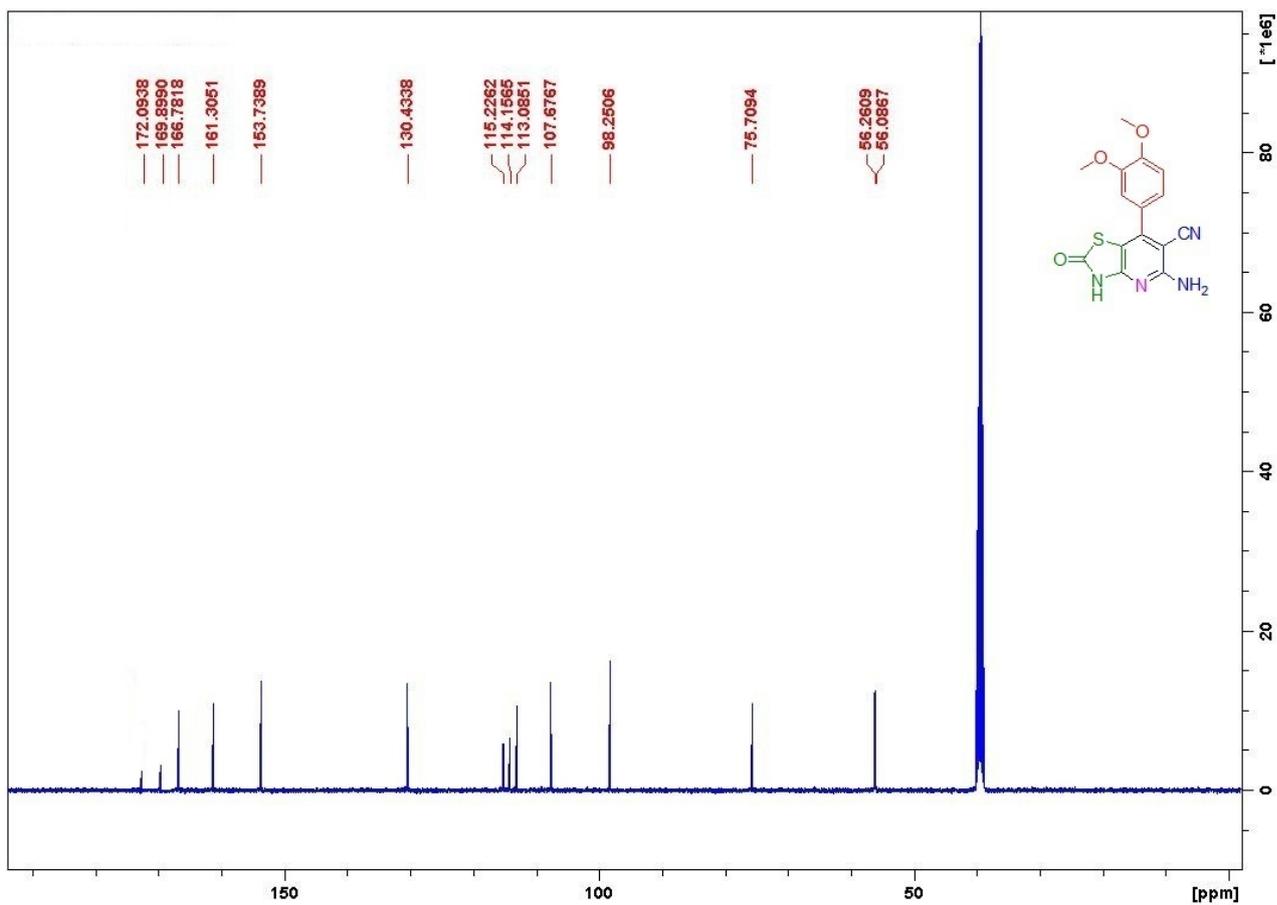




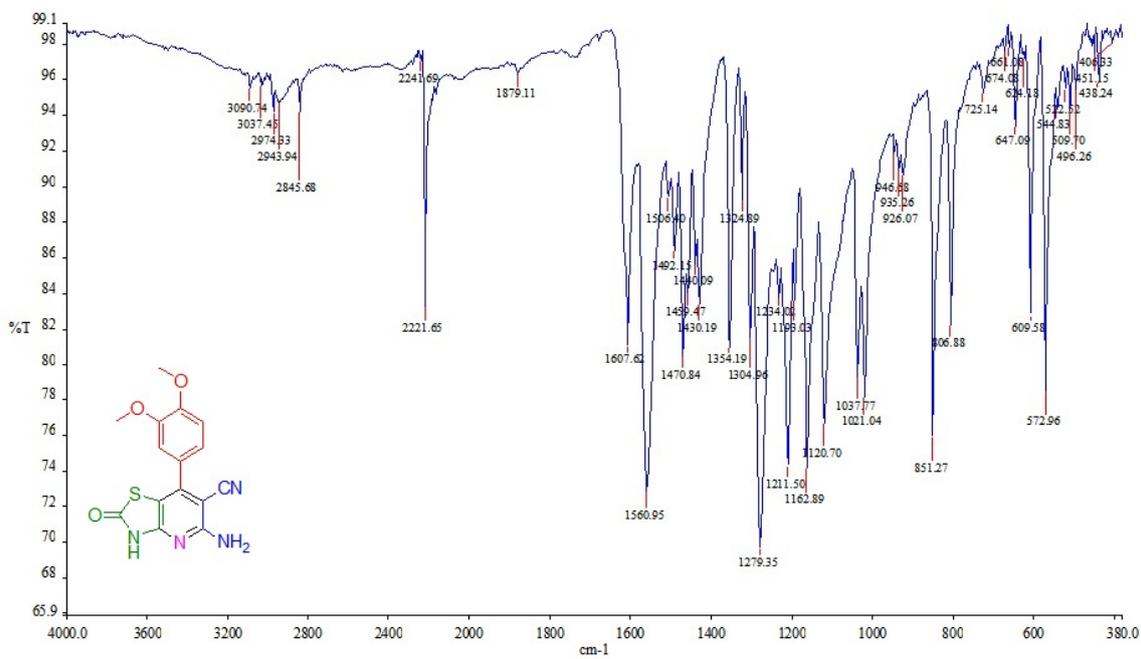
<sup>1</sup>H NMR spectra of compound **5g**



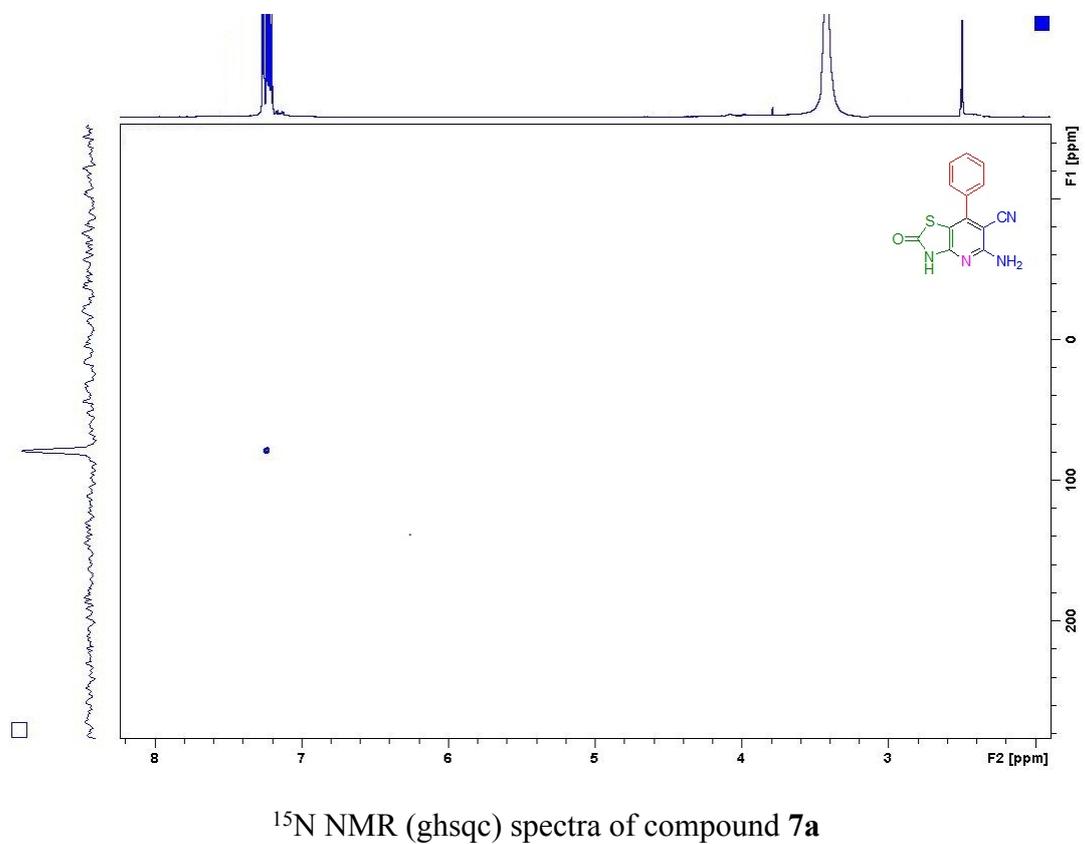
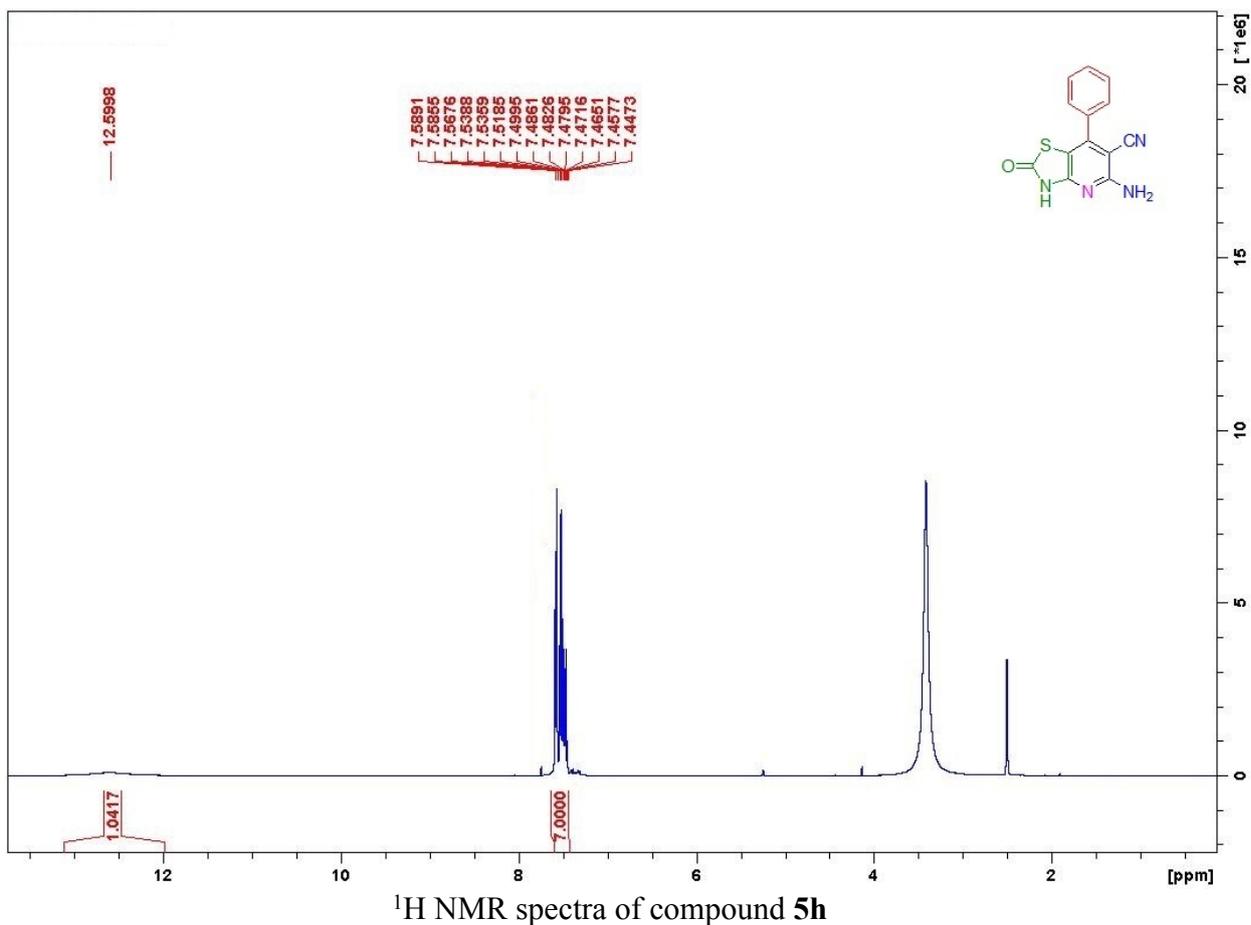
<sup>15</sup>N NMR (ghsqc) spectra of compound **5g**

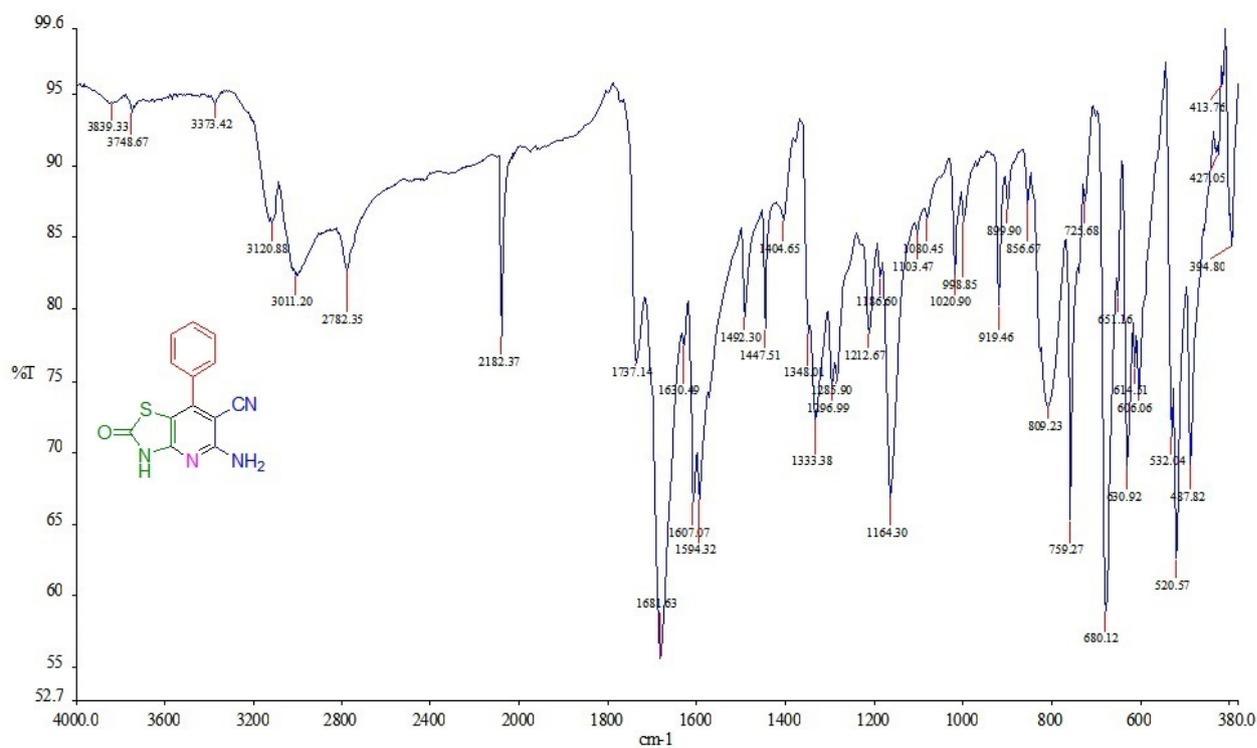
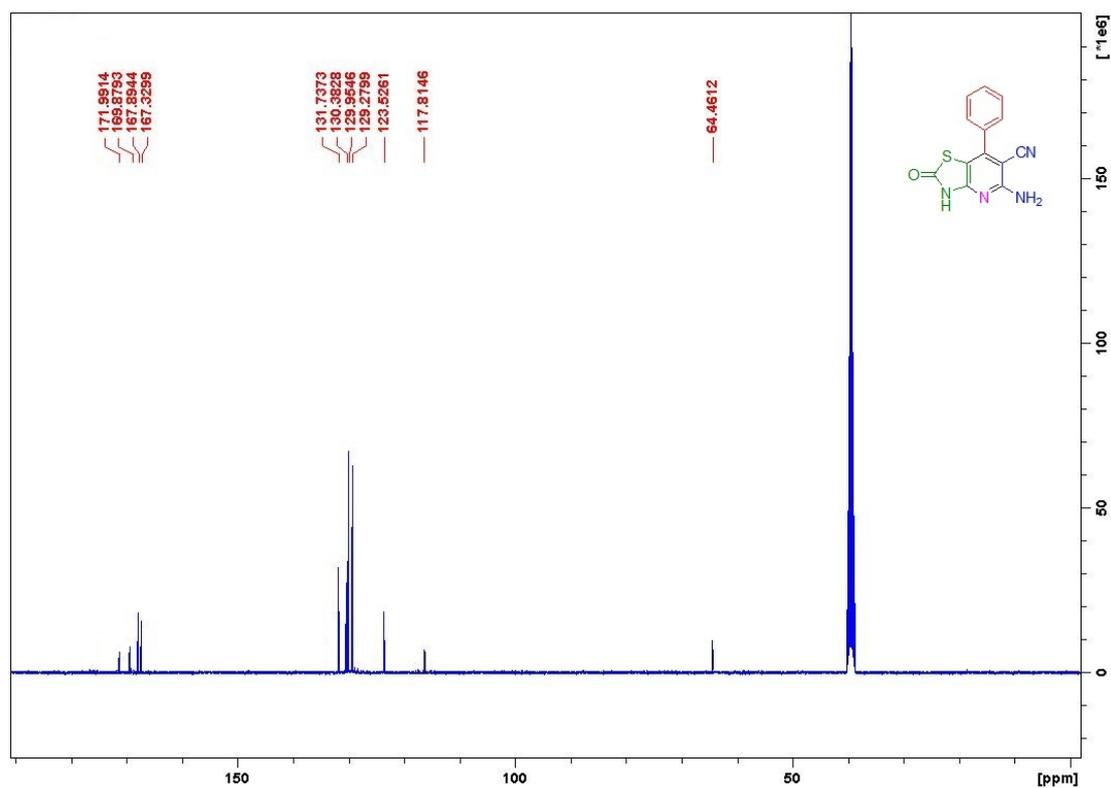


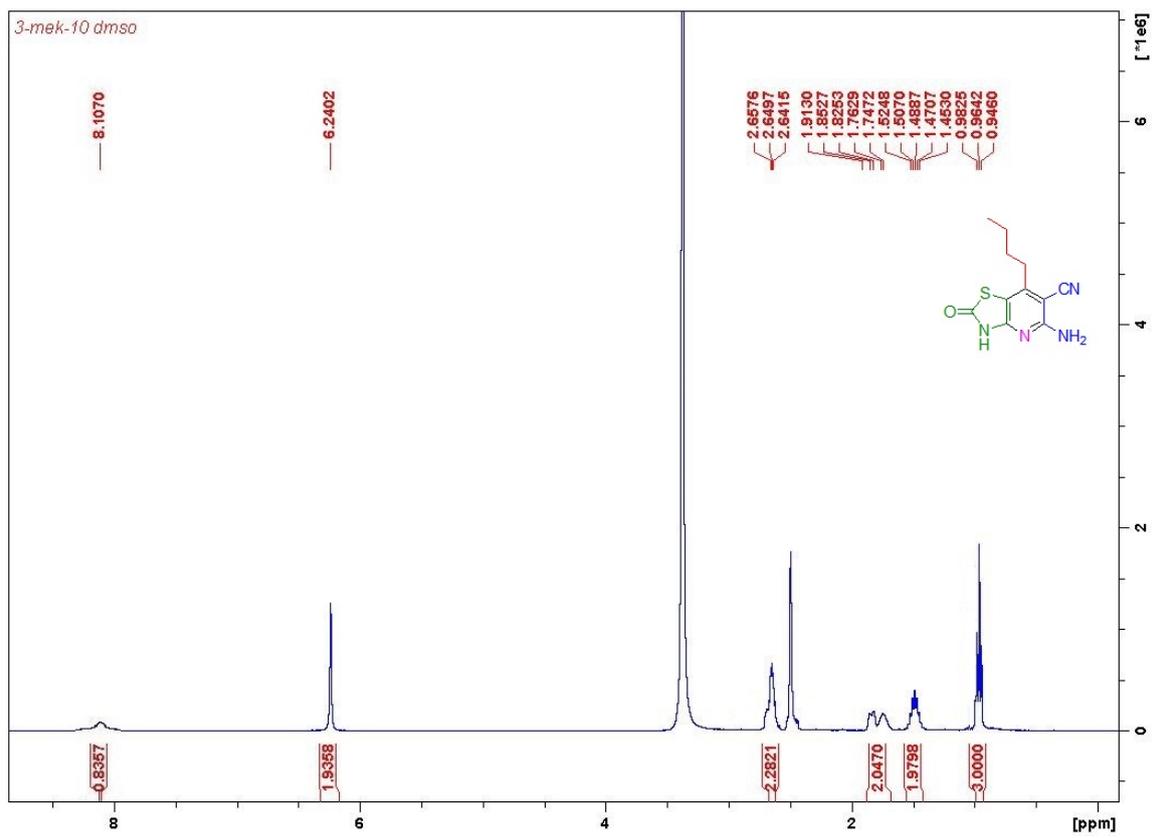
<sup>13</sup>C NMR spectra of compound 5g



FTIR spectra of compound 5g







<sup>1</sup>H NMR spectra of compound **5i**