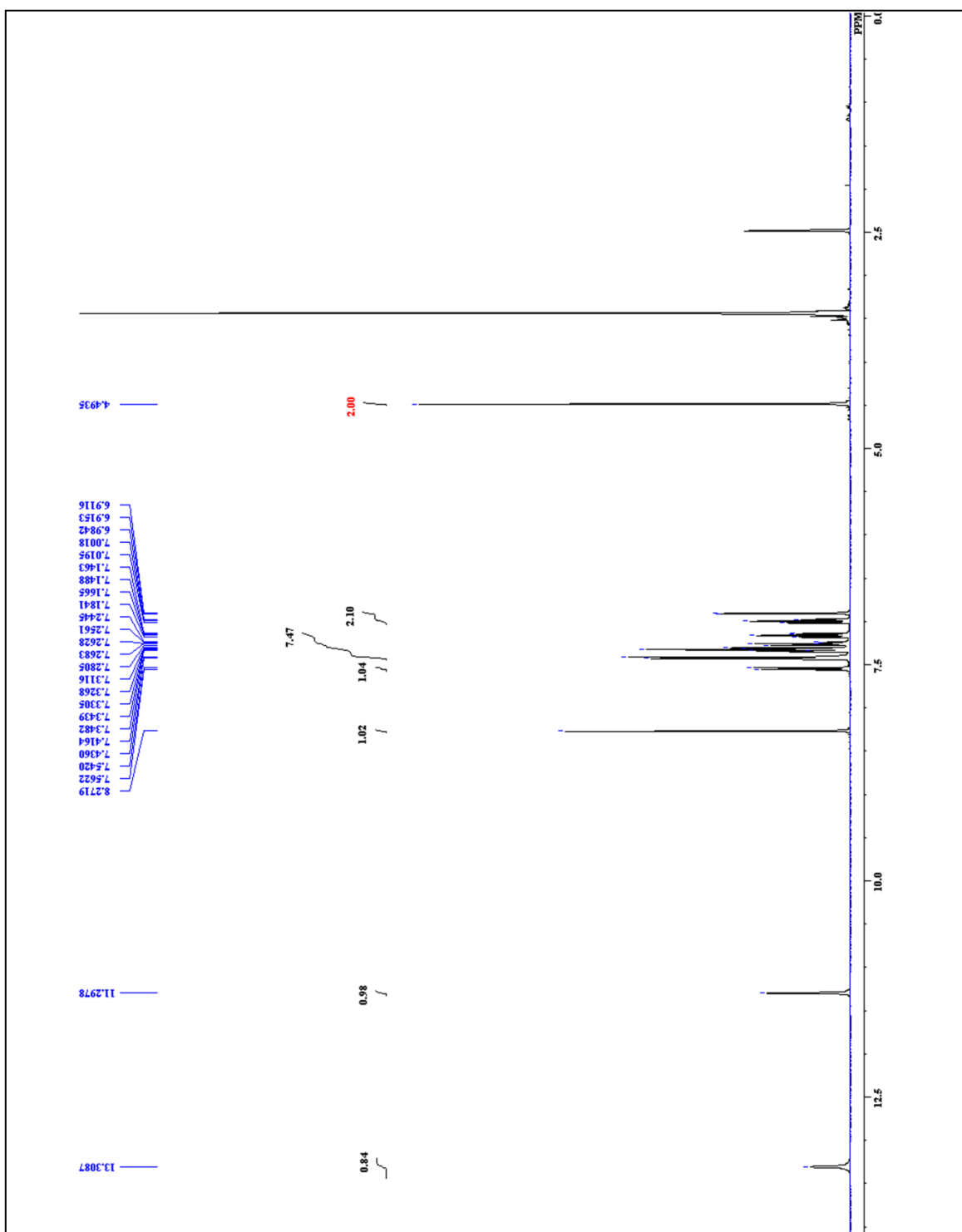
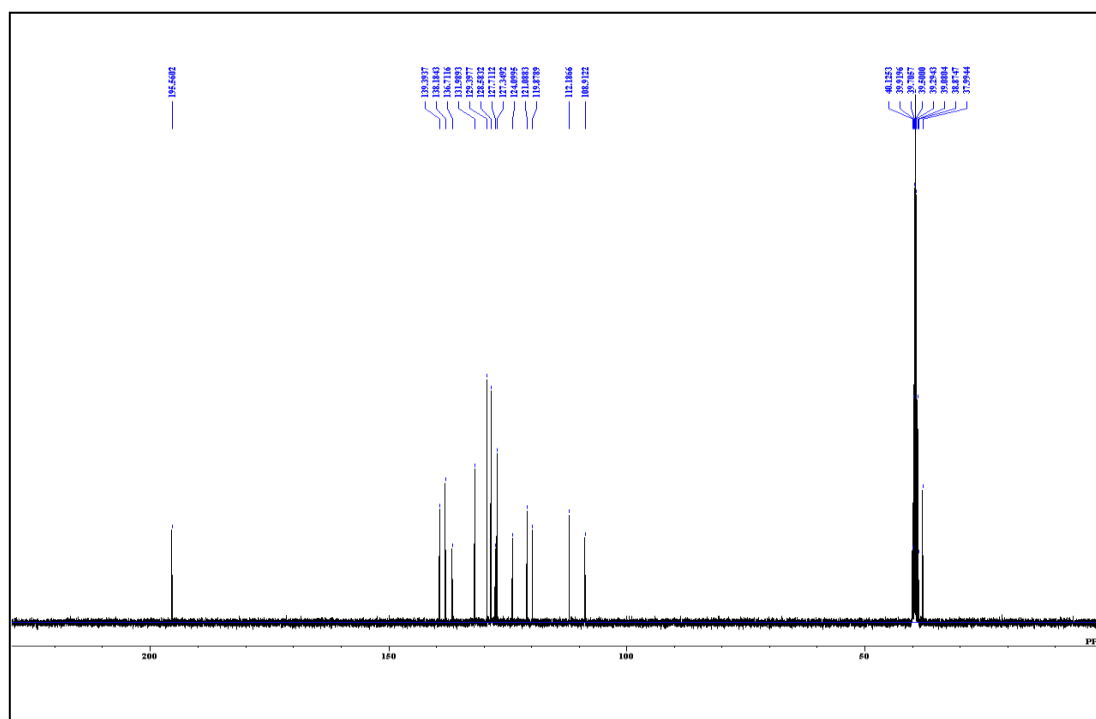


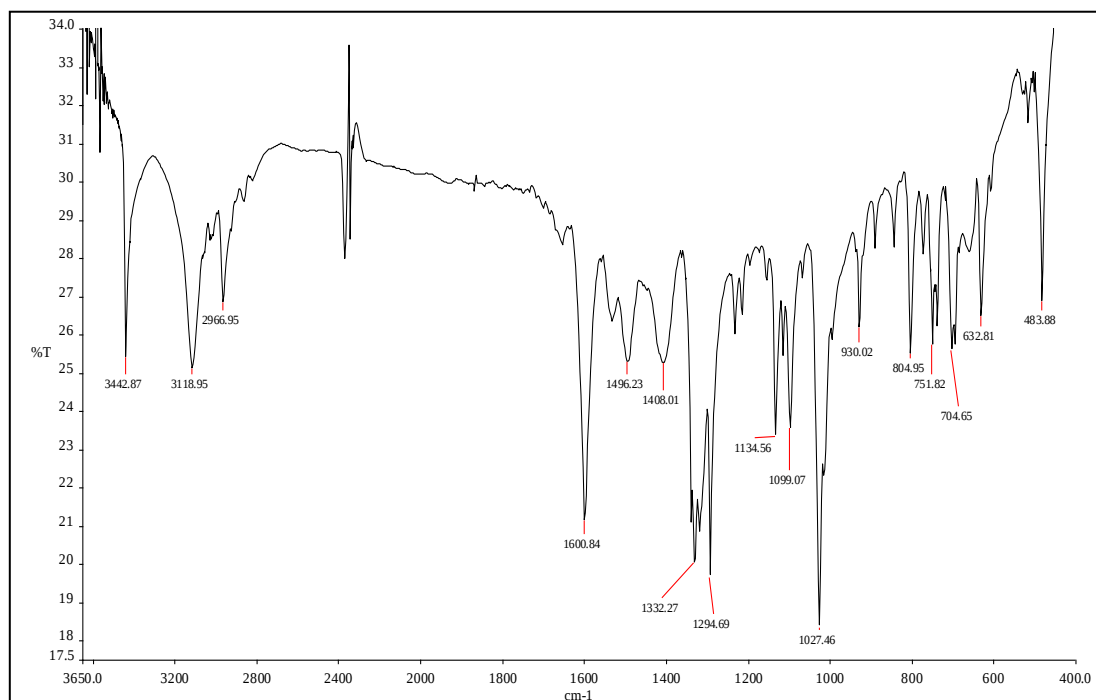
APENDIX A

Spectra of compounds in chapter II

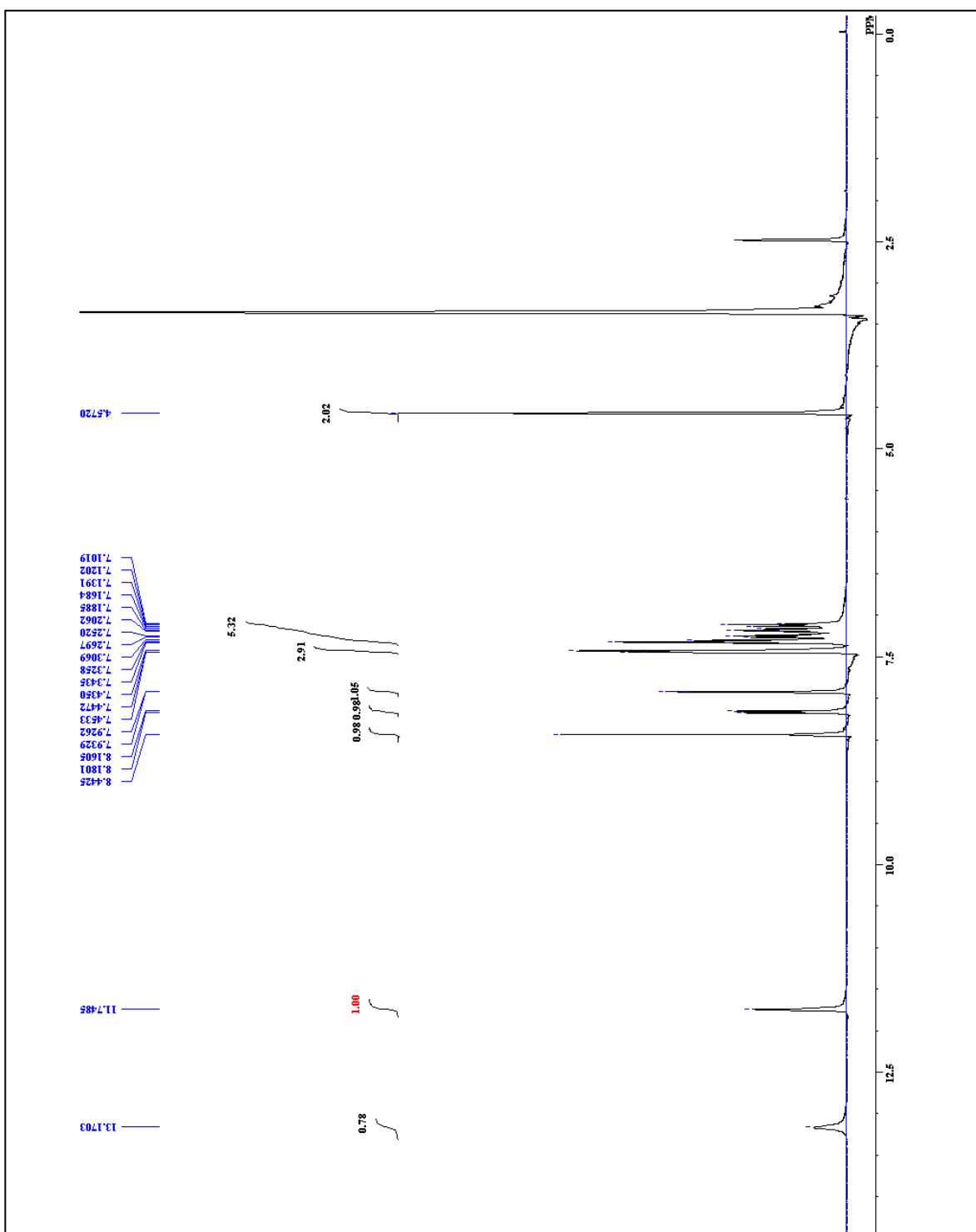
¹H NMR spectrum (400 MHz, DMSO-*d*₆) of **H₂L**¹



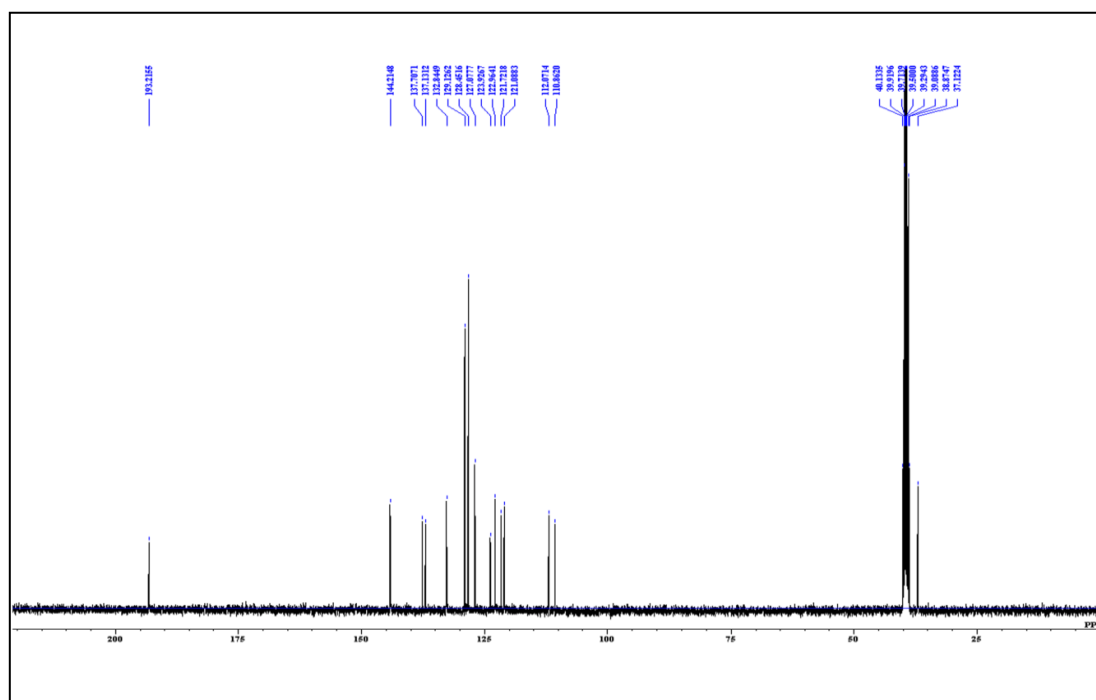
^{13}C NMR spectrum (400 MHz, $\text{DMSO}-d_6$) of H_2L^1



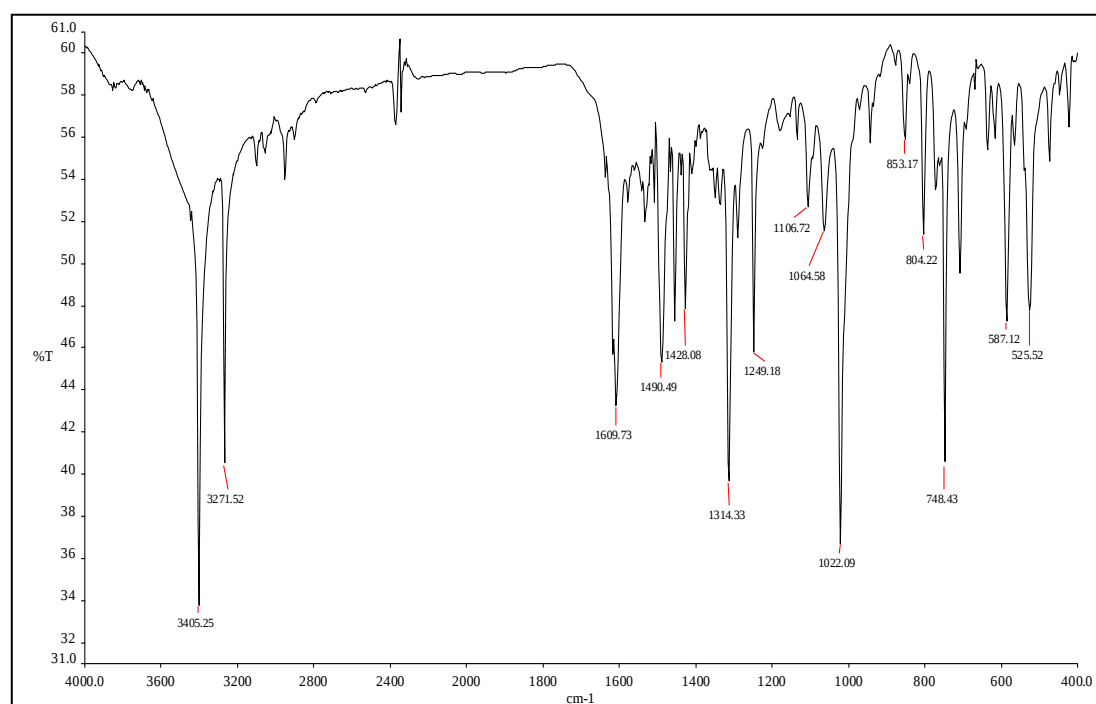
IR spectrum (KBr) of H_2L^1



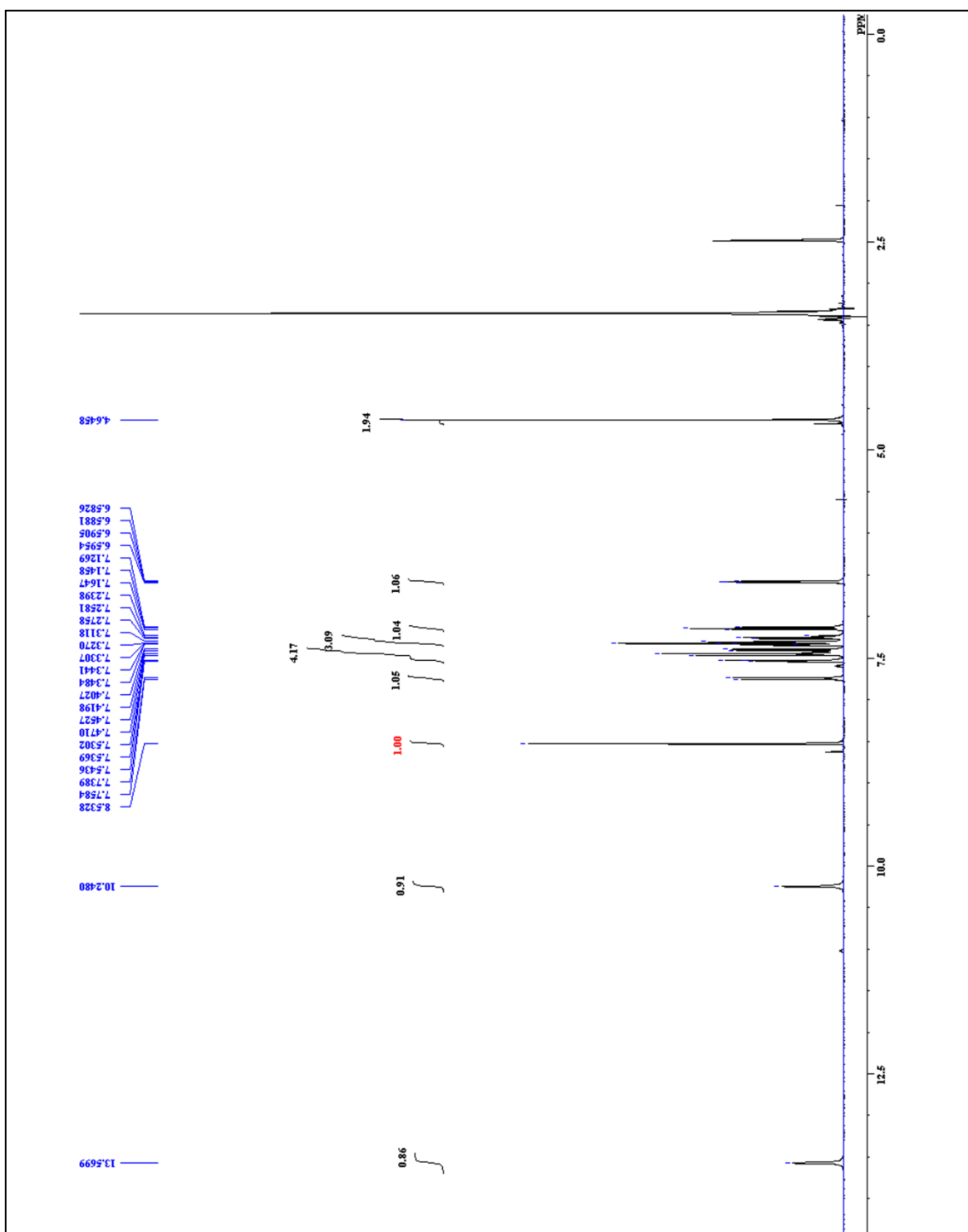
¹H NMR spectrum (400 MHz, DMSO-*d*₆) of **H₂L²**



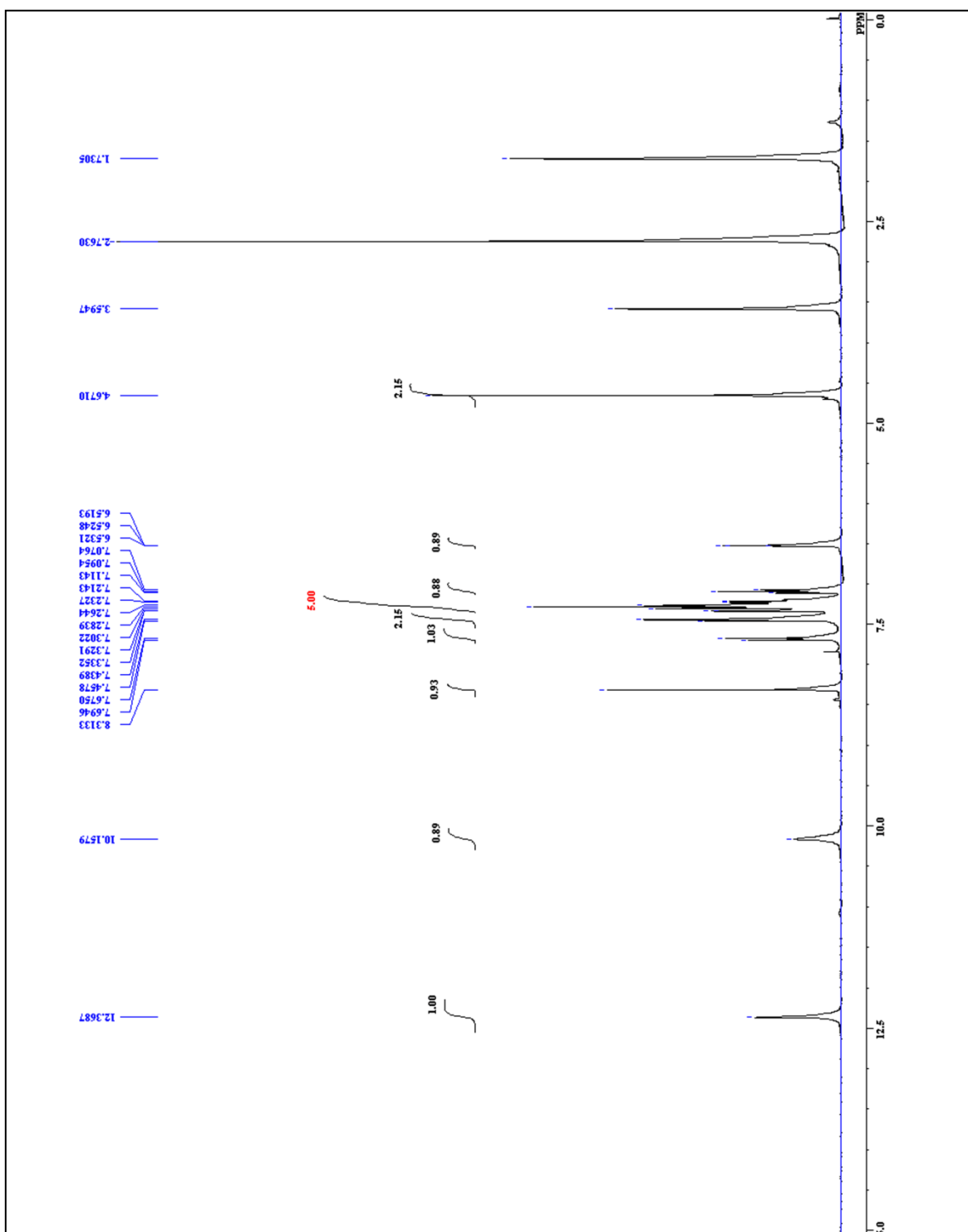
¹³C NMR spectrum (400 MHz, DMSO-*d*₆) of **H₂L²**



IR spectrum (KBr) of **H₂L²**

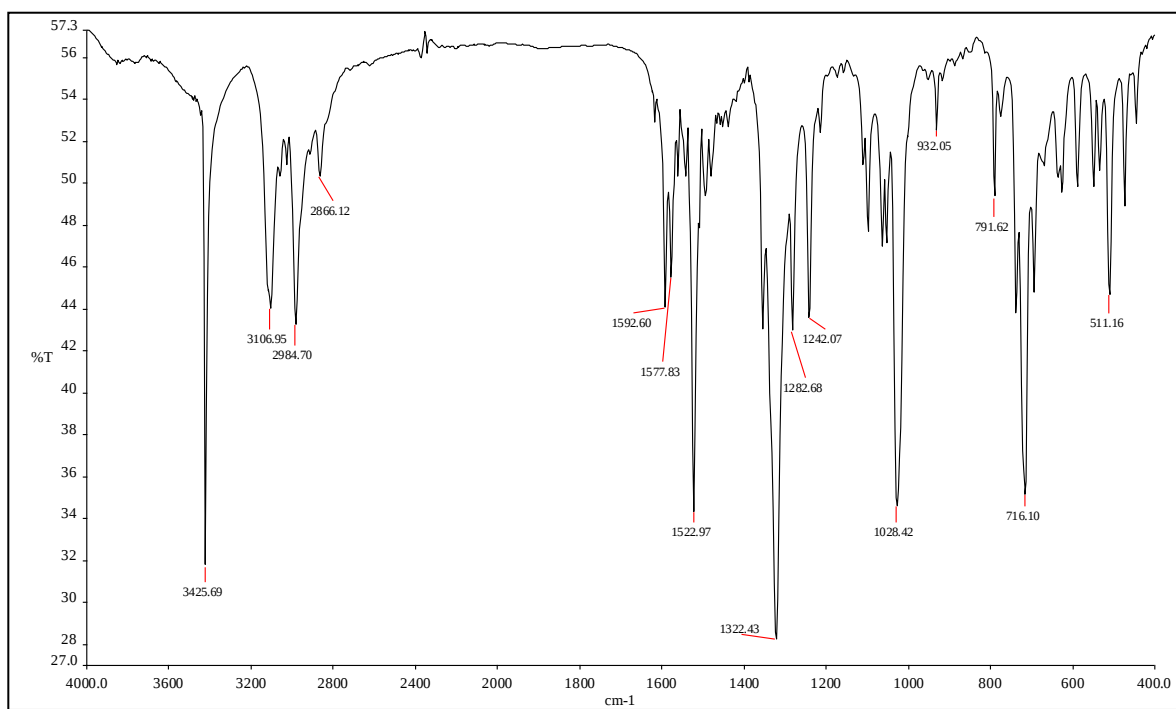


^1H NMR spectrum (400 MHz, $\text{DMSO-}d_6$) of H_2L^3

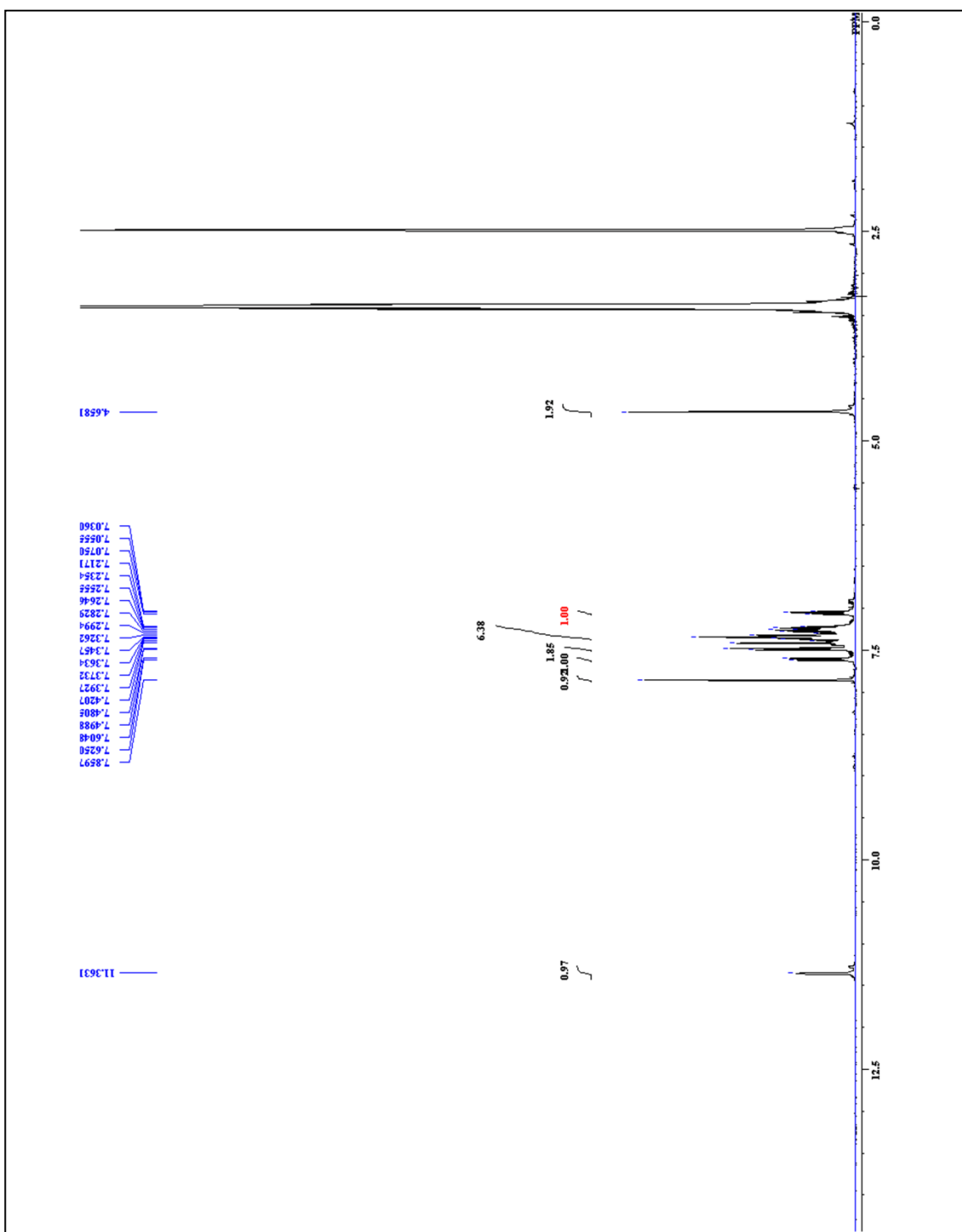


¹H NMR spectrum (400 MHz, THF-*d*₈) of **H₂L³**

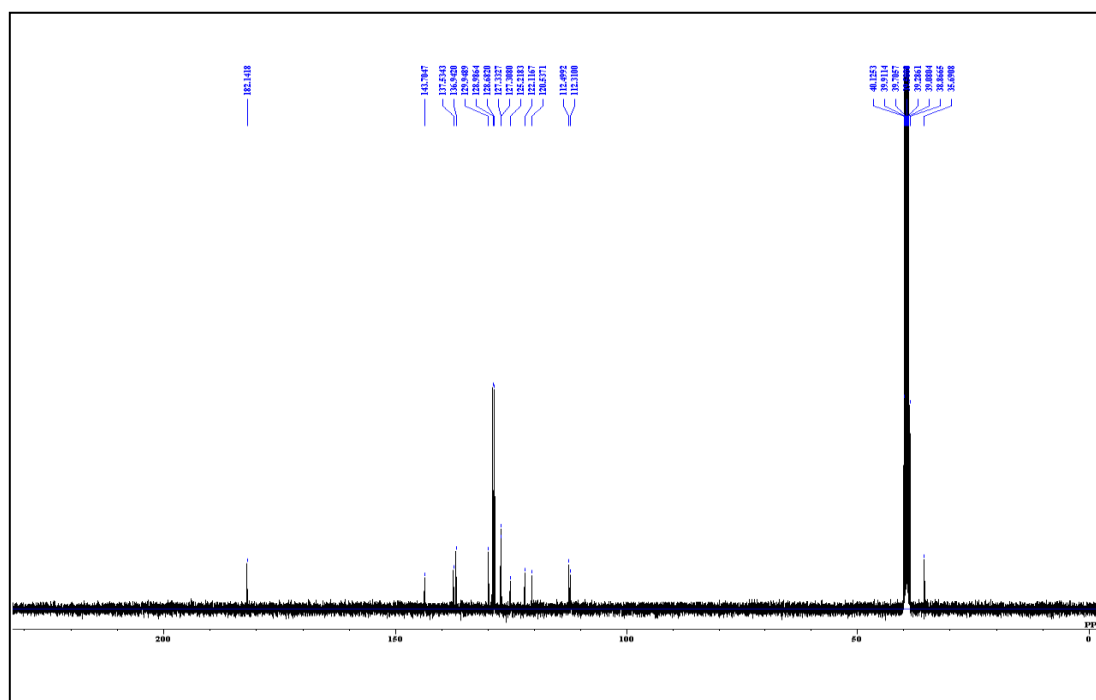




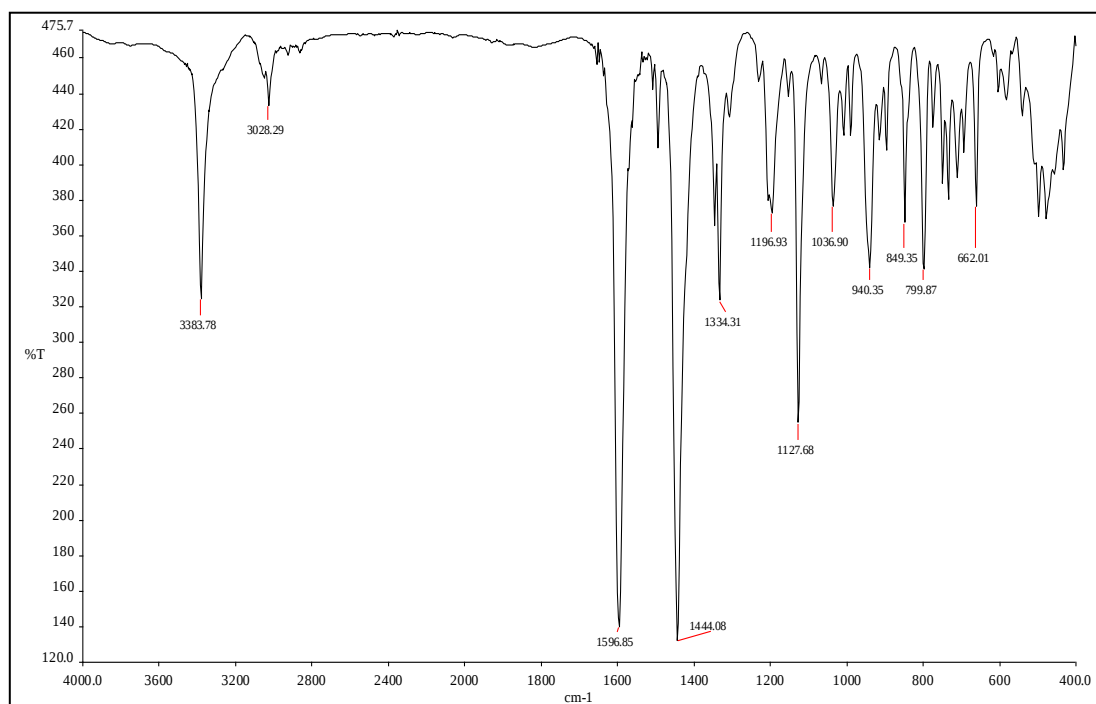
IR spectrum (KBr) of H_2L^3



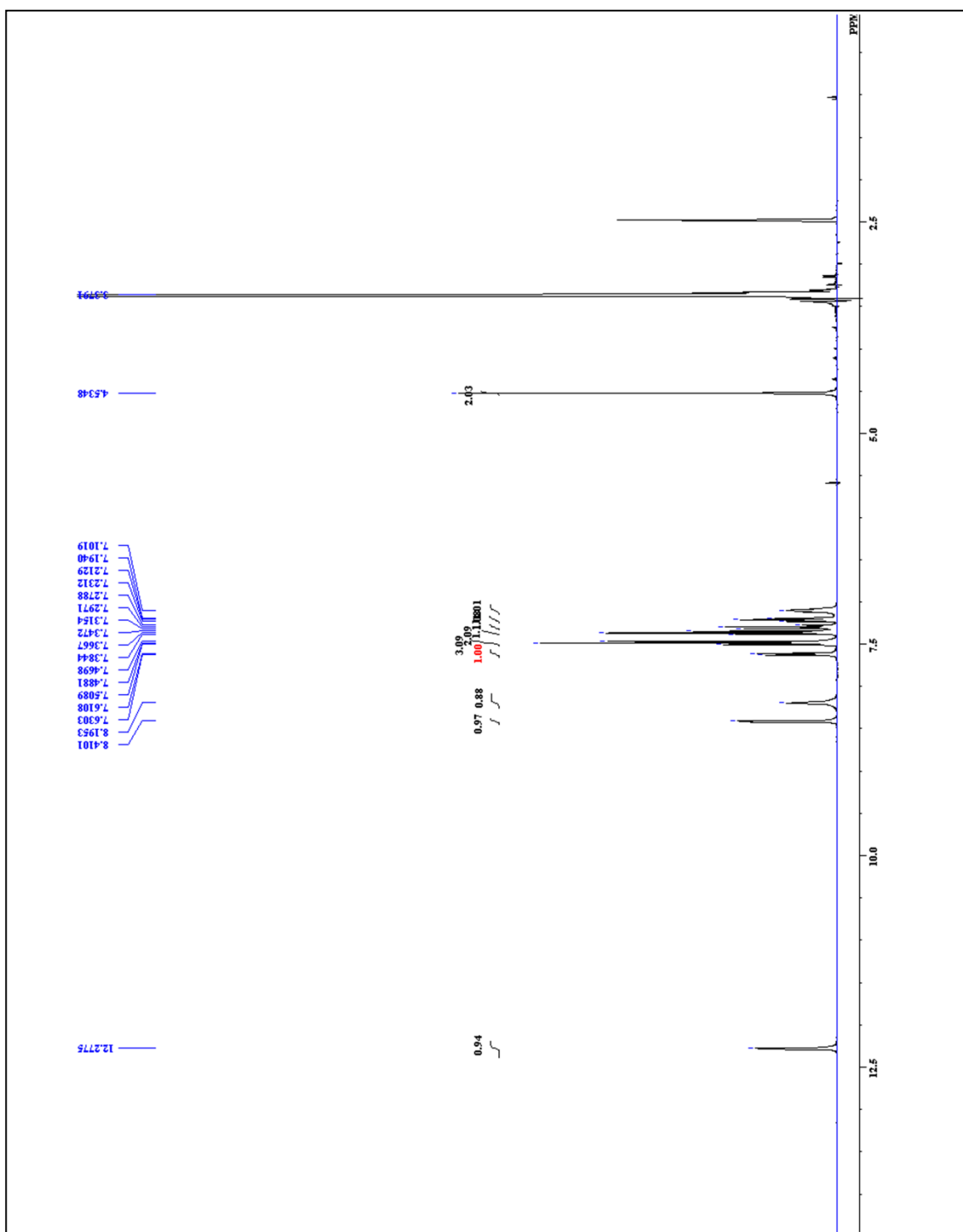
¹H NMR spectrum (400 MHz, DMSO-*d*₆) of [Zn(HL¹)₂]



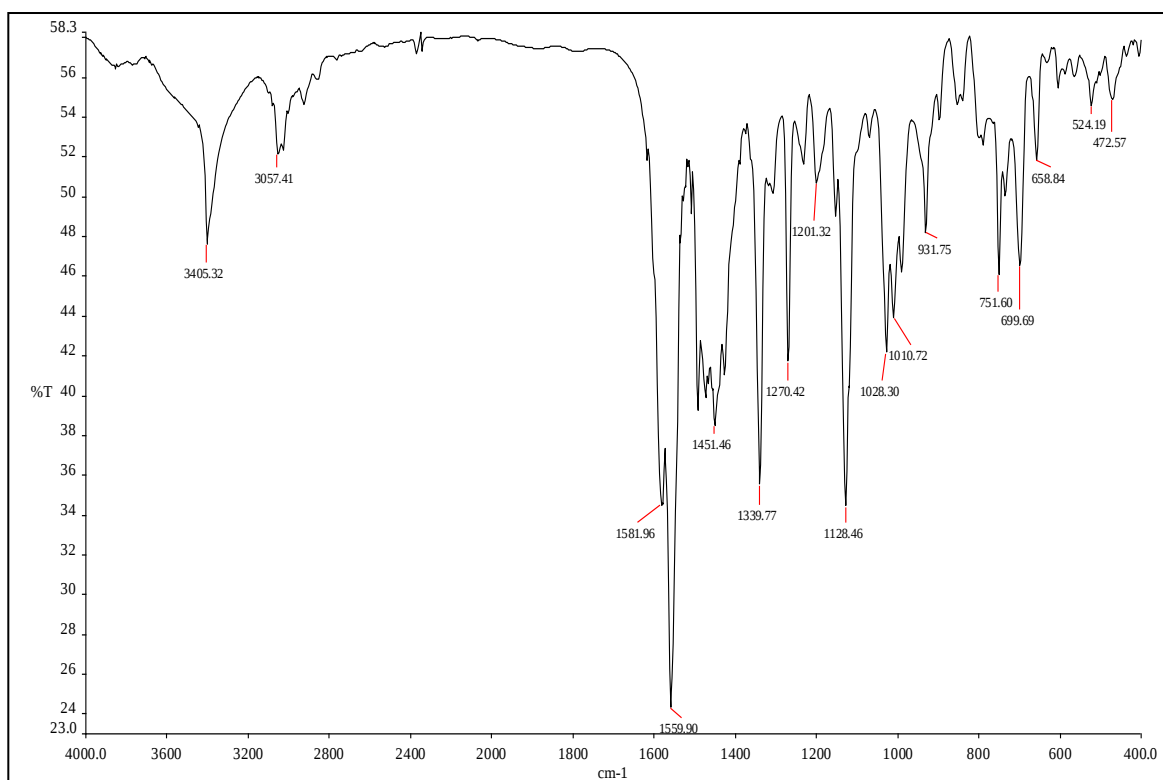
^{13}C NMR spectrum (400 MHz, $\text{DMSO}-d_6$) of $[\text{Zn}(\text{HL}^1)_2]$



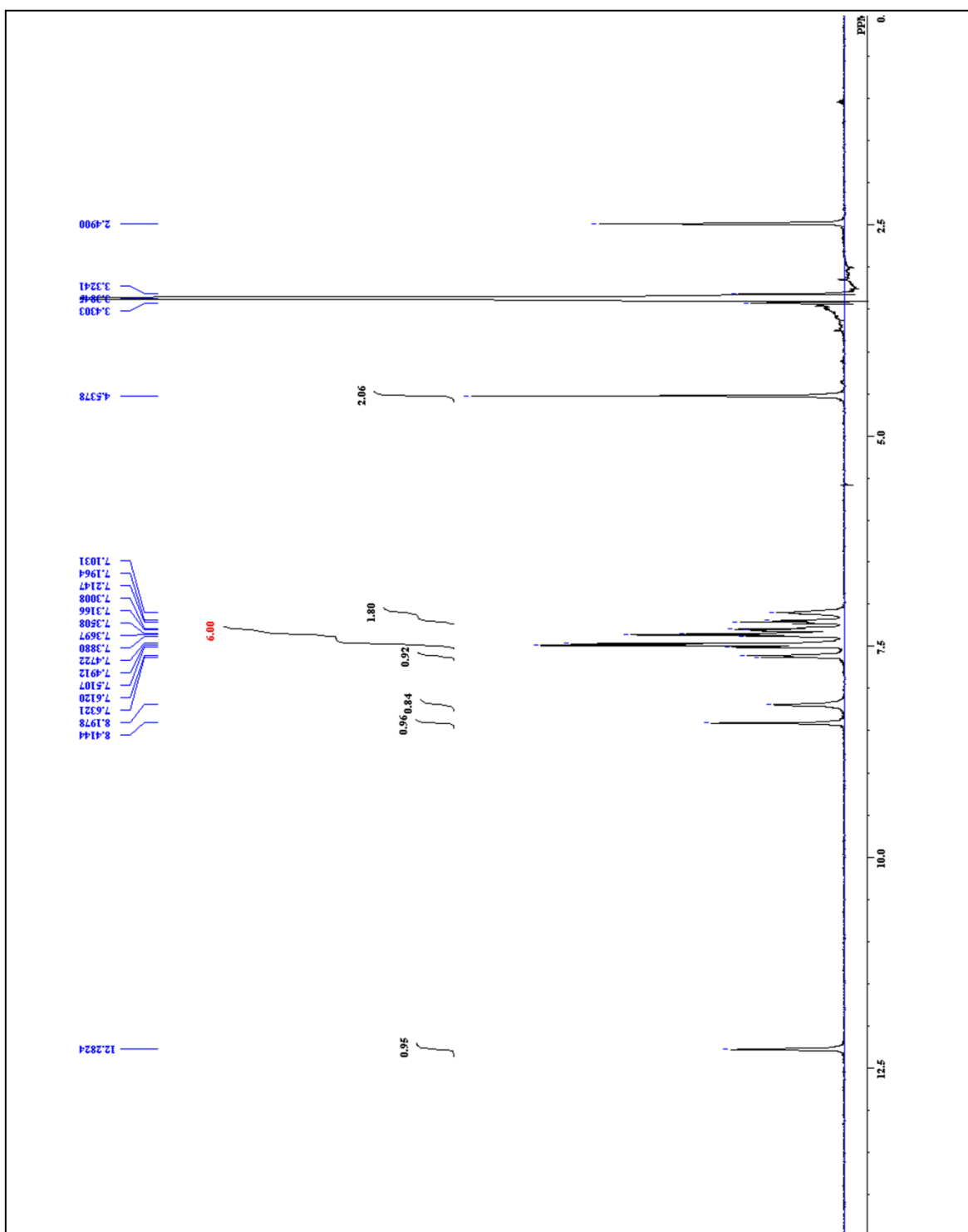
IR spectrum (KBr) of $[\text{Zn}(\text{HL}^1)_2]$



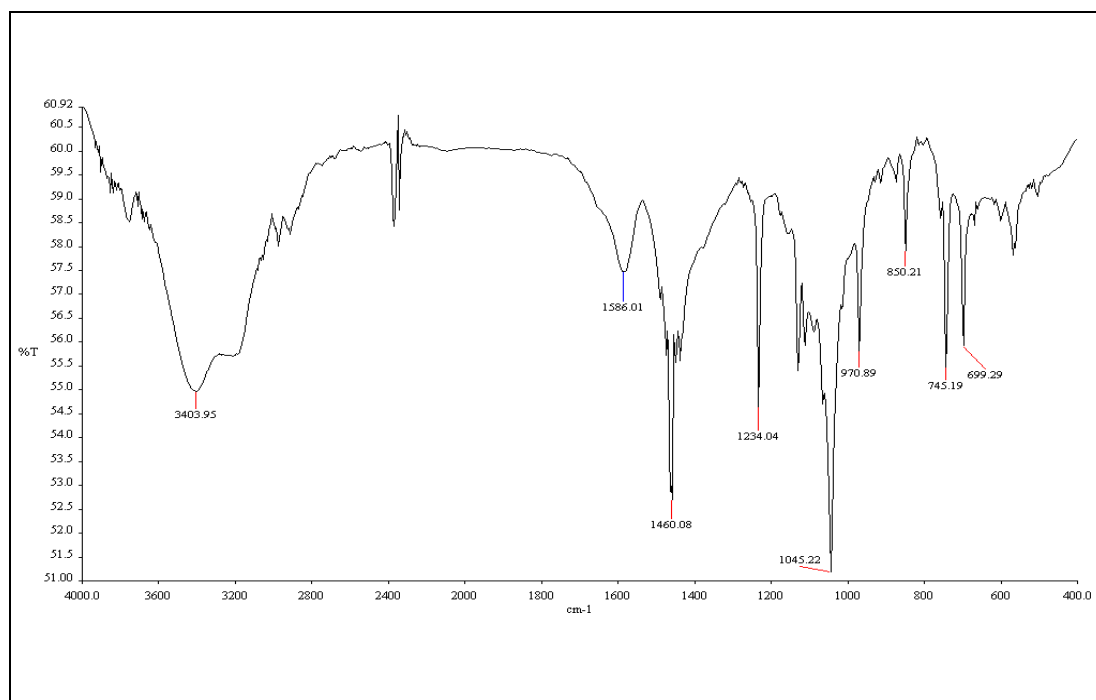
¹H NMR spectrum (400 MHz, DMSO-*d*₆) of [Ni(HL¹)₂].H₂O



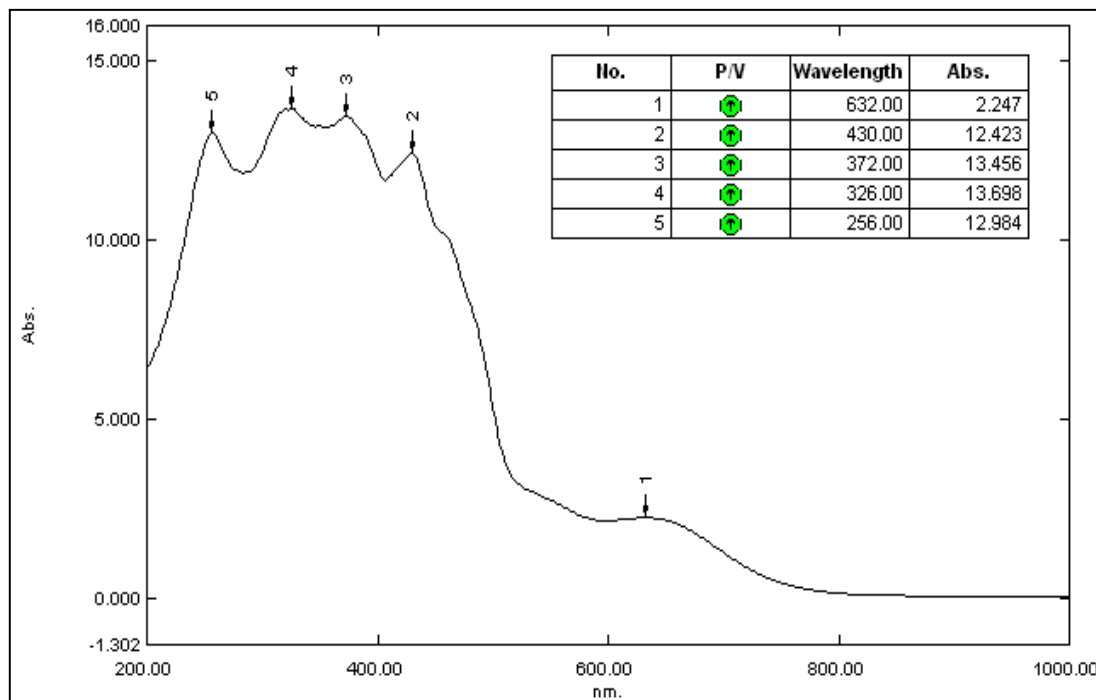
IR spectrum (KBr) of $[\text{Ni}(\text{HL}^1)_2] \cdot \text{H}_2\text{O}$



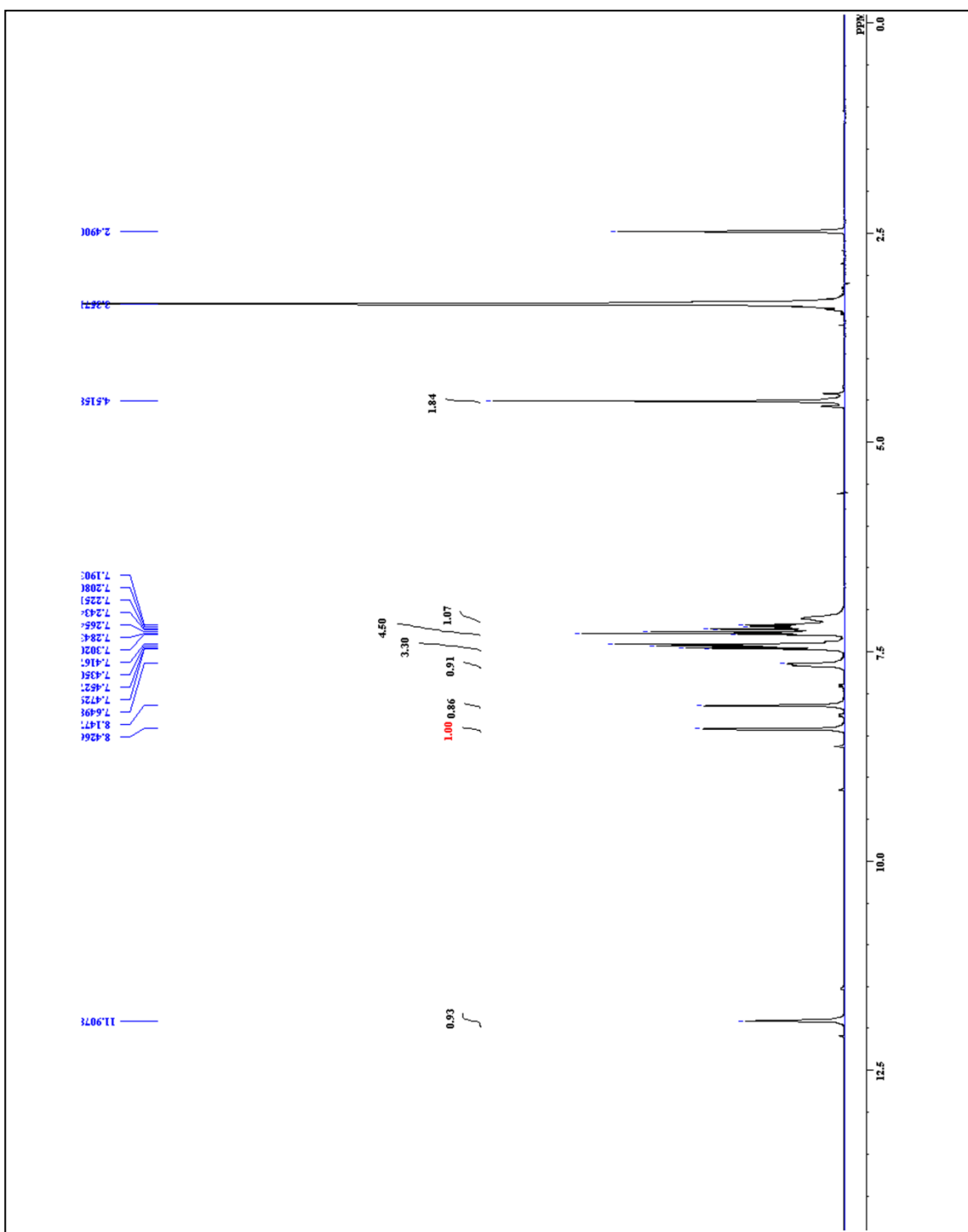
¹H NMR spectrum (400 MHz, DMSO-*d*₆) of [Ni(HL²)₂]



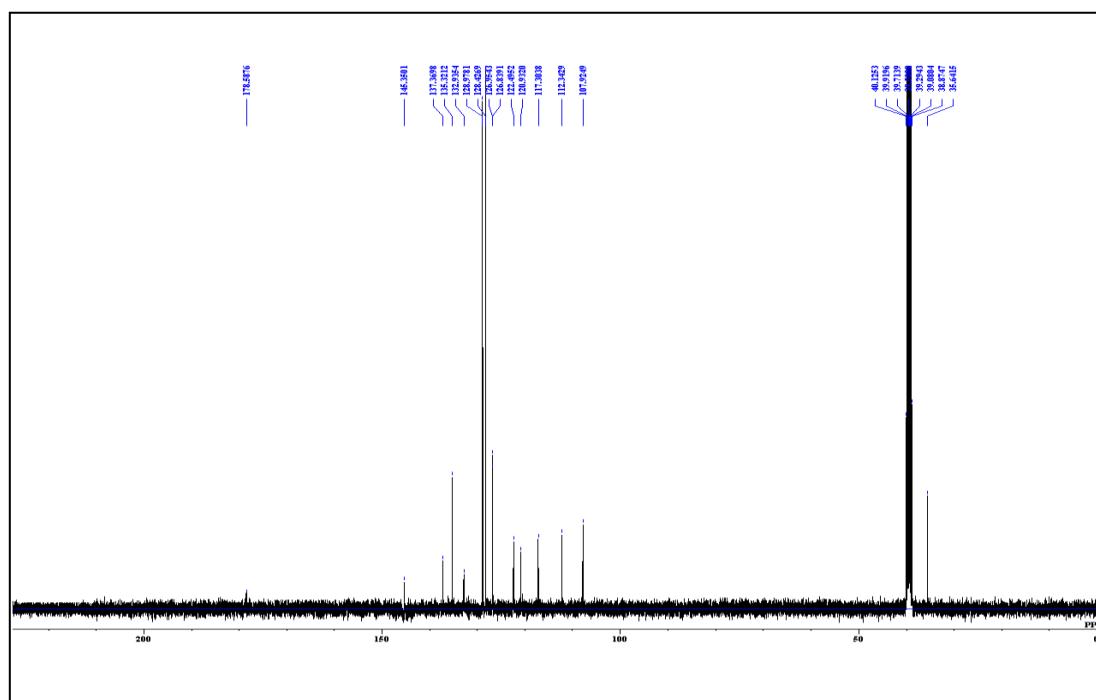
IR spectrum (KBr) of $[\text{Ni}(\text{HL}^2)_2]$



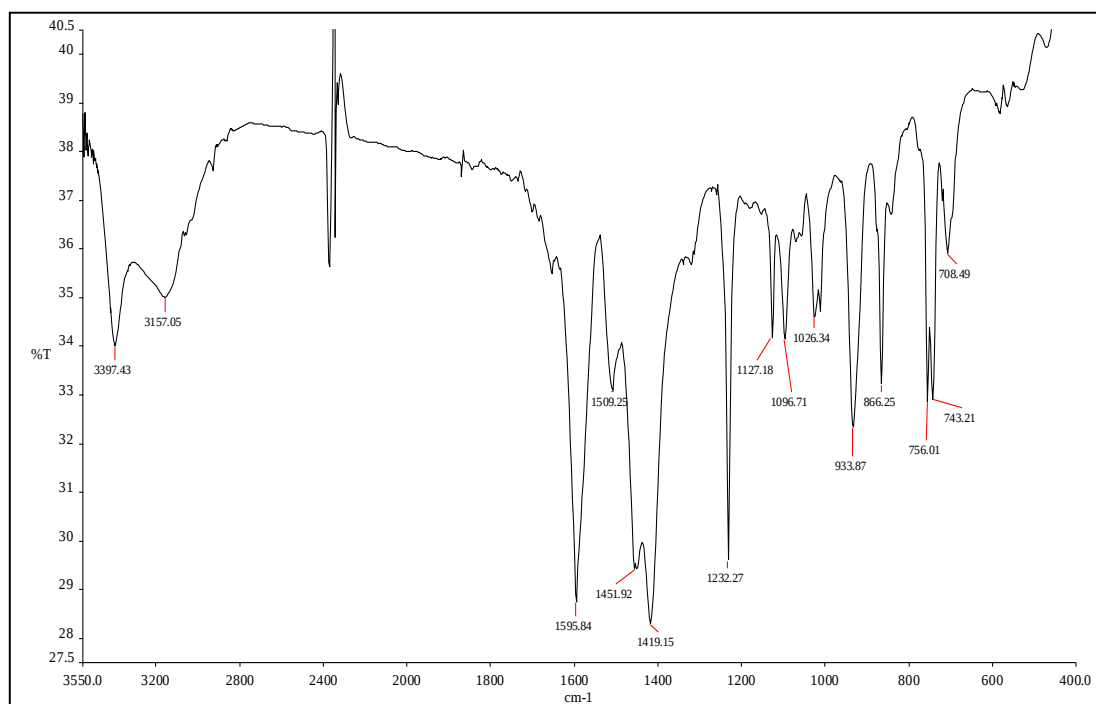
UV-Vis spectrum (solid) of $[\text{Ni}(\text{HL}^2)_2]$



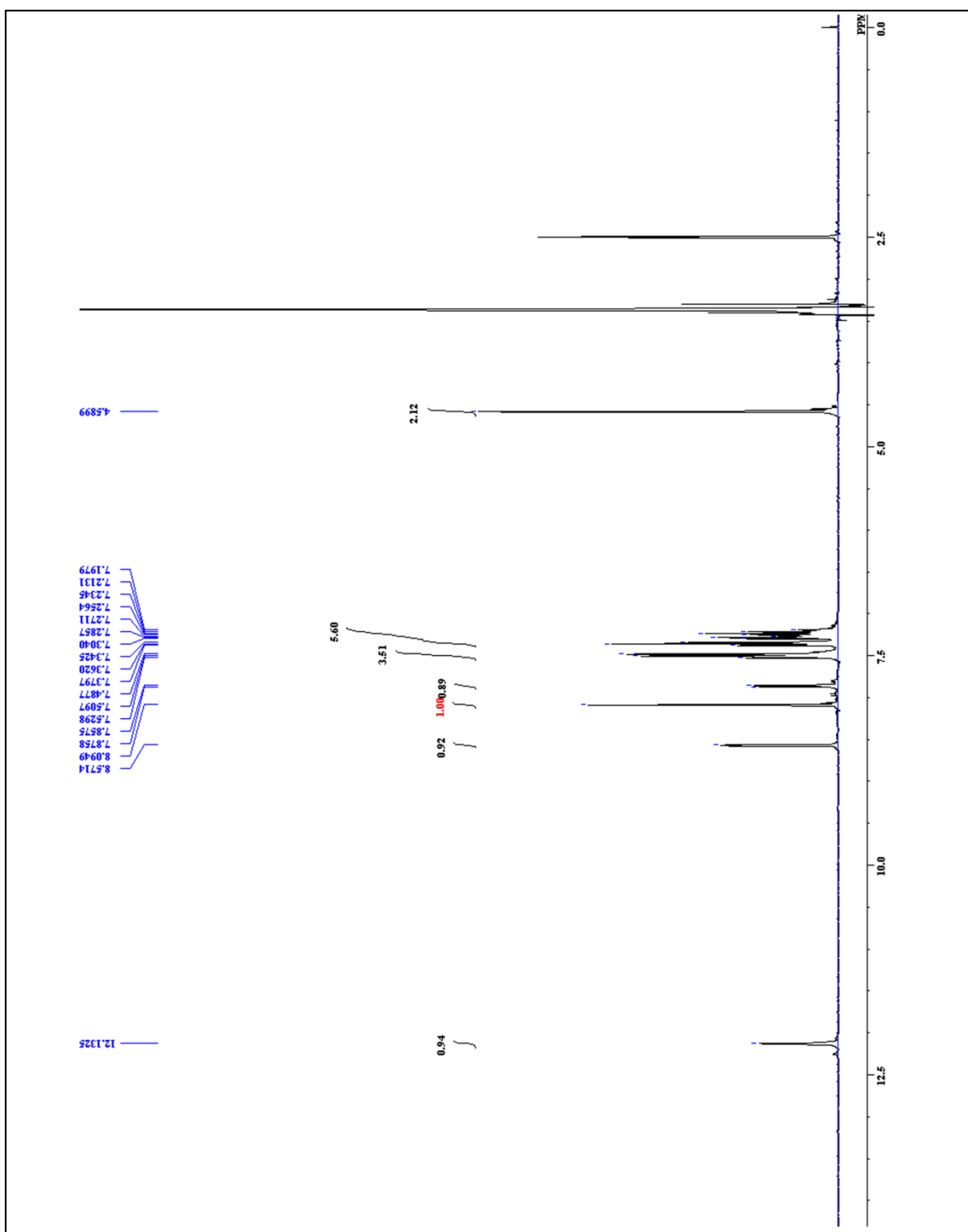
¹H NMR spectrum (400 MHz, DMSO-*d*₆) of [Cd(HL²)₂]



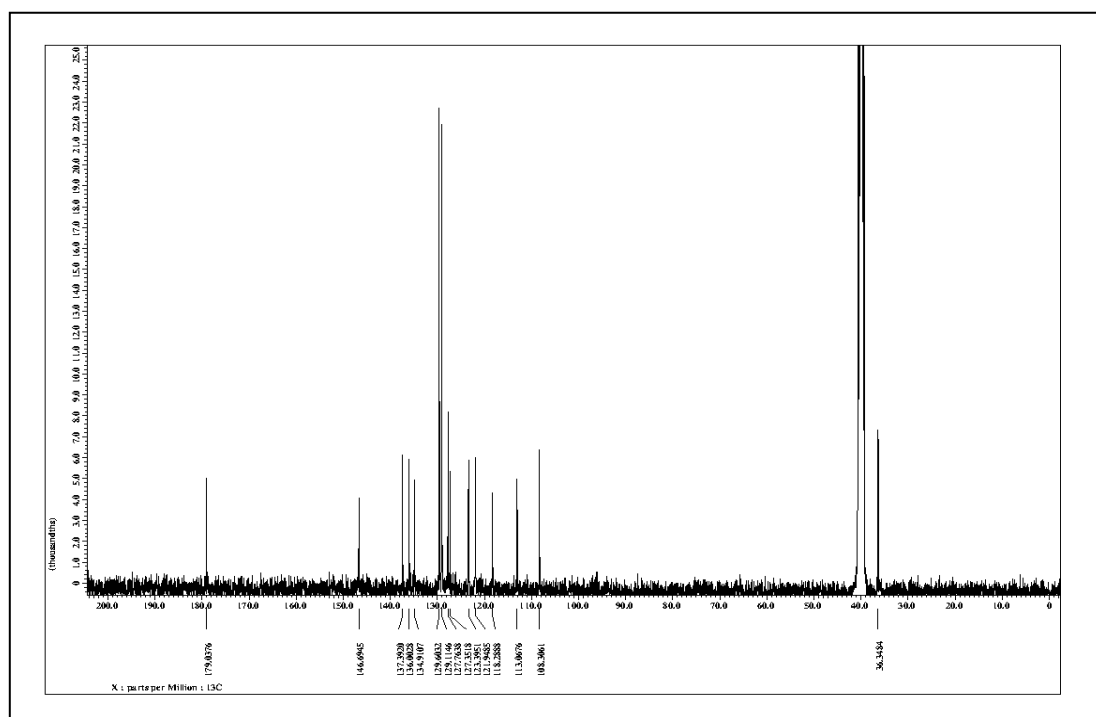
¹³C NMR spectrum (400 MHz, DMSO-*d*₆) of [Cd(HL²)₂]



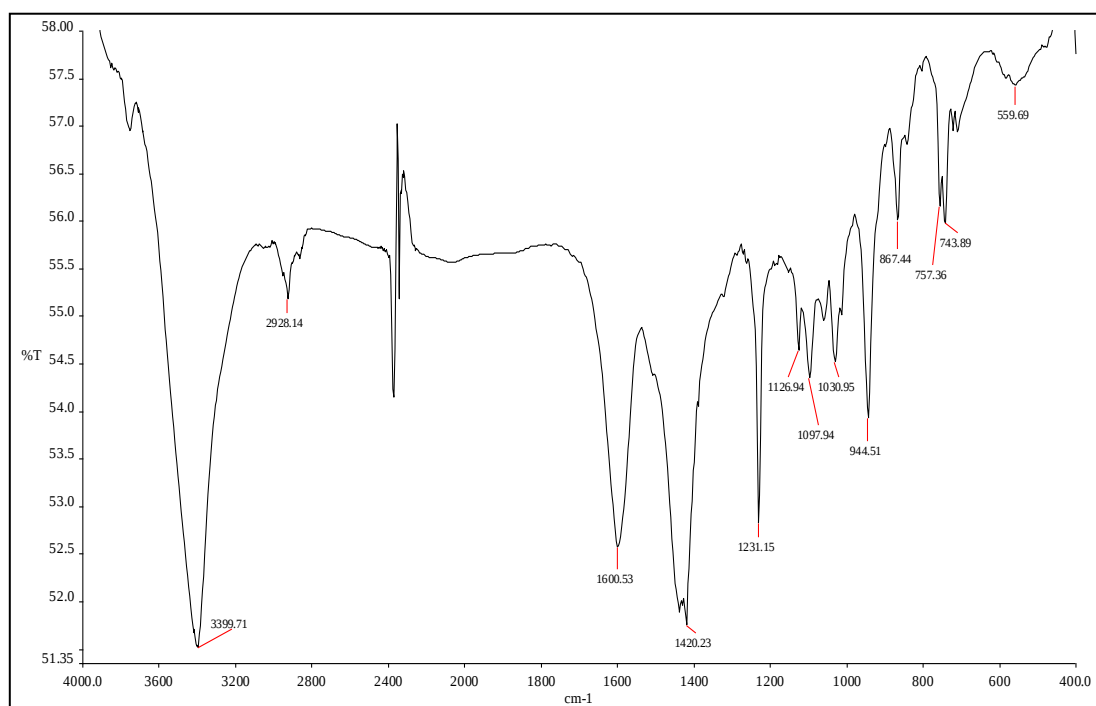
IR spectrum (KBr) of [Cd(HL²)₂]



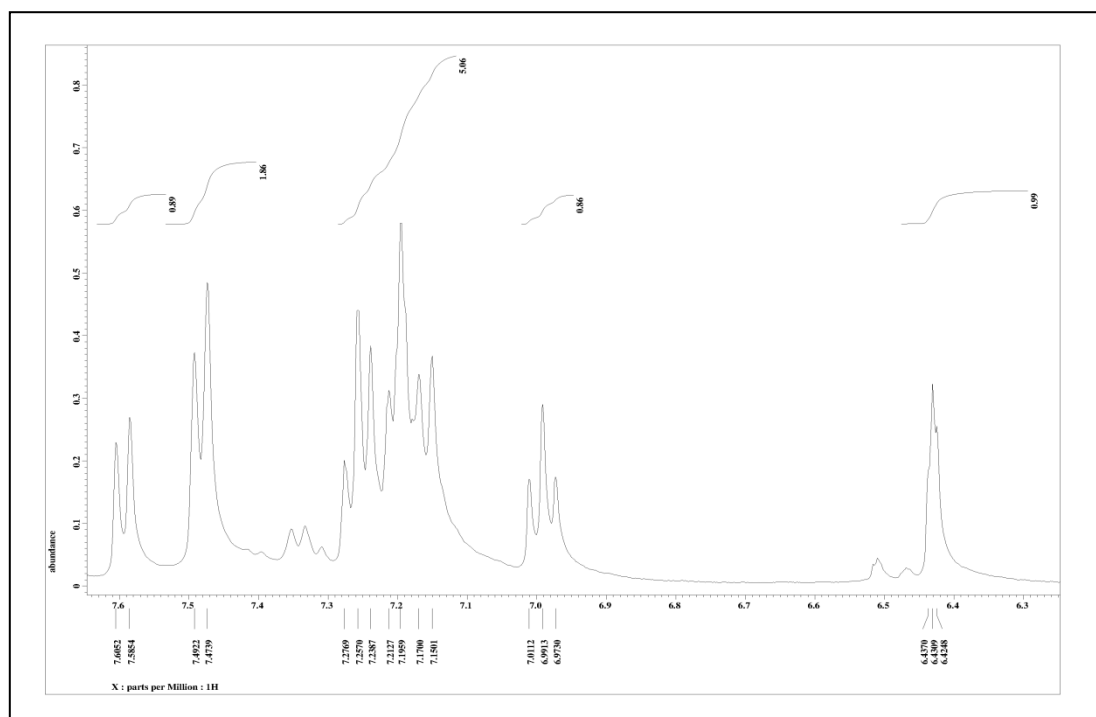
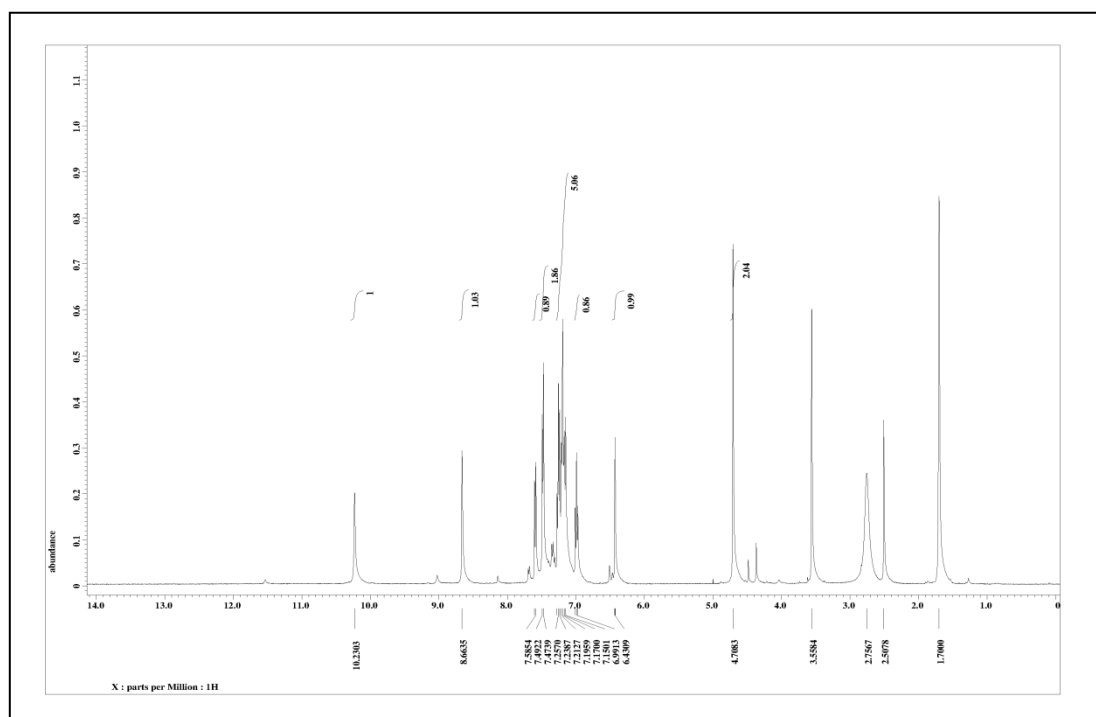
^1H NMR spectrum (400 MHz, $\text{DMSO-}d_6$) of $[\text{Zn}(\text{HL}^2)_2]$



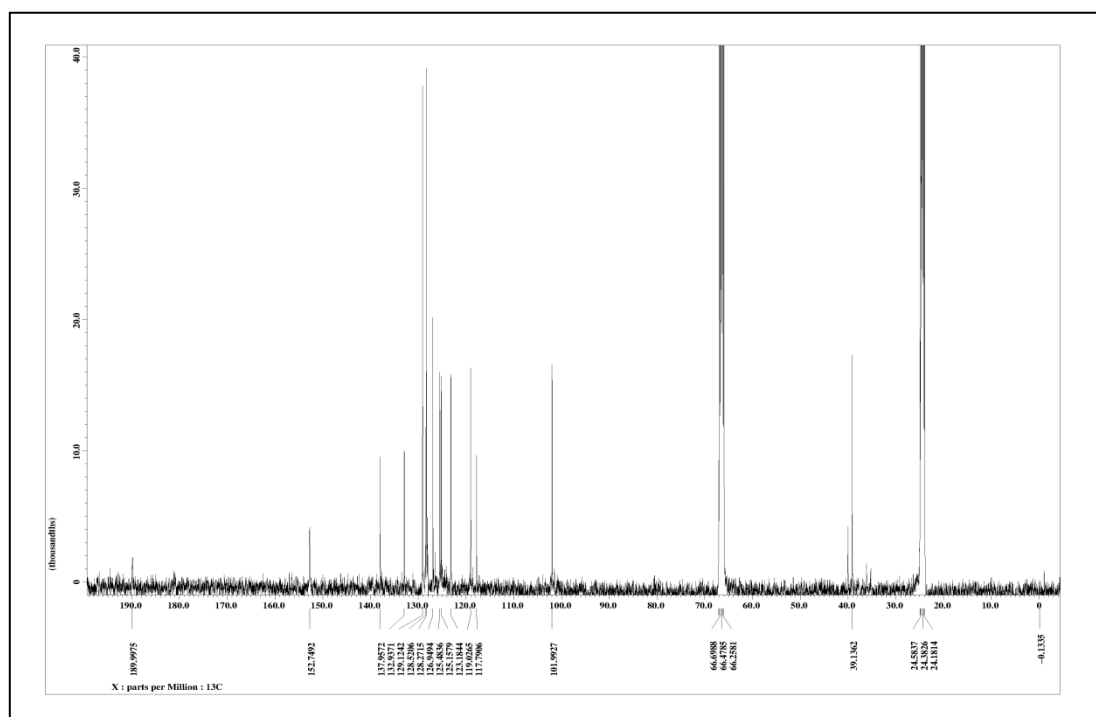
^{13}C NMR spectrum (400 MHz, $\text{DMSO}-d_6$) of $[\text{Zn}(\text{HL}^2)_2]$



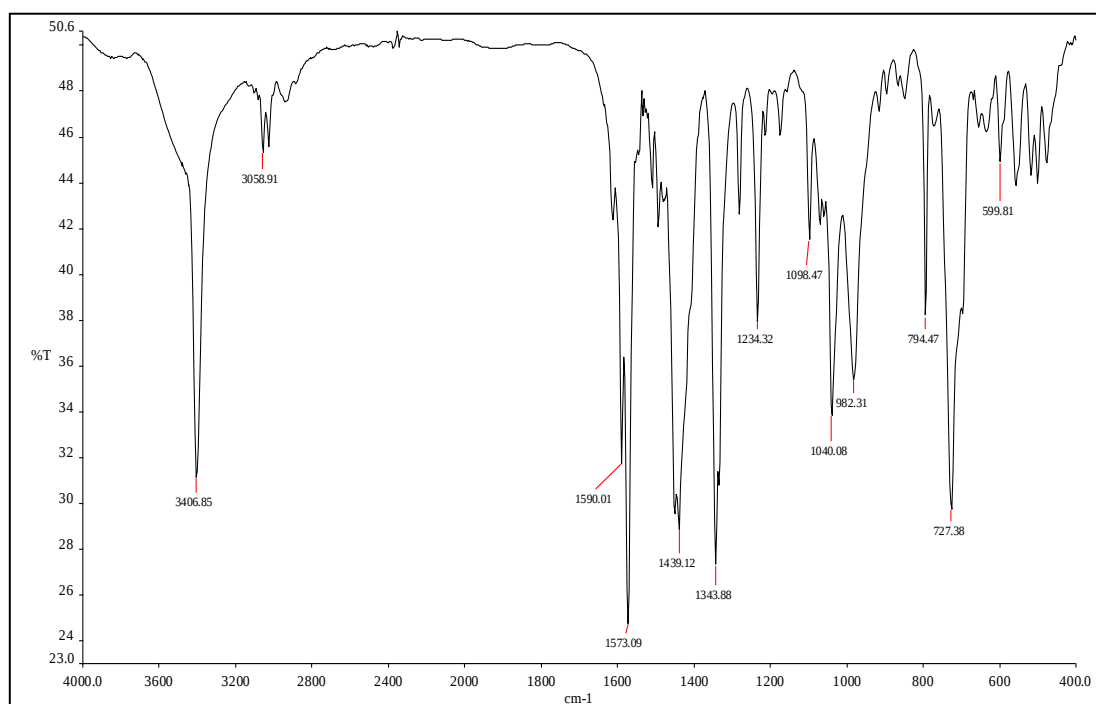
IR spectrum (KBr) of $[\text{Zn}(\text{HL}^2)_2]$



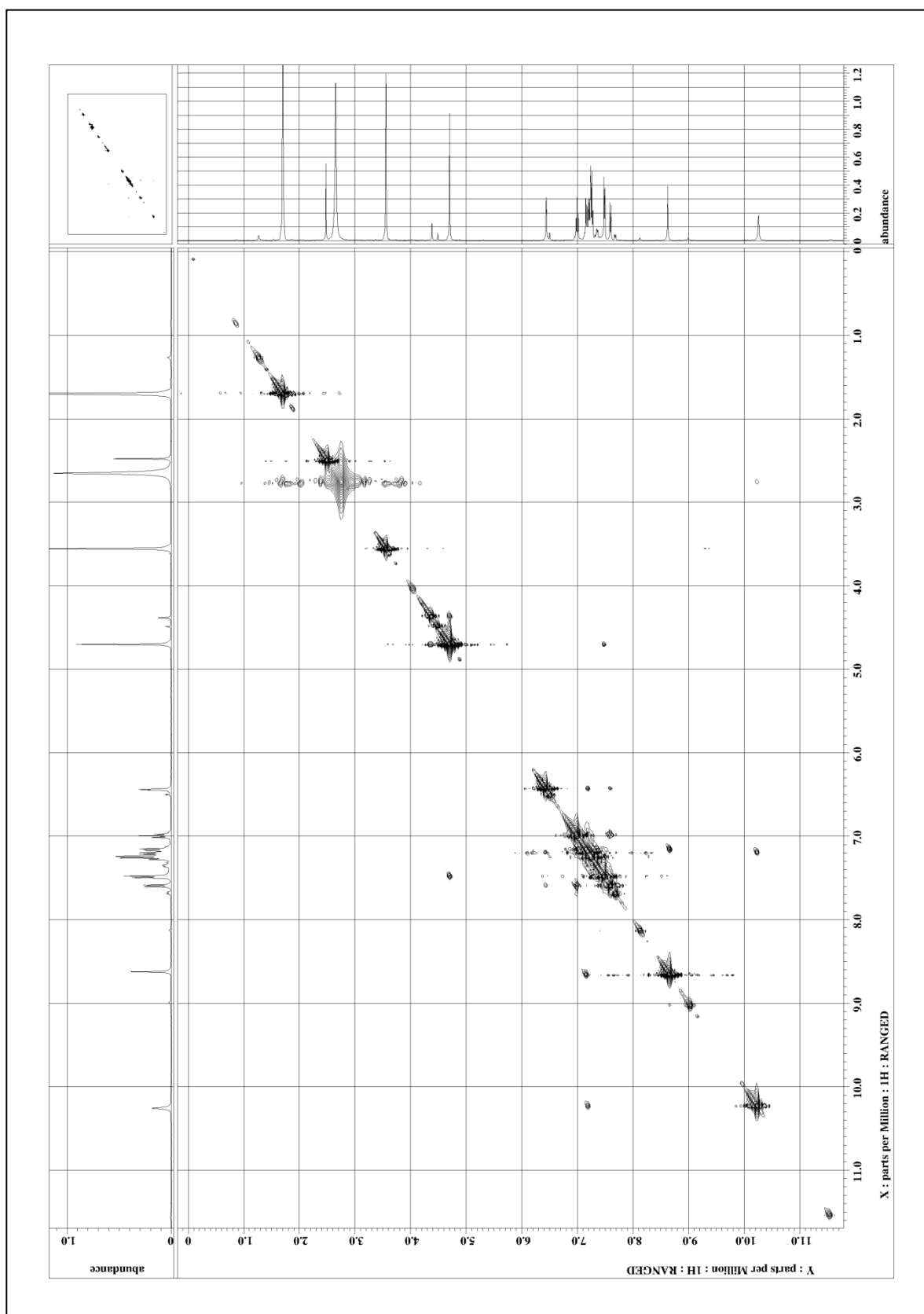
¹H NMR spectrum (400 MHz, THF-d₈) of [Cd(HL)₂]



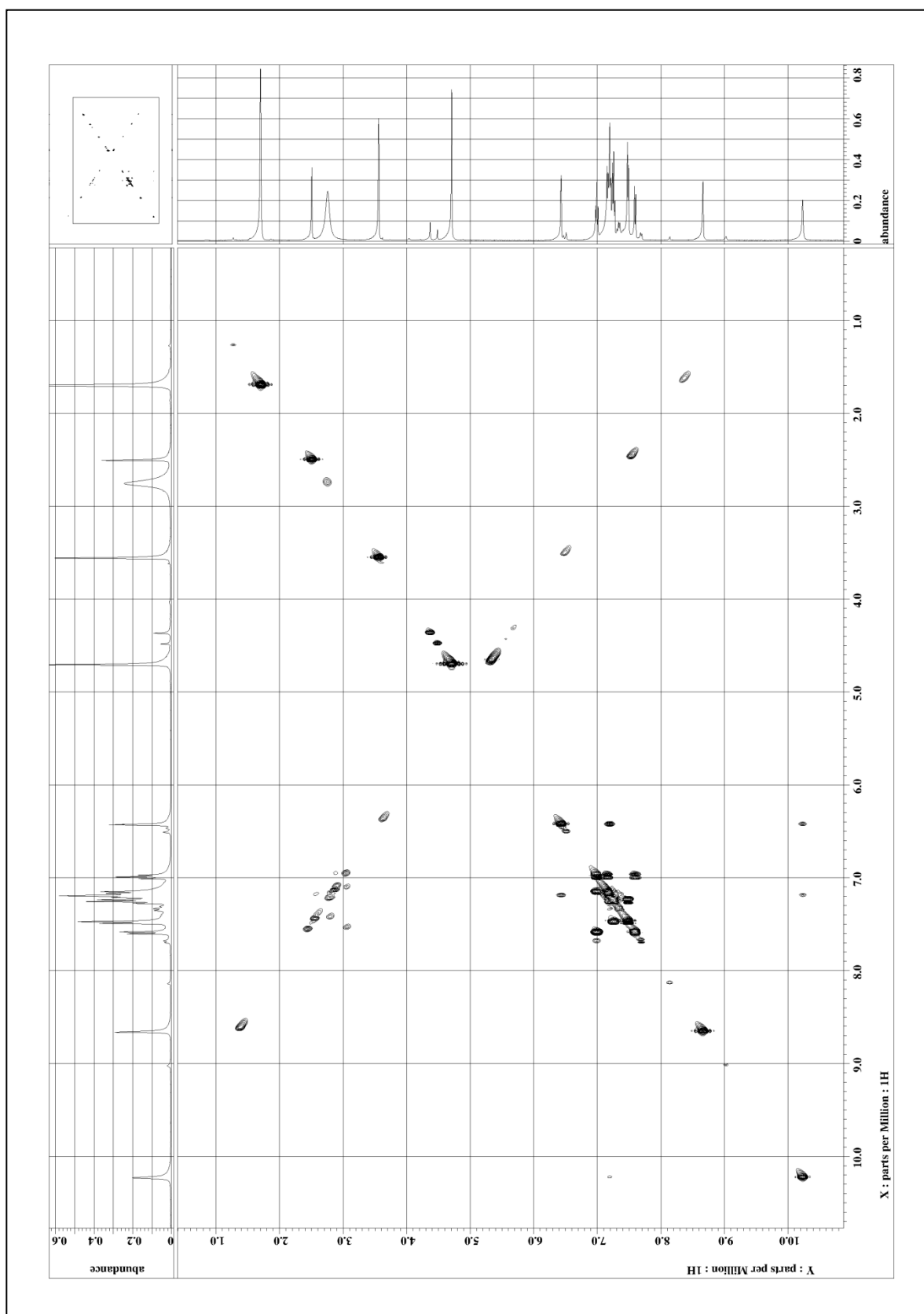
¹³C NMR spectrum (400 MHz, THF-*d*₈) of [Cd(HL³)₂]



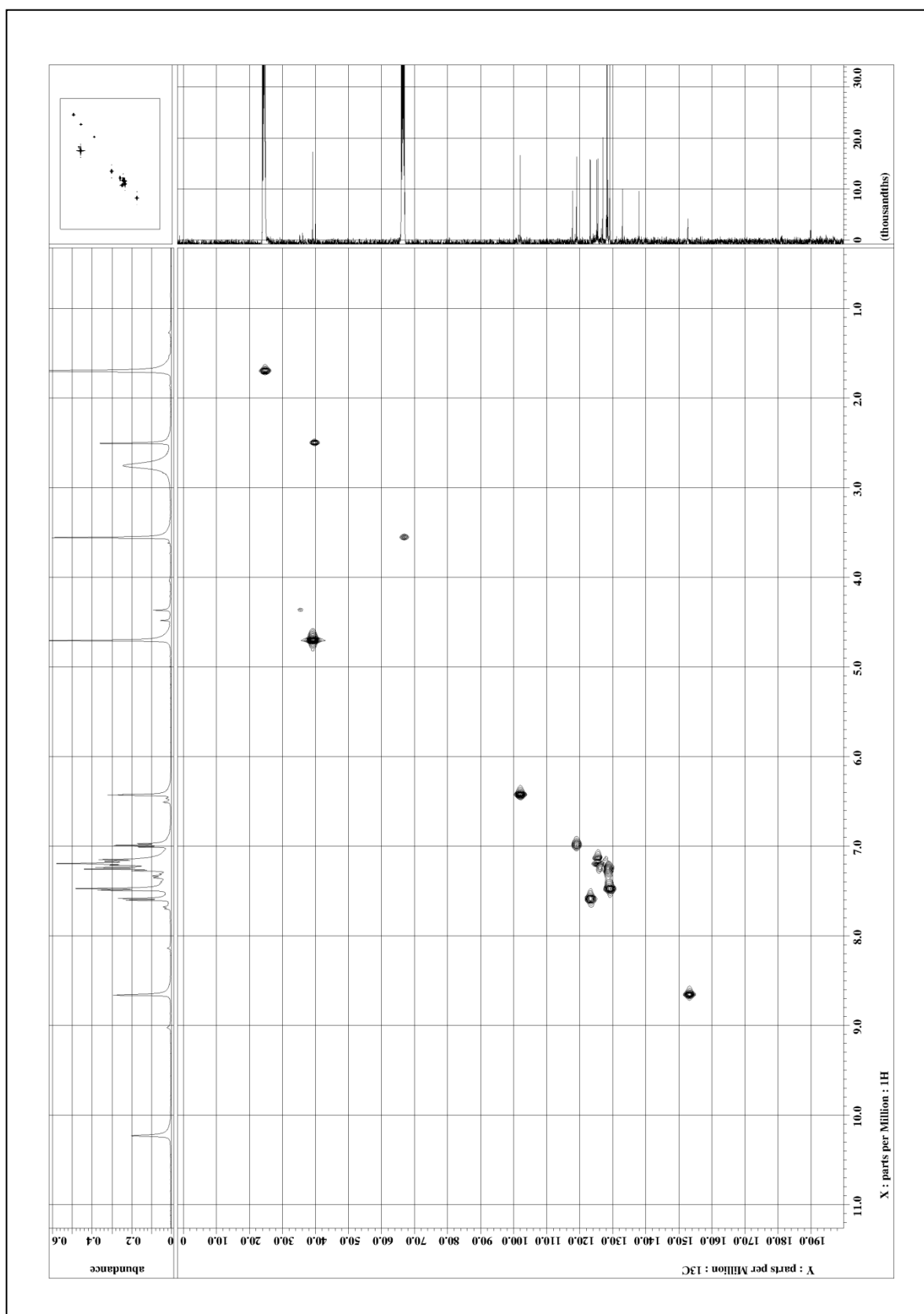
IR spectrum (KBr) of [Cd(HL³)₂]



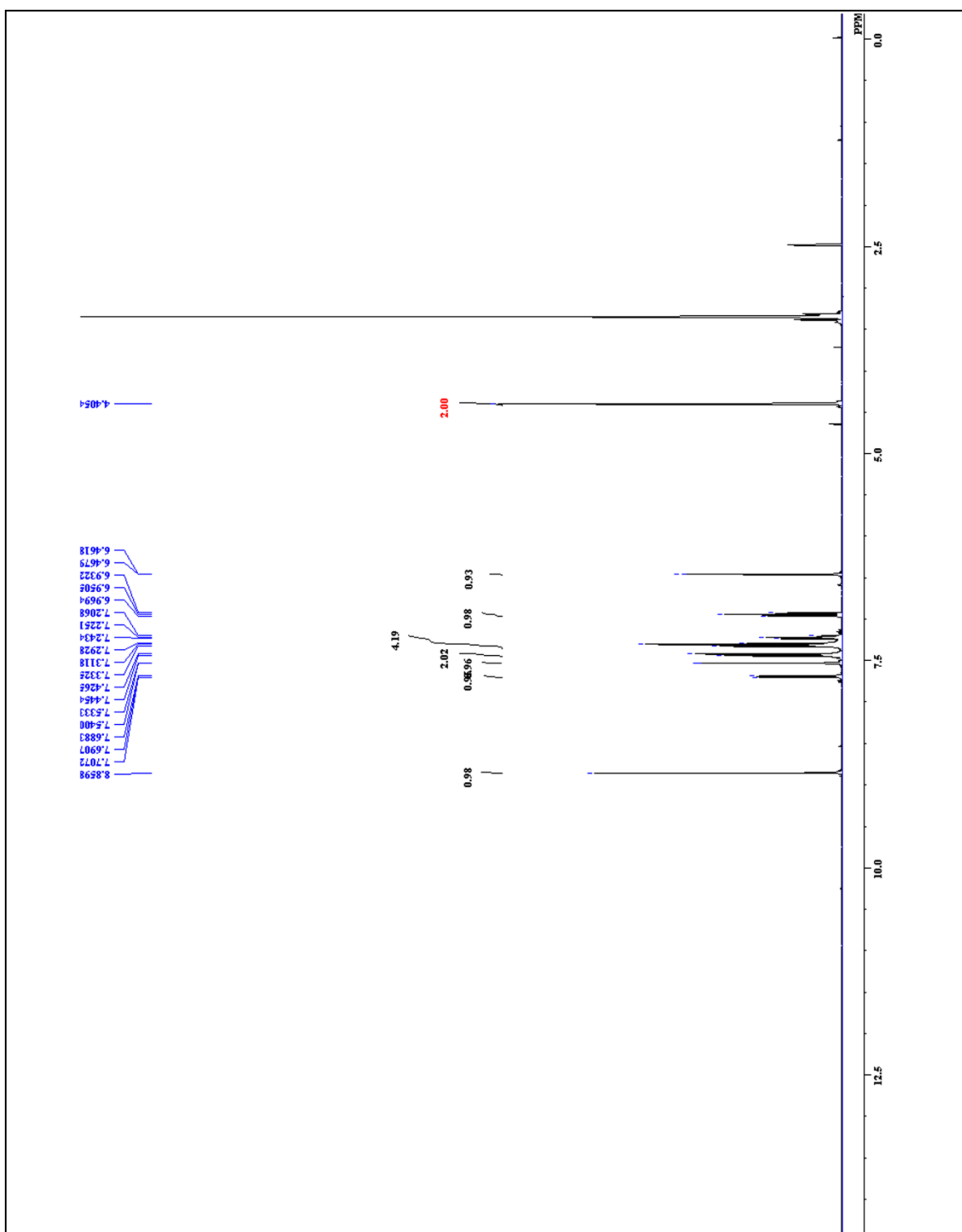
NOESY spectrum (400 MHz, $\text{THF-}d_8$) of $[\text{Cd}(\text{HL}^3)_2]$



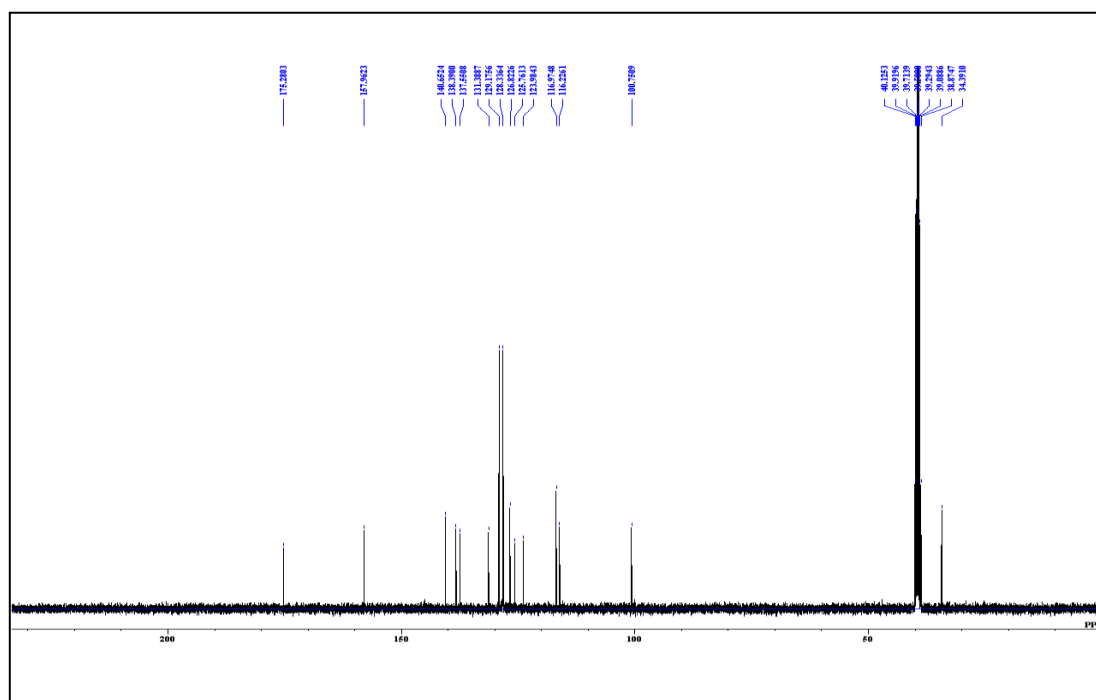
COSY spectrum (400 MHz, THF- d_8) of $[\text{Cd}(\text{HL}^3)_2]$



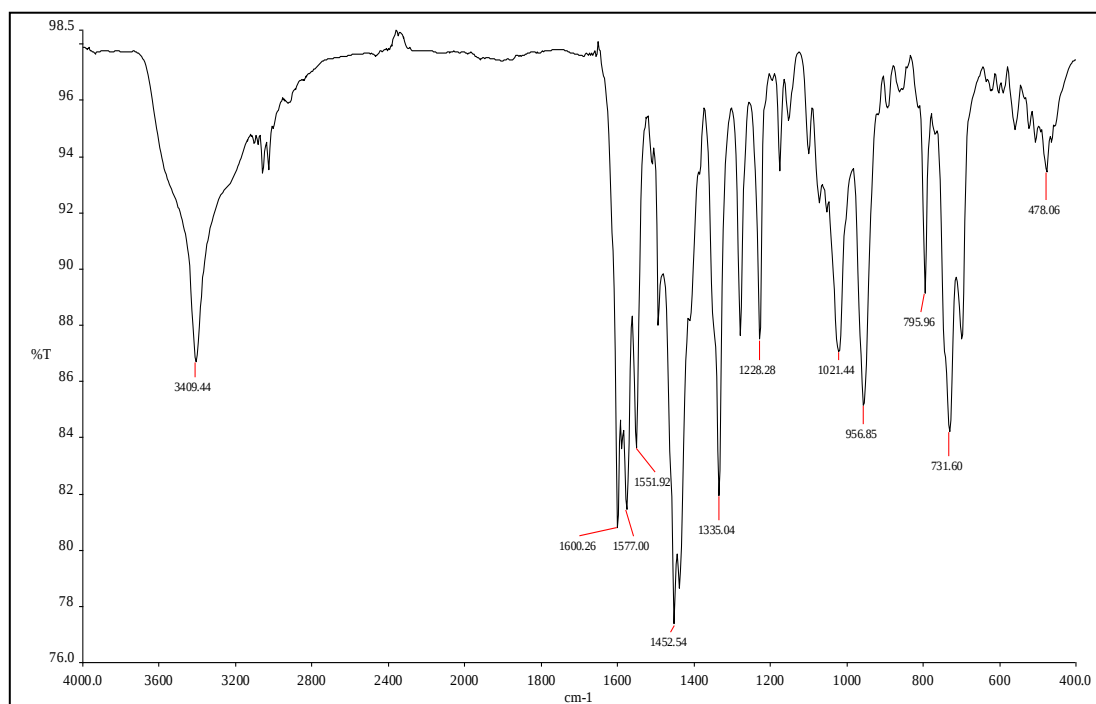
HMQC spectrum (400 MHz, $\text{THF-}d_8$) of $[\text{Cd}(\text{HL}^3)_2]$



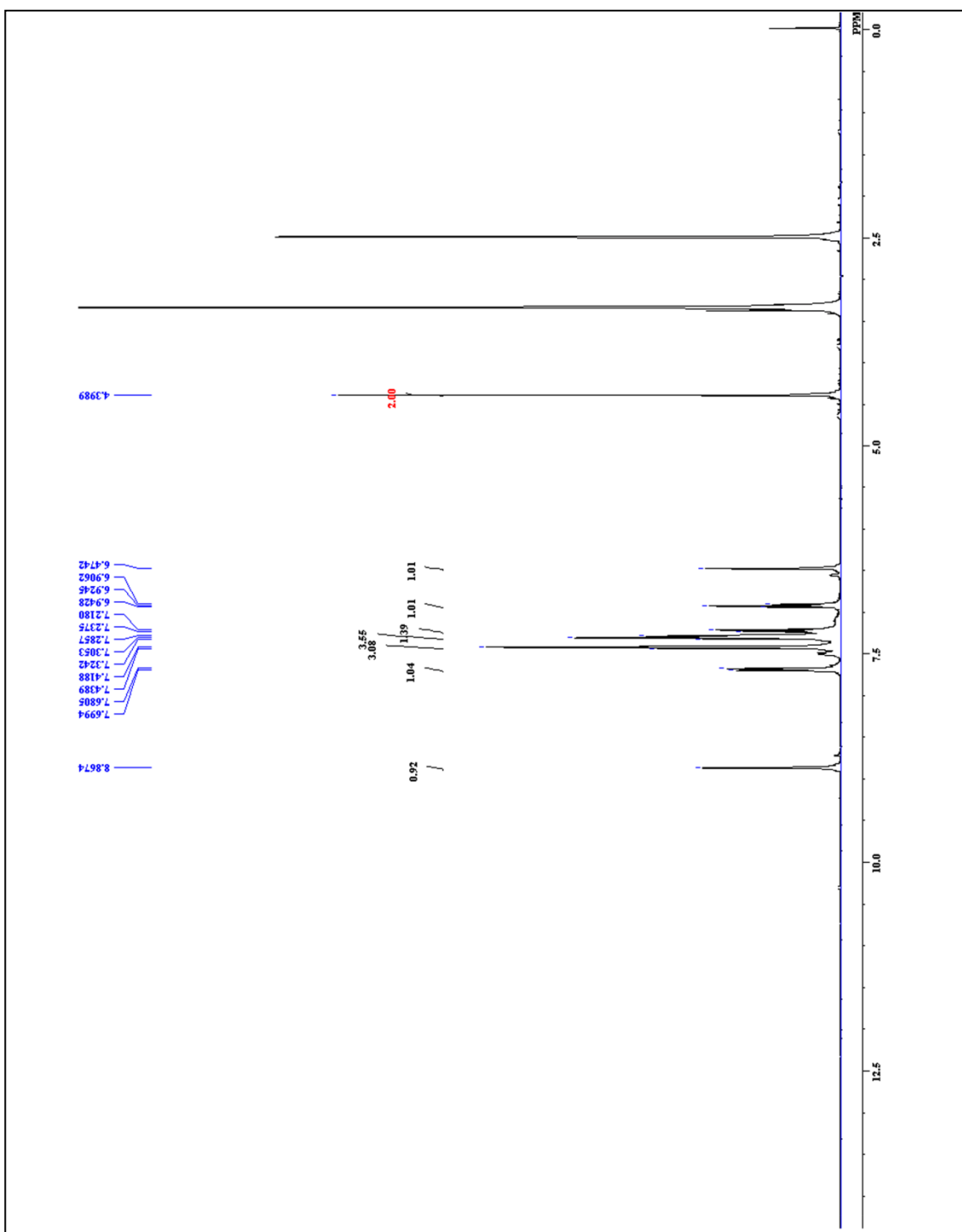
^1H NMR spectrum (400 MHz, $\text{DMSO-}d_6$) of $[\text{Zn}(\text{L}^3)(\text{H}_2\text{O})]$



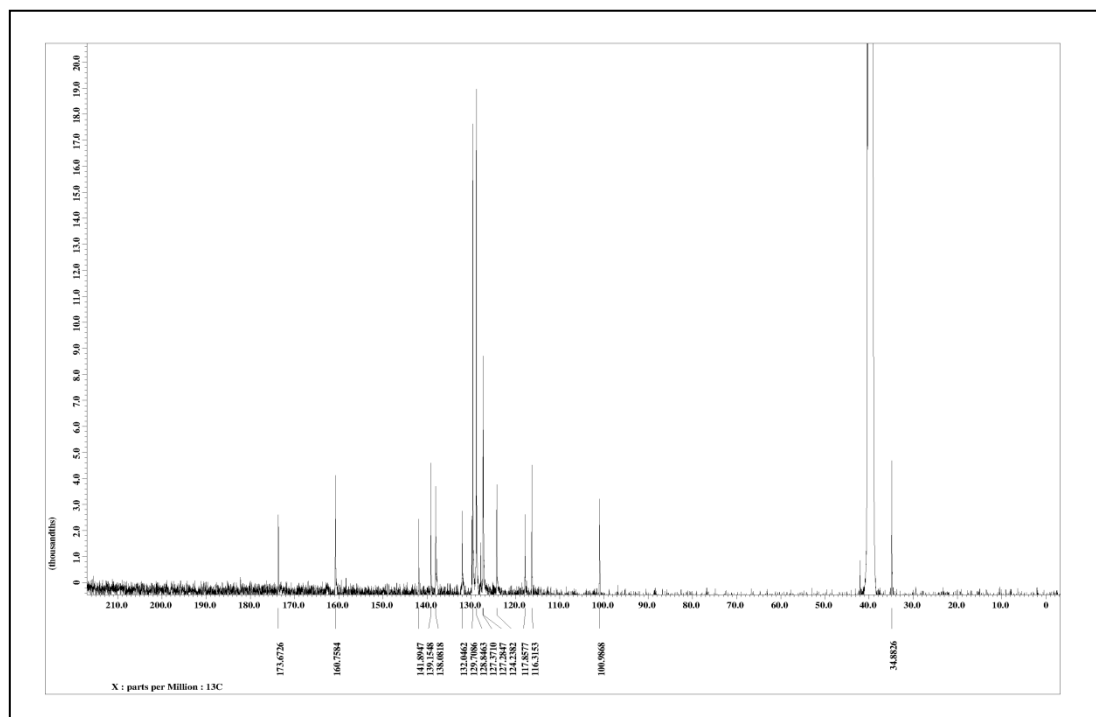
^{13}C NMR spectrum (400 MHz, $\text{DMSO}-d_6$) of $[\text{Zn}(\text{L}^3)(\text{H}_2\text{O})]$



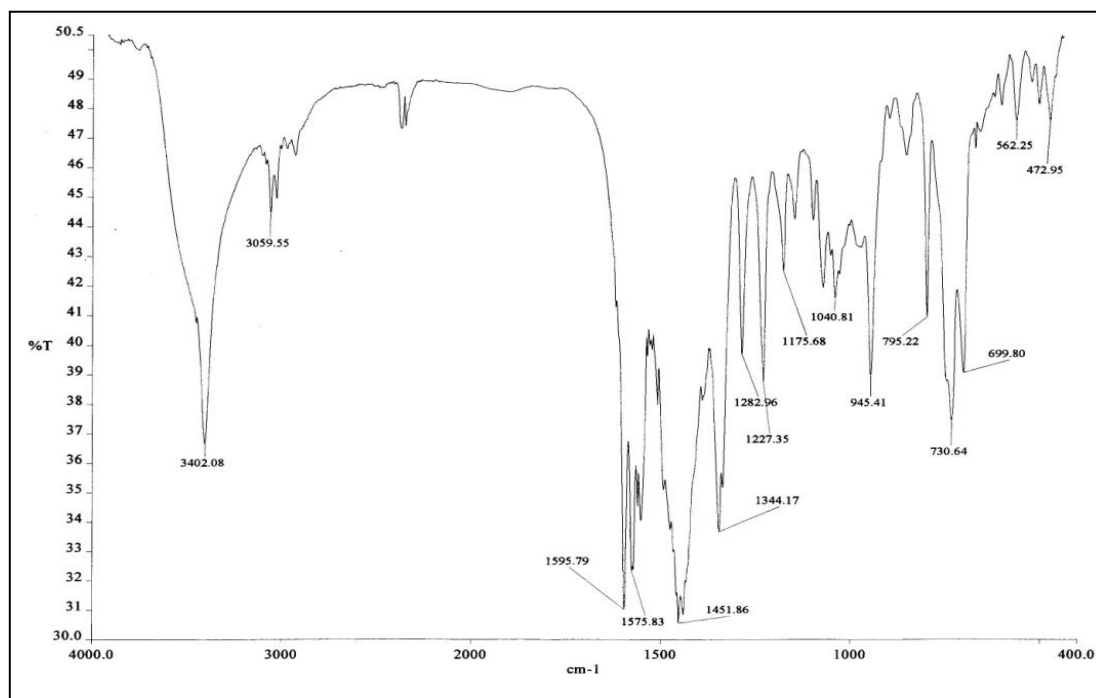
IR spectrum (KBr) of $[\text{Zn}(\text{L}^3)(\text{H}_2\text{O})]$



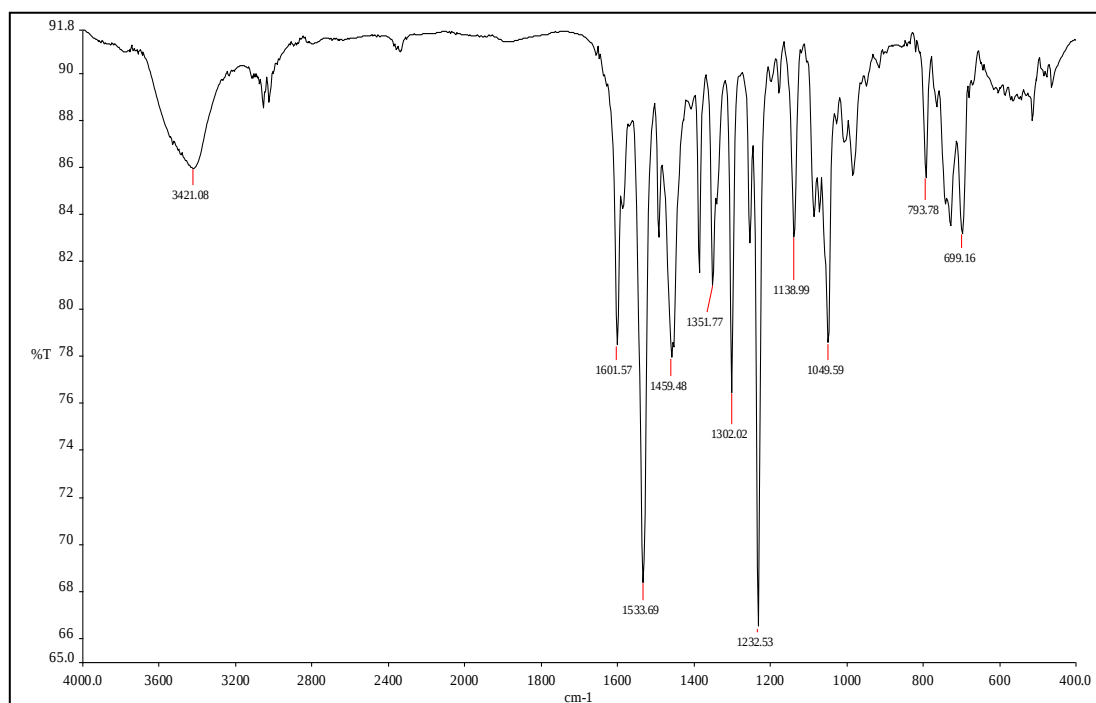
^1H NMR spectrum (400 MHz, $\text{DMSO-}d_6$) of $[\text{Cd}(\text{L}^3)(\text{H}_2\text{O})]$



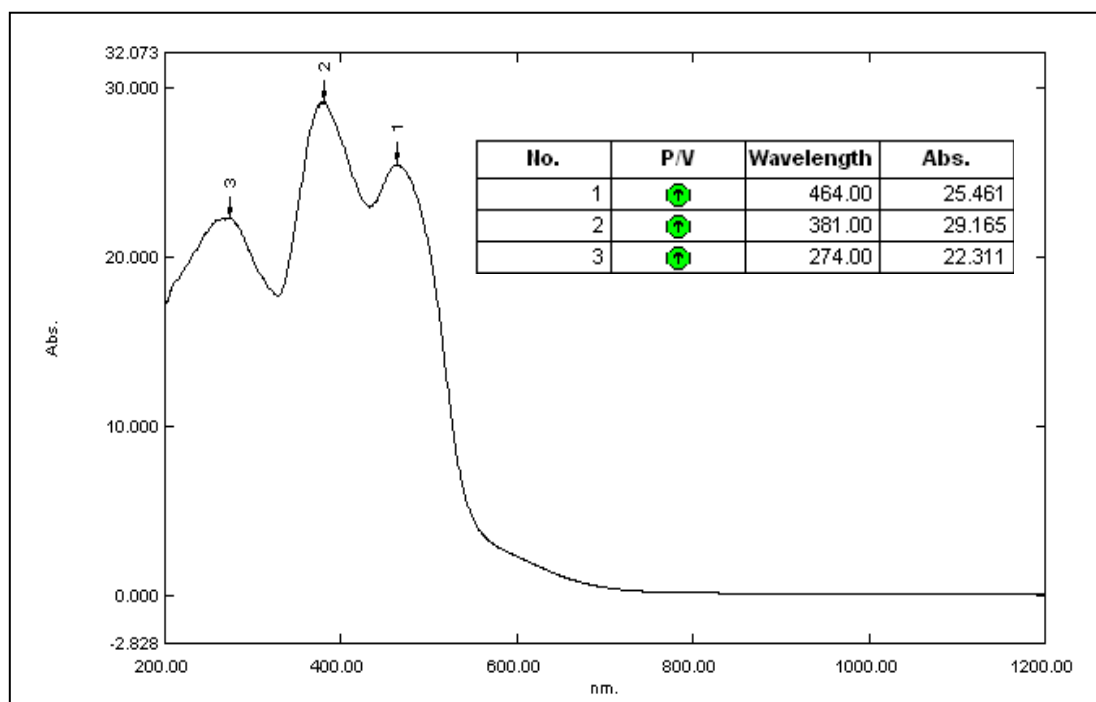
^{13}C NMR spectrum (400 MHz, $\text{DMSO}-d_6$) of $[\text{Cd}(\text{L}^3)(\text{H}_2\text{O})]$



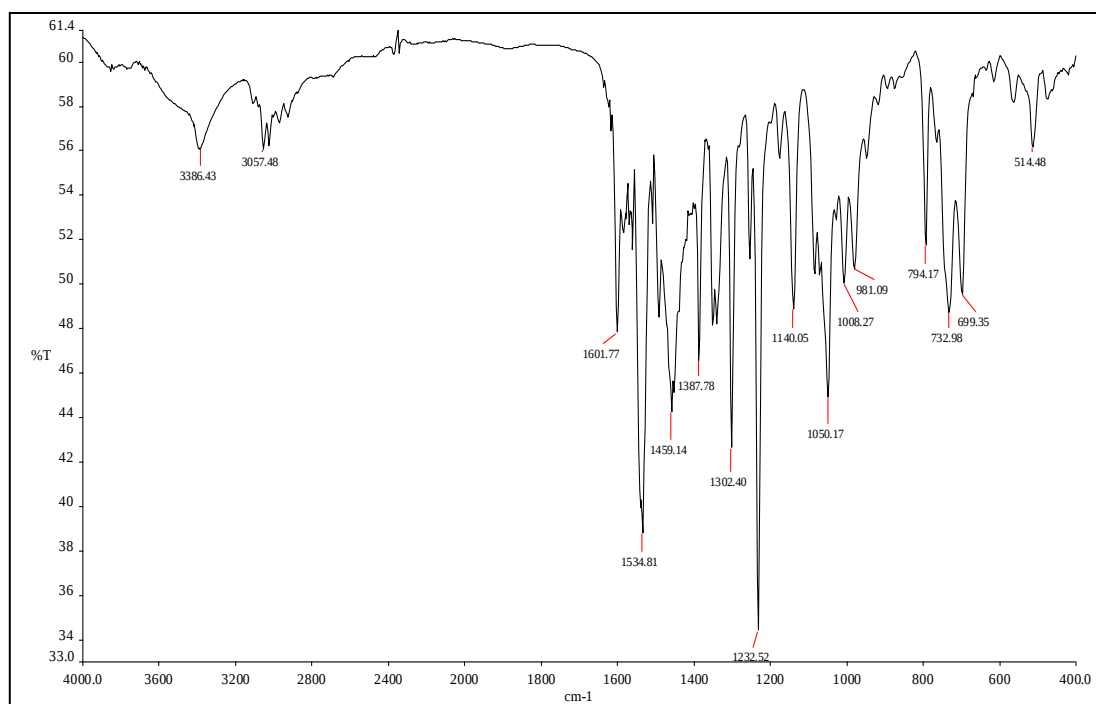
IR spectrum (KBr) of $[\text{Cd}(\text{L}^3)(\text{H}_2\text{O})]$



IR spectrum (KBr) of $[\text{Ni}(\text{L}^3)(\text{H}_2\text{O})]$



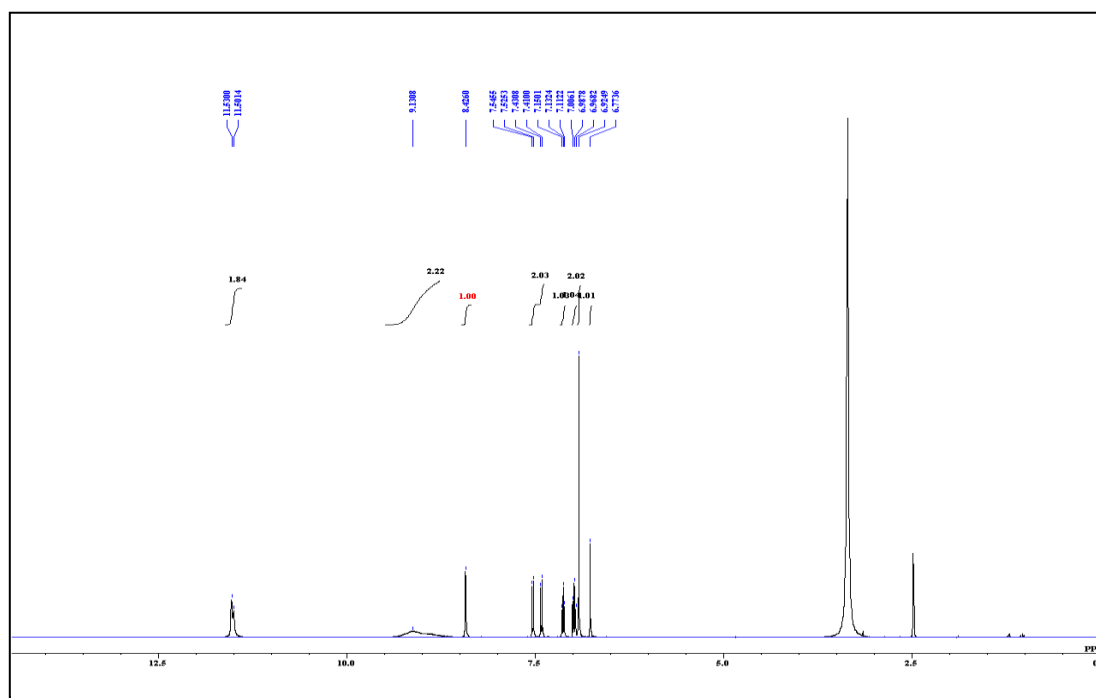
UV-Vis spectrum (solid) of $[\text{Ni}(\text{L}^3)(\text{H}_2\text{O})]$



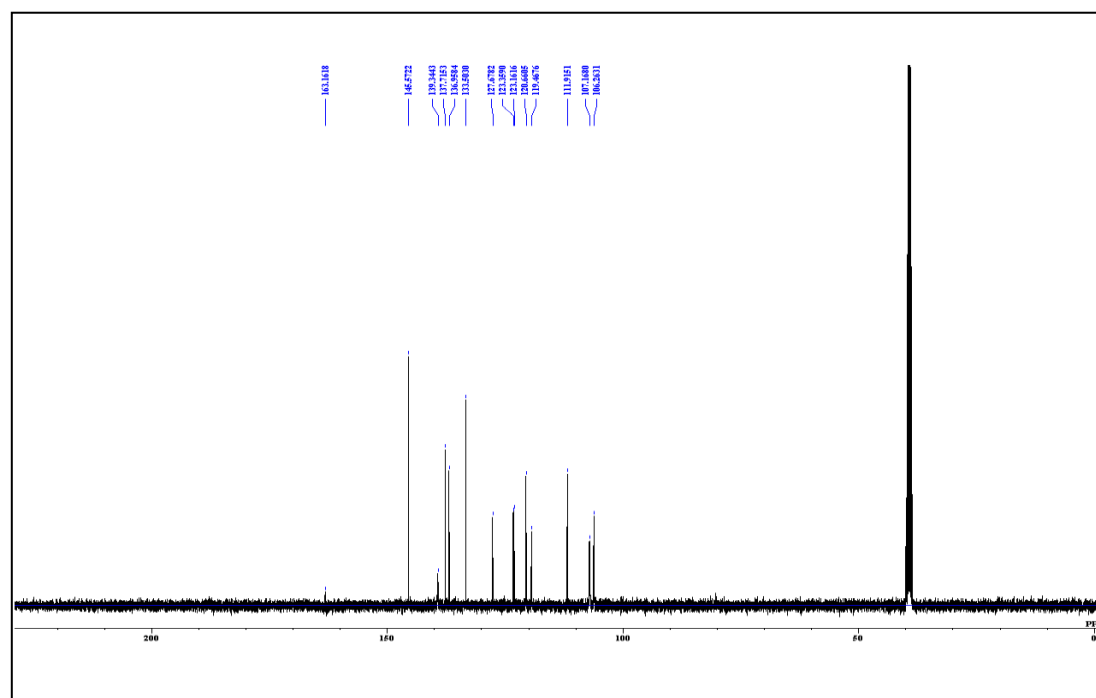
IR spectrum (KBr) of $[\text{Ni}(\text{L}^3)(\text{Et}_3\text{N})(\text{H}_2\text{O})]$

APENDIX B

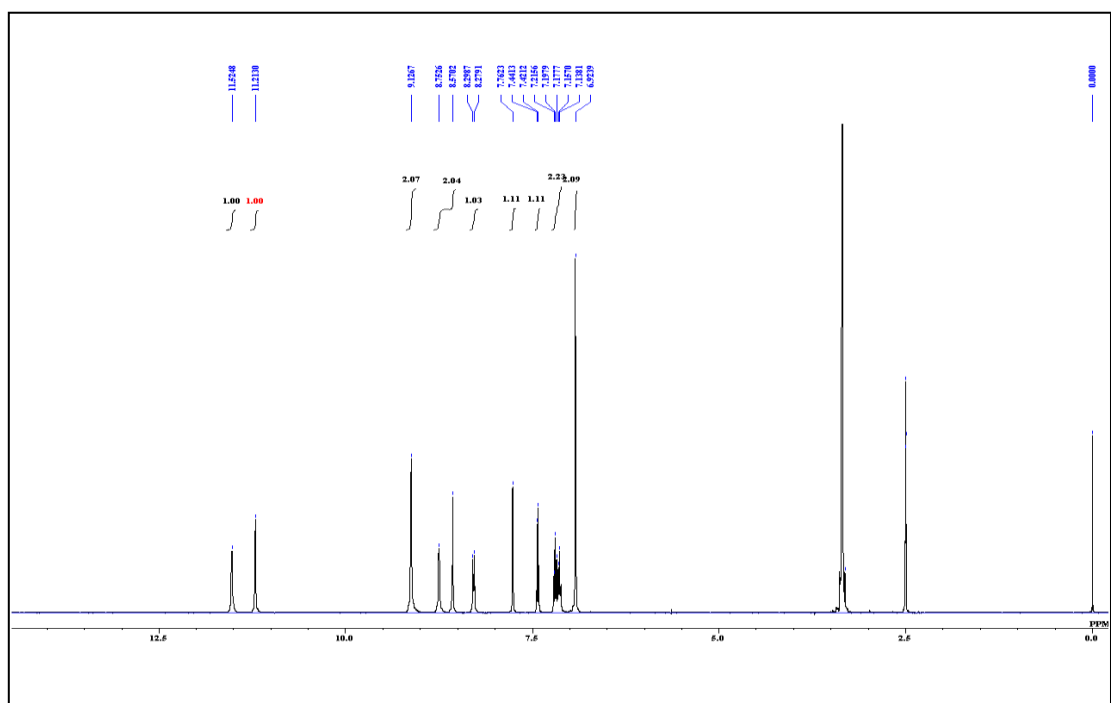
Spectra of compounds in chapter III



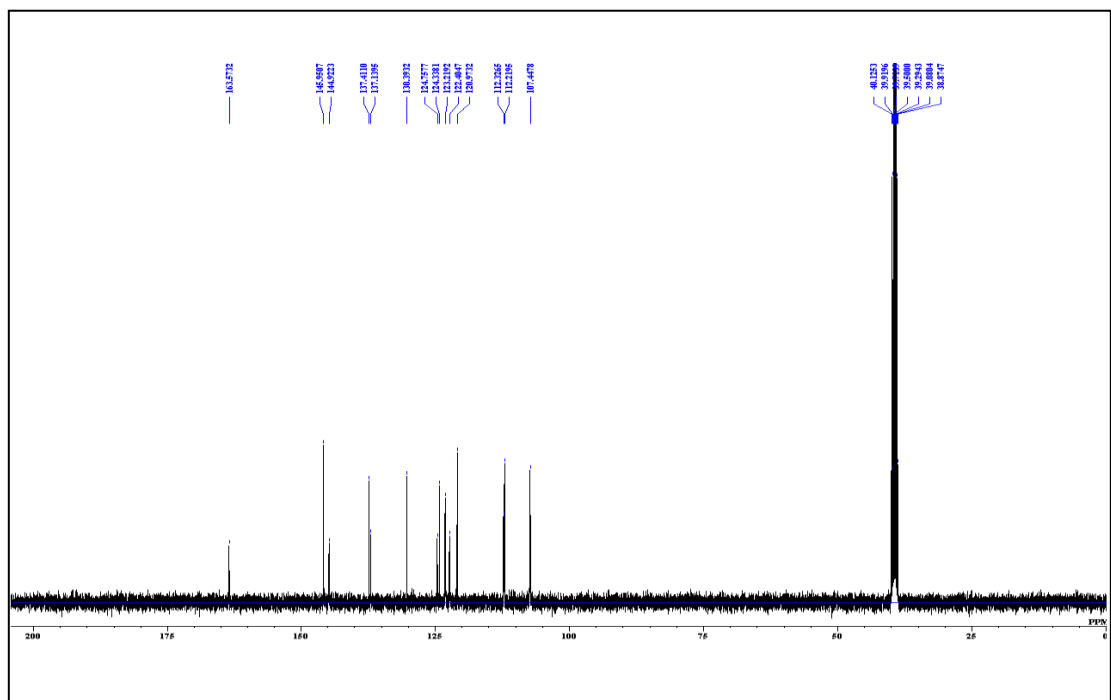
¹H NMR spectrum (400 MHz, DMSO-*d*₆) of **2a**



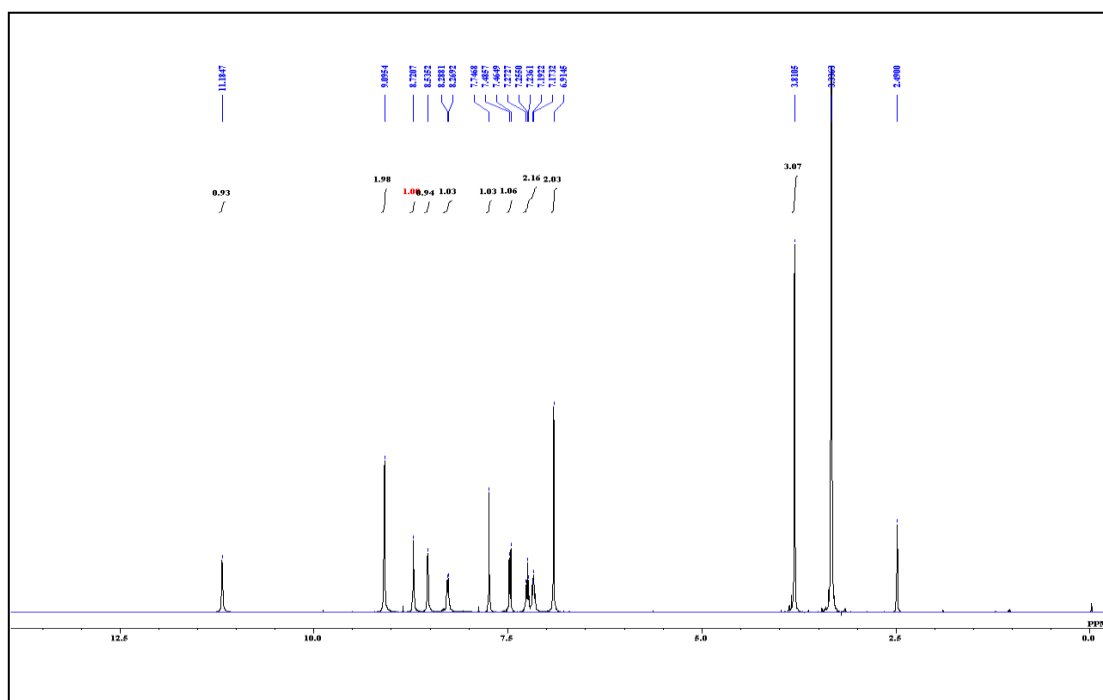
¹³C NMR spectrum (400 MHz, DMSO-*d*₆) of **2a**

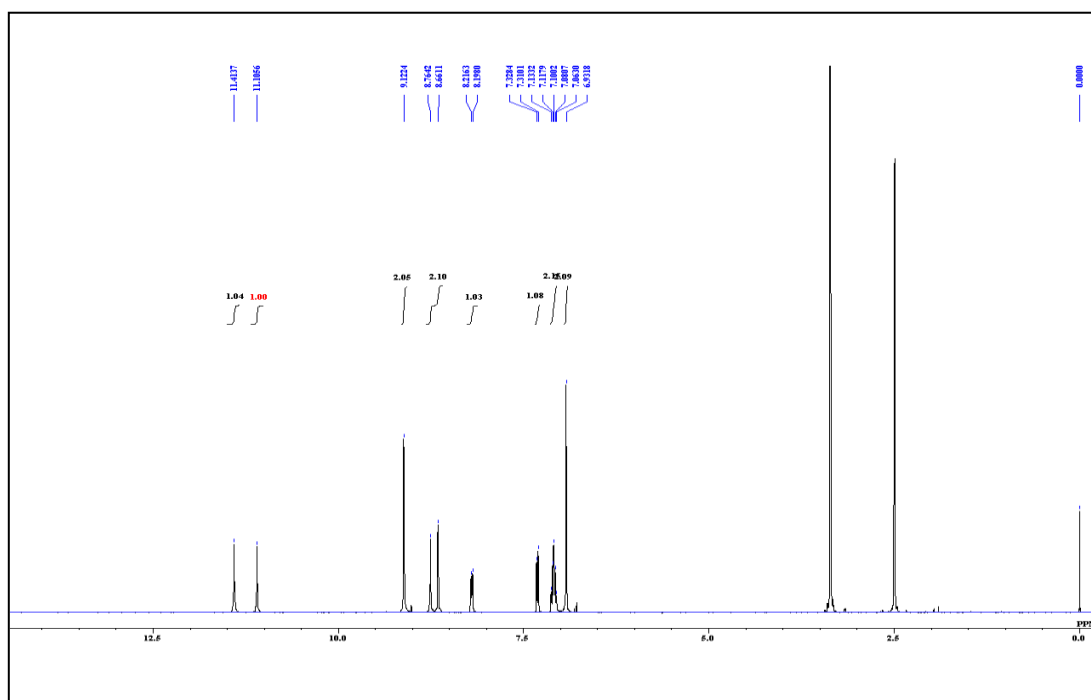


¹H NMR spectrum (400 MHz, DMSO-*d*₆) of **3a**

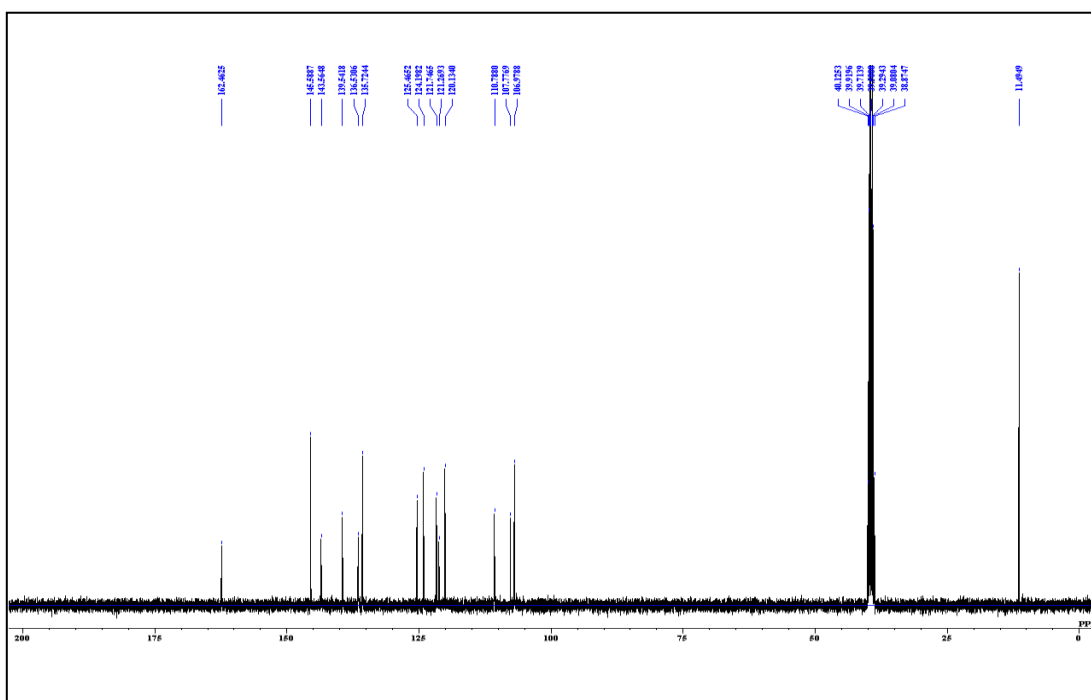


¹³C NMR spectrum (400 MHz, DMSO-*d*₆) of **3a**

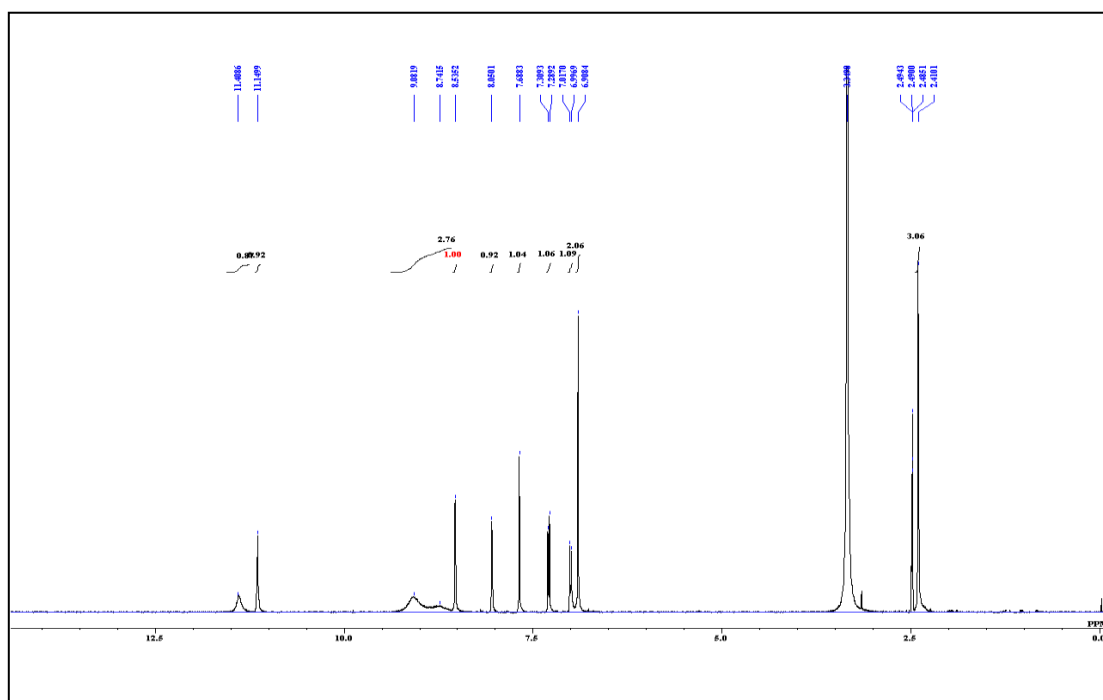




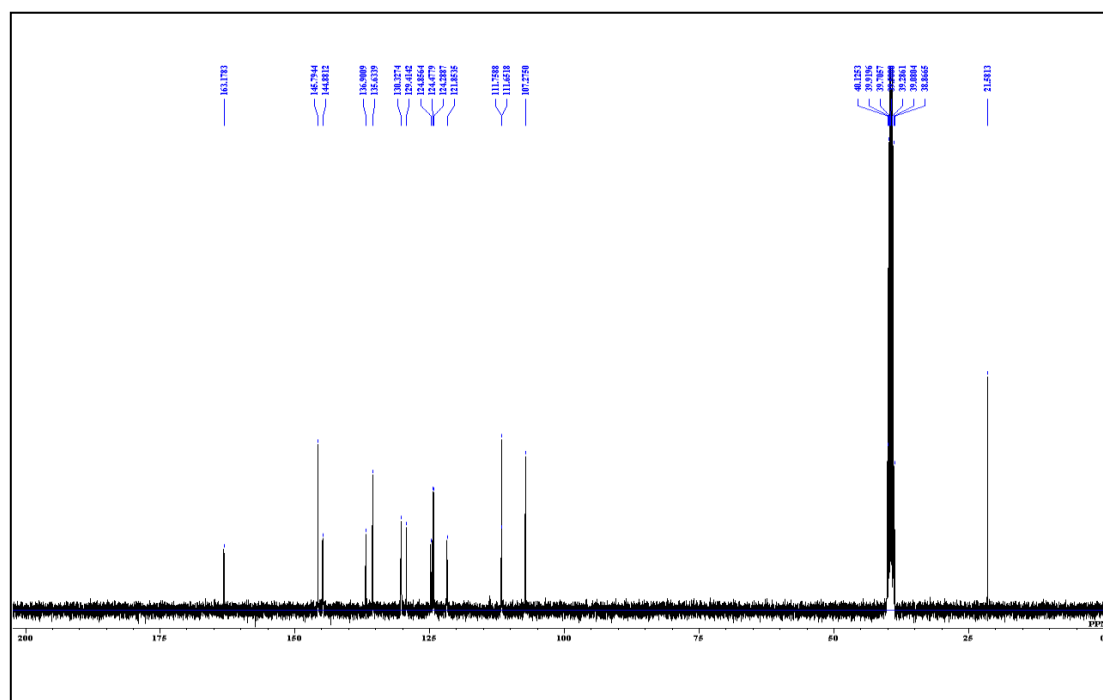
¹H NMR spectrum (400 MHz, DMSO-*d*₆) of **3c**



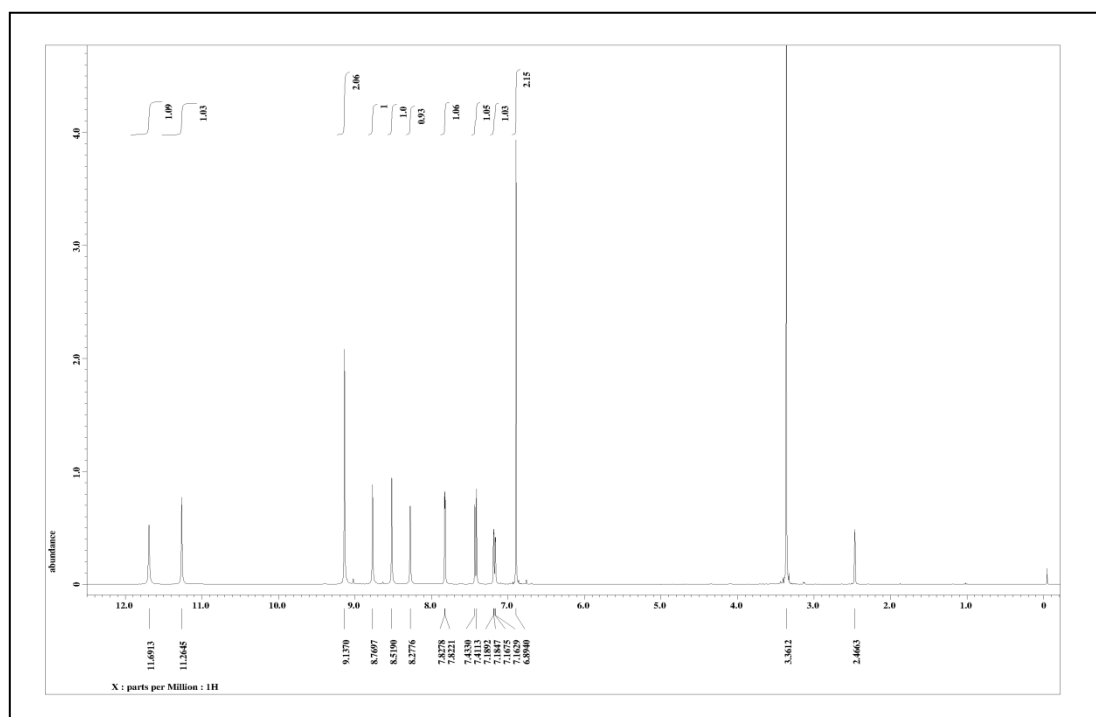
¹³C NMR spectrum (400 MHz, DMSO-*d*₆) of **3c**



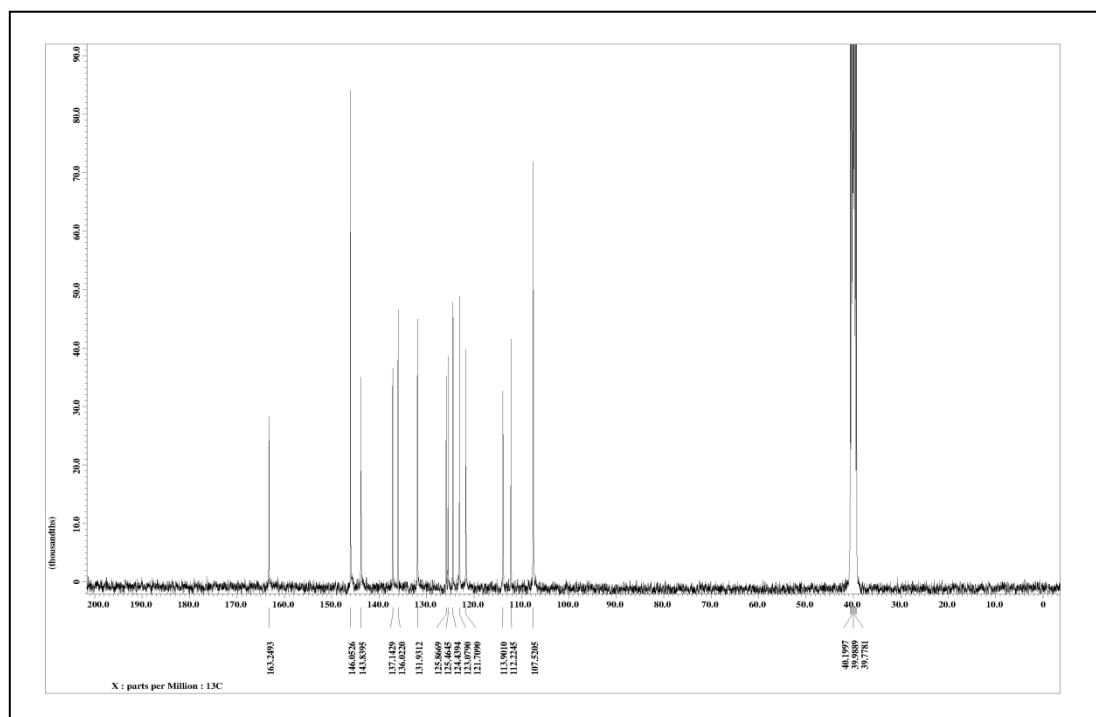
¹H NMR spectrum (400 MHz, DMSO-*d*₆) of **3d**



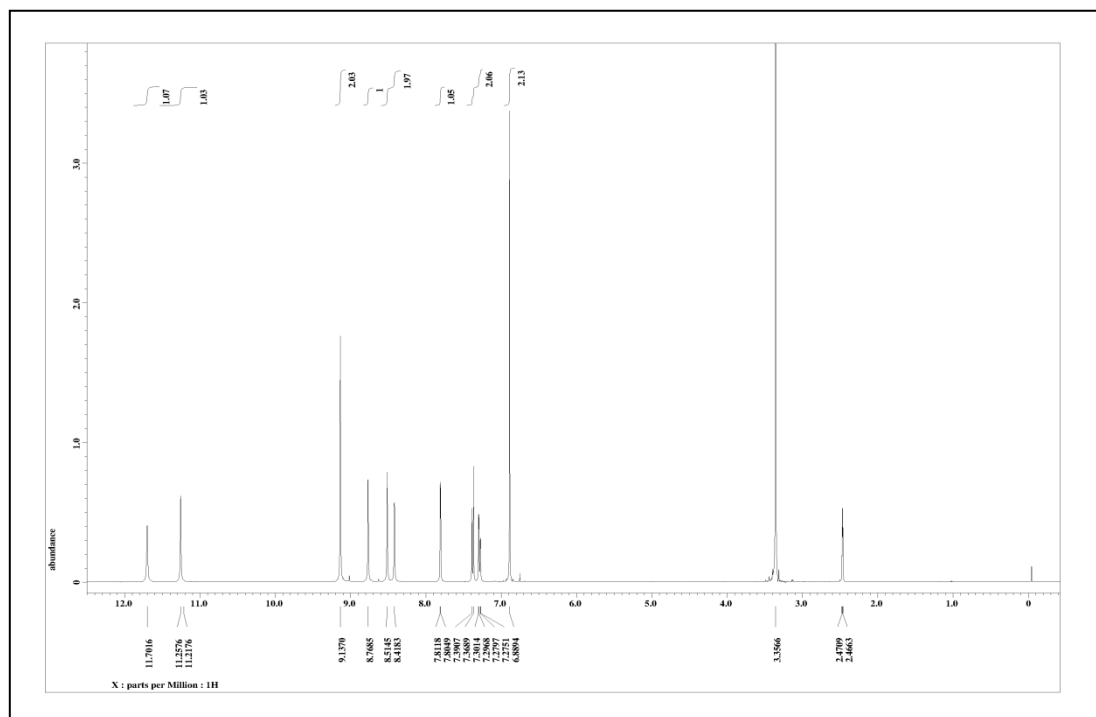
¹³C NMR spectrum (400 MHz, DMSO-*d*₆) of **3d**



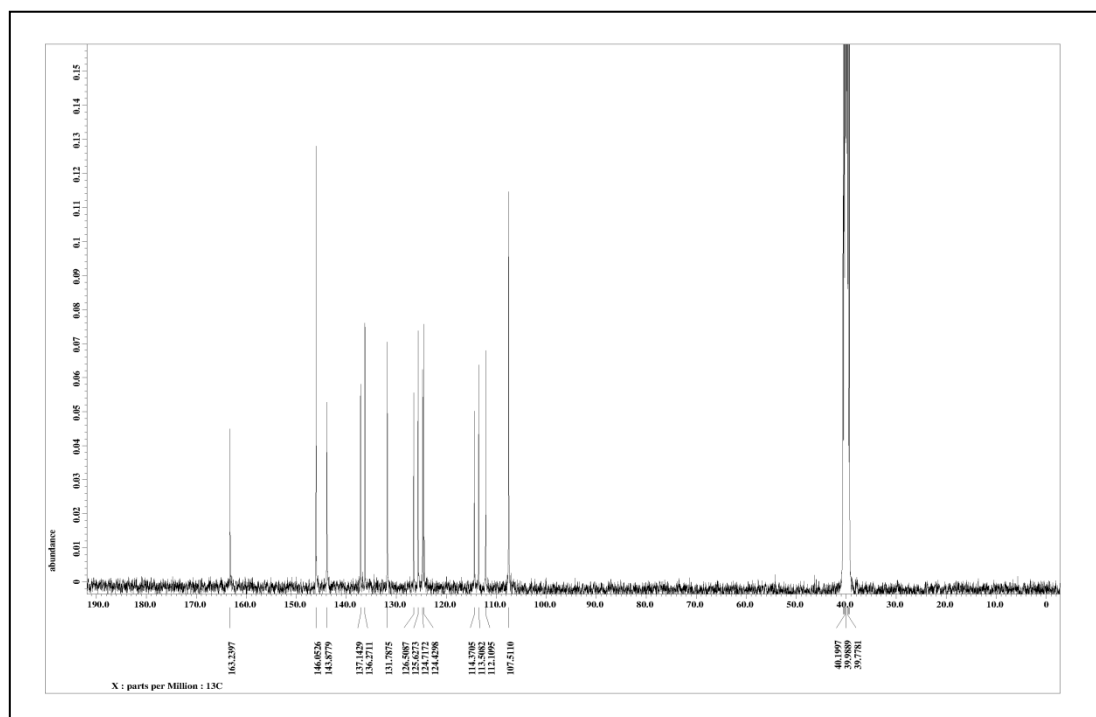
¹H NMR spectrum (400 MHz, DMSO-*d*₆) of **3e**



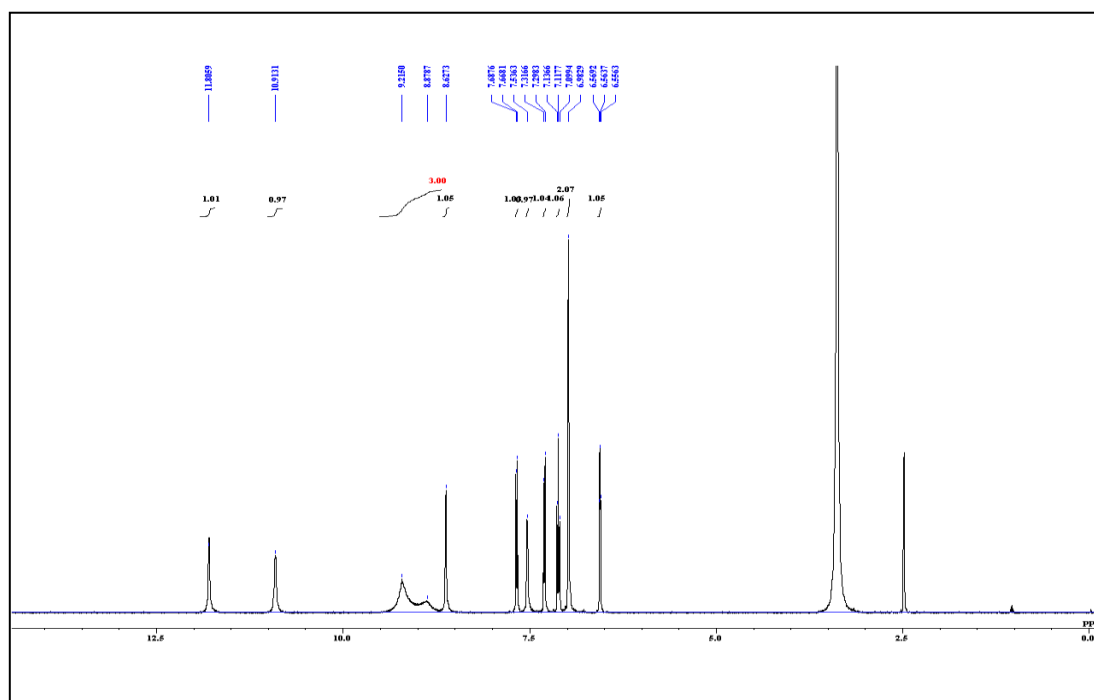
¹³C NMR spectrum (400 MHz, DMSO-*d*₆) of **3e**



¹H NMR spectrum (400 MHz, DMSO-*d*₆) of **3f**

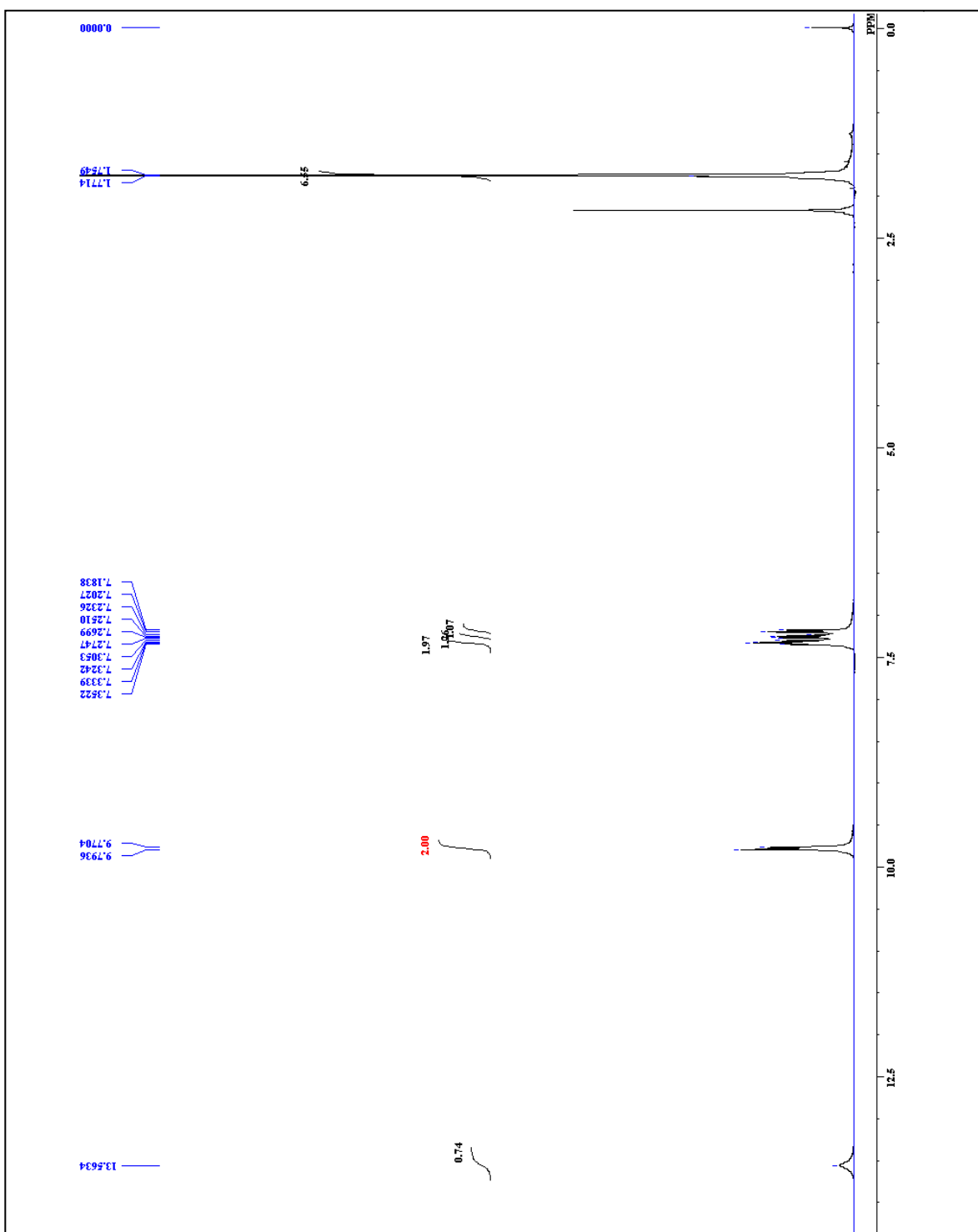


¹³C NMR spectrum (400 MHz, DMSO-*d*₆) of **3f**

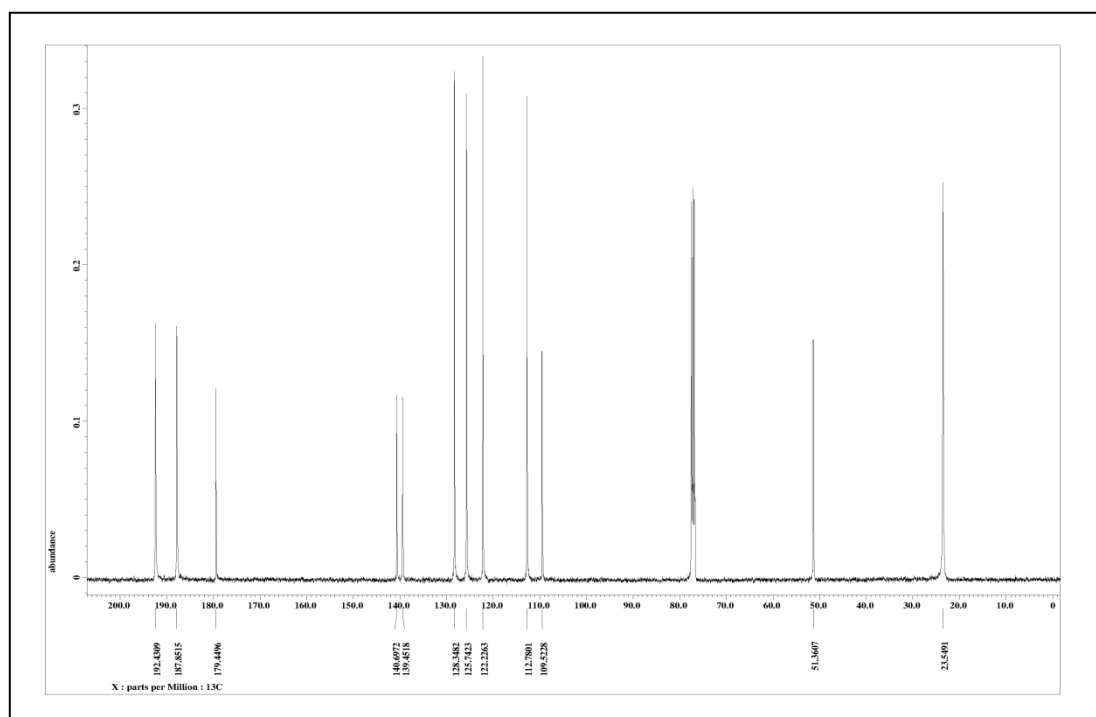


APENDIX C

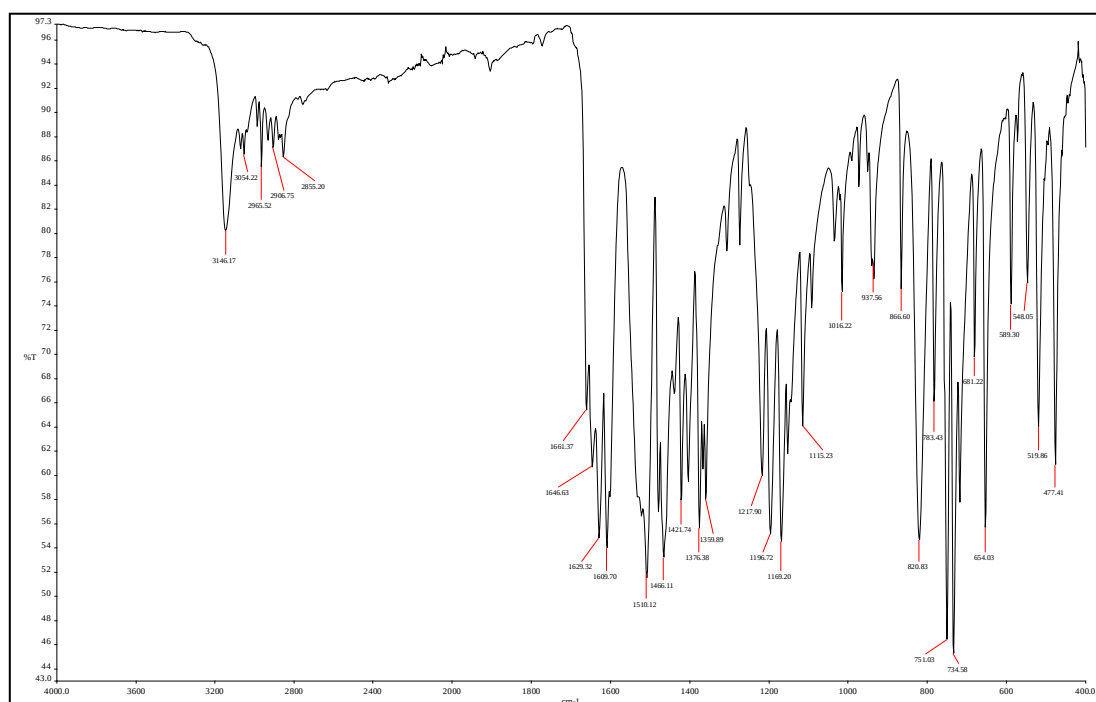
Spectra of compounds in chapter IV



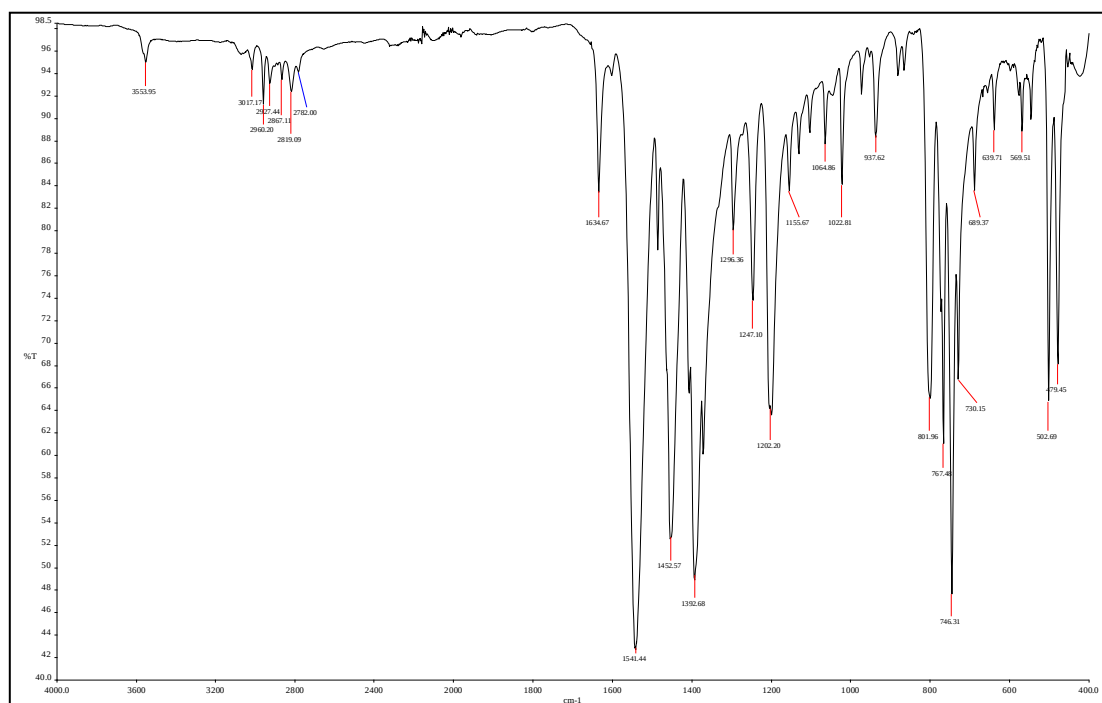
¹H NMR spectrum (400 MHz, CDCl₃) of 2-(diformylmethylidene)-3,3-dimethylindole



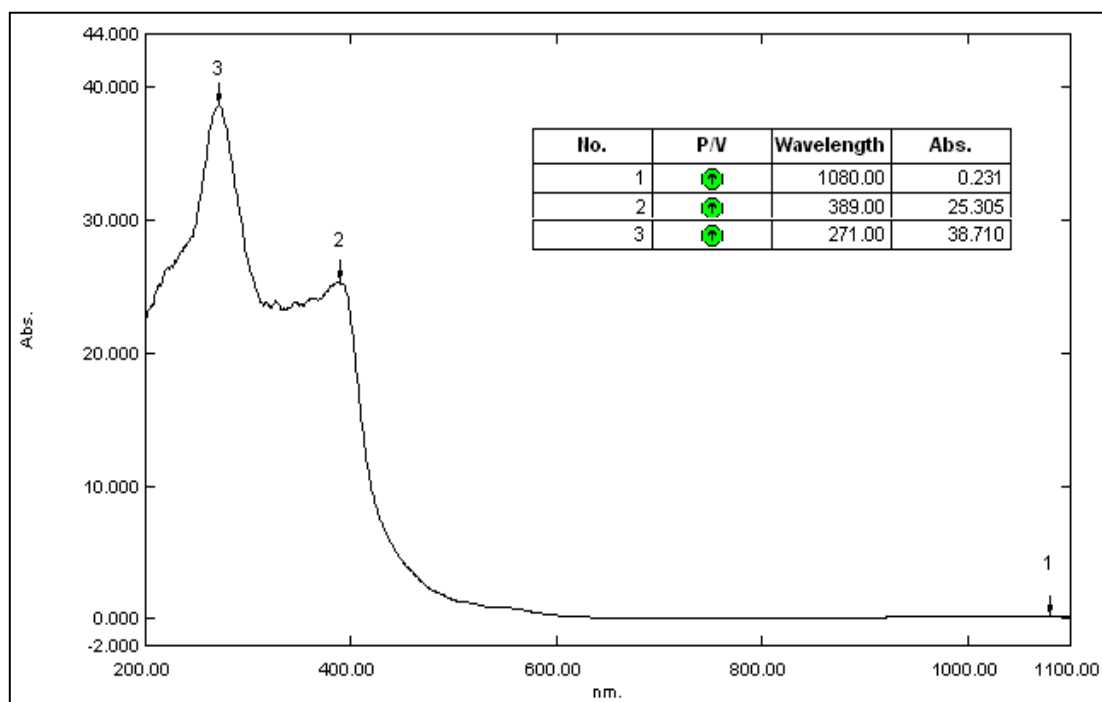
¹³C NMR spectrum (400 MHz, CDCl₃) of 2-(diformylmethylidene)-3,3-dimethylindole



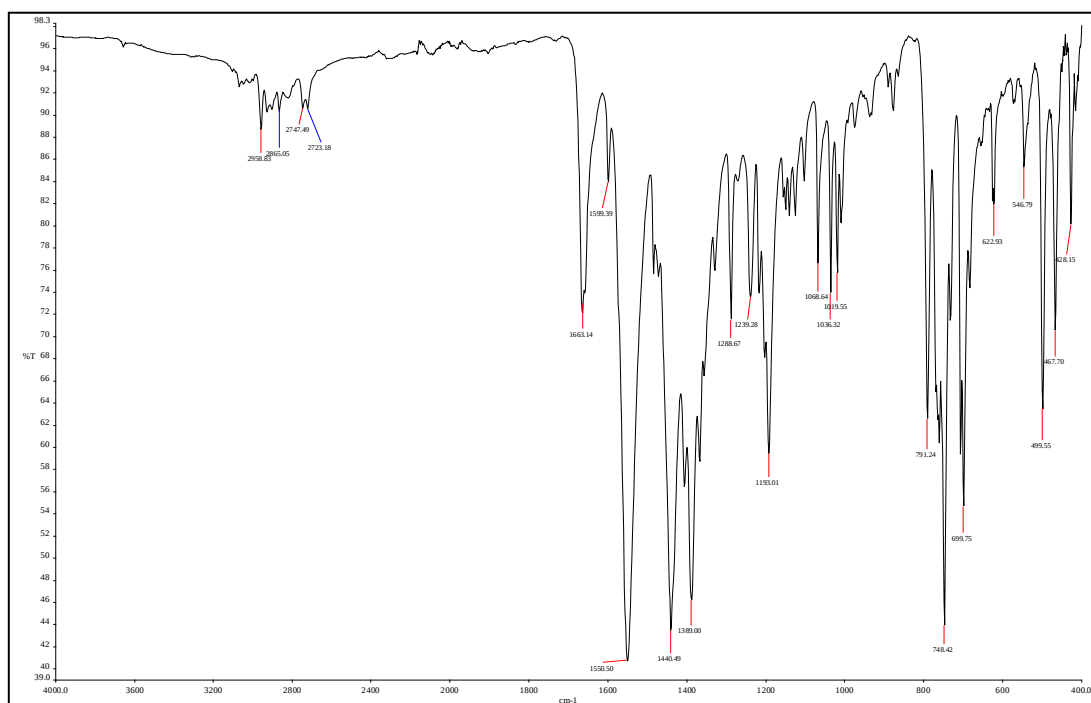
IR spectrum (ATR) of 2-(diformylmethylidene)-3,3-dimethylindole



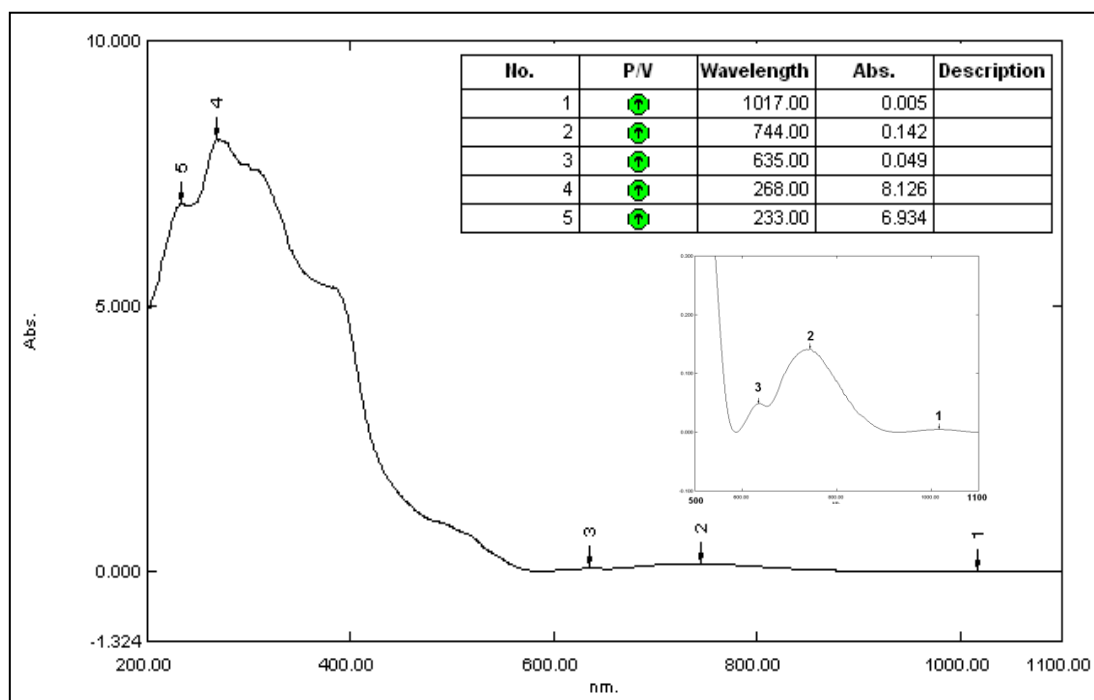
IR spectrum (ATR) of Co(II) complex **1**



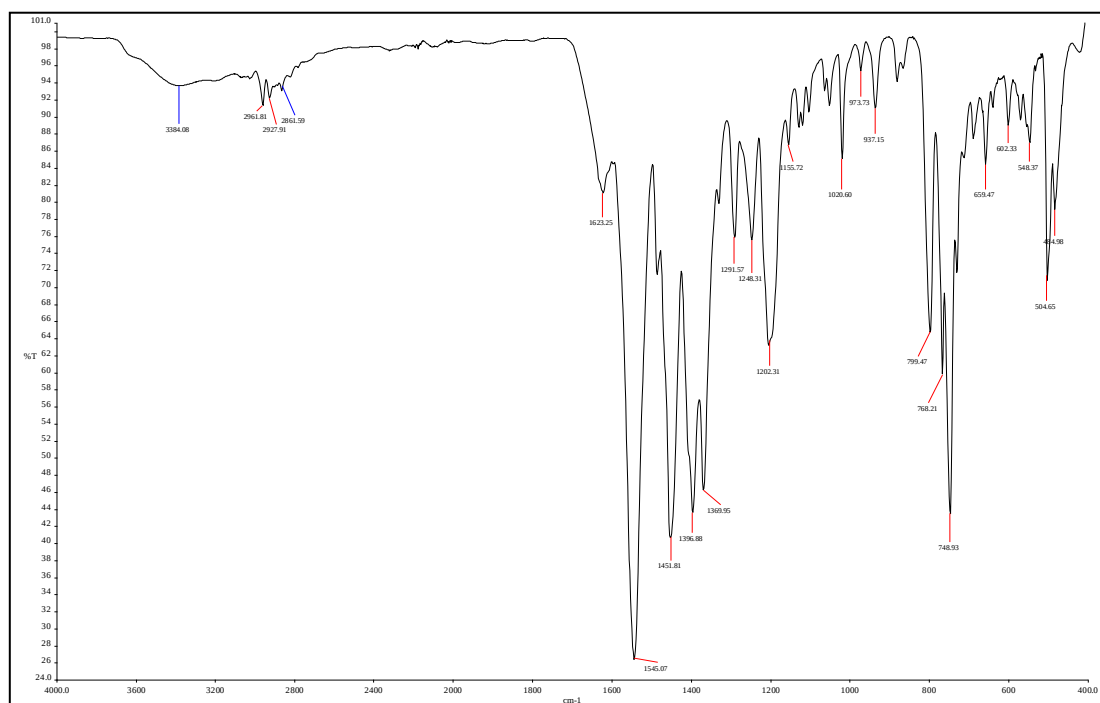
UV-Vis spectrum (solid) of Co(II) complex **1**



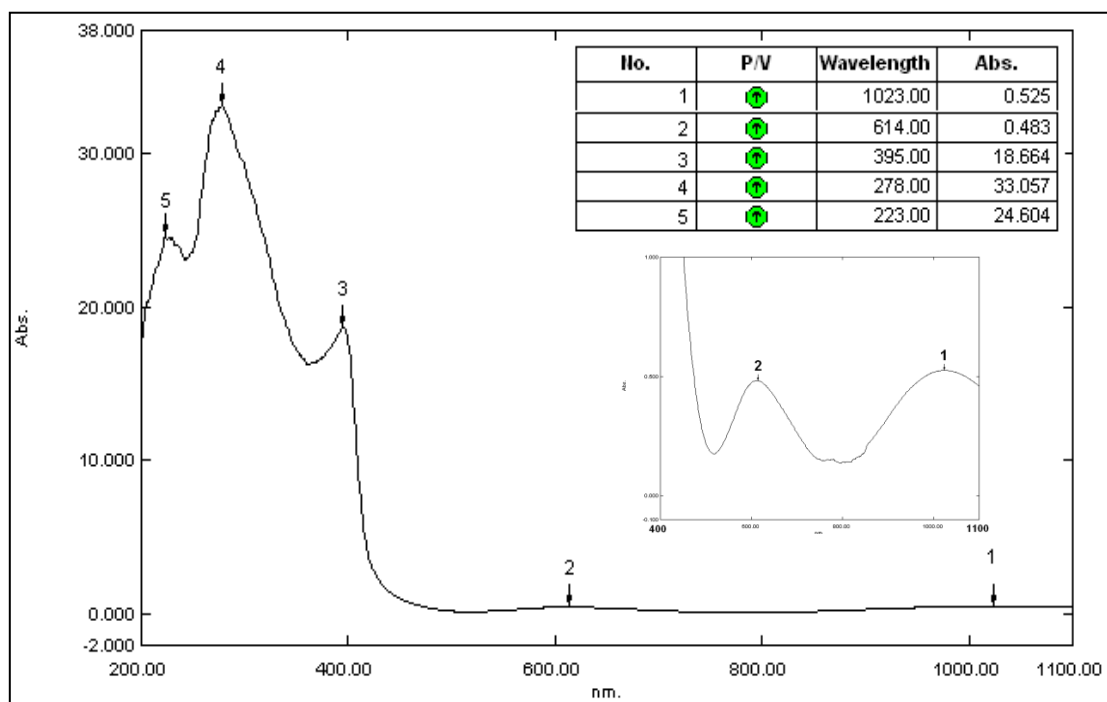
IR spectrum (ATR) of Co(II) complex **2**



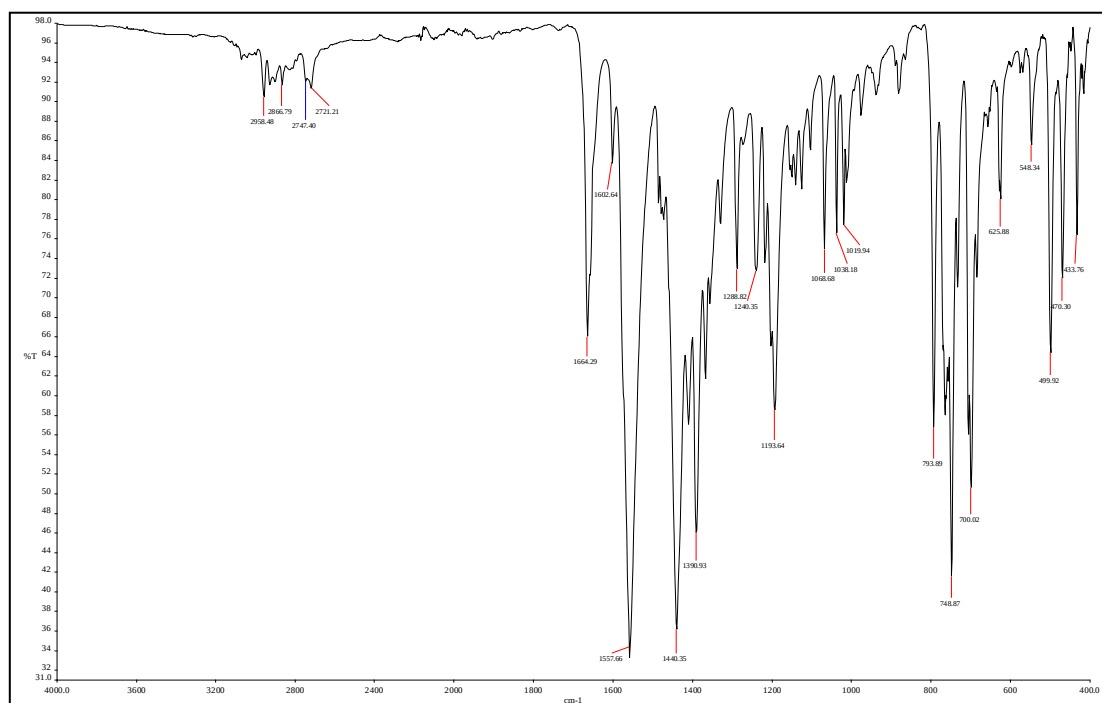
UV-Vis spectrum (solid) of Co(II) complex **2**



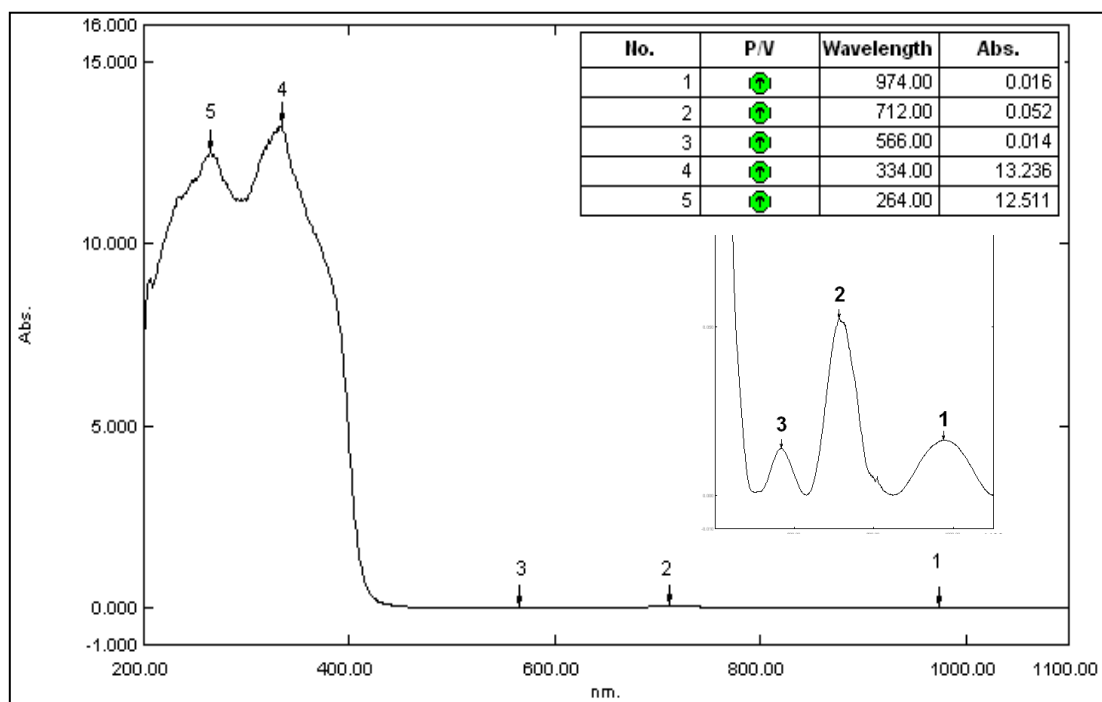
IR spectrum (ATR) of Ni(II) complex **3**



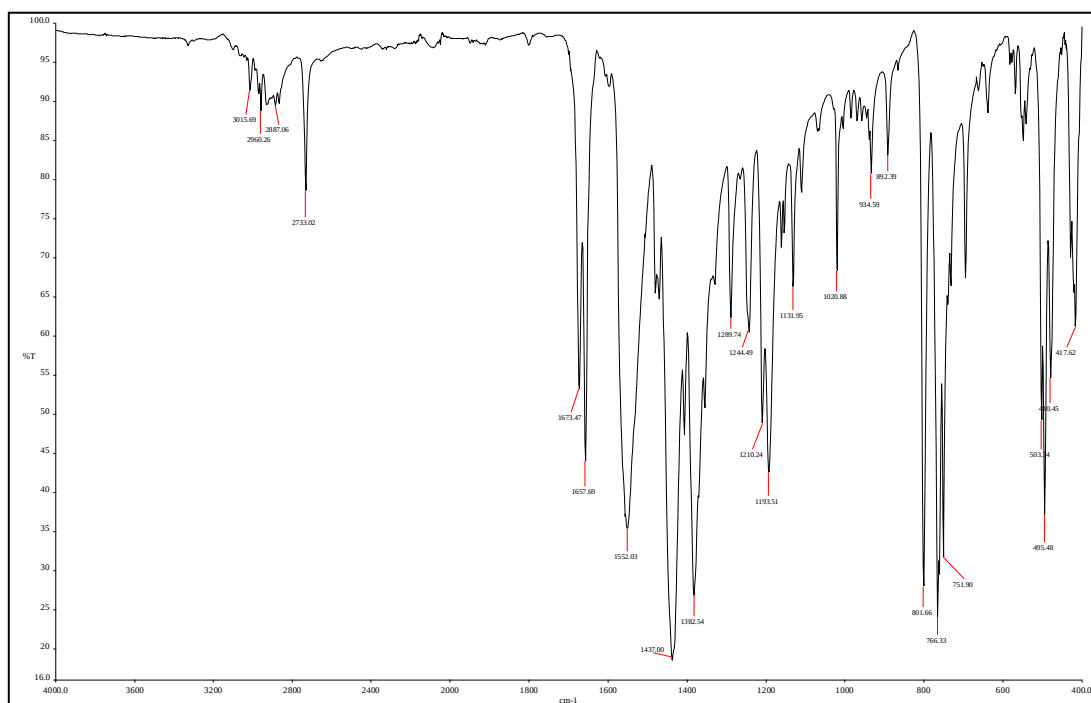
UV-Vis spectrum (solid) of Ni(II) complex **3**



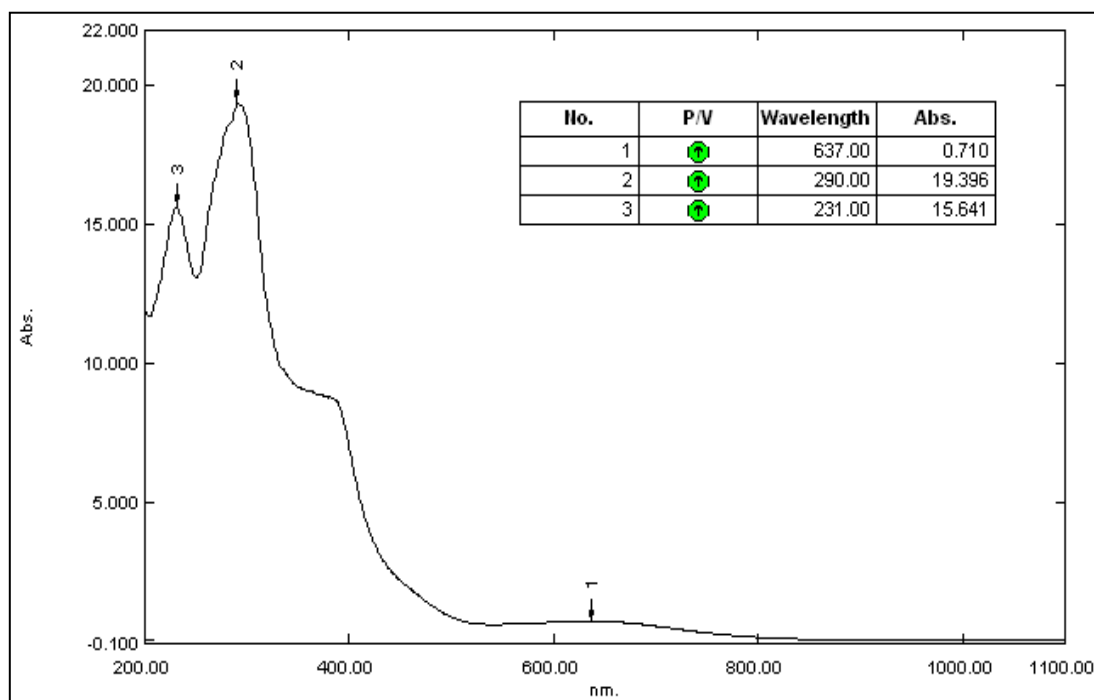
IR spectrum (ATR) of Ni(II) complex 4



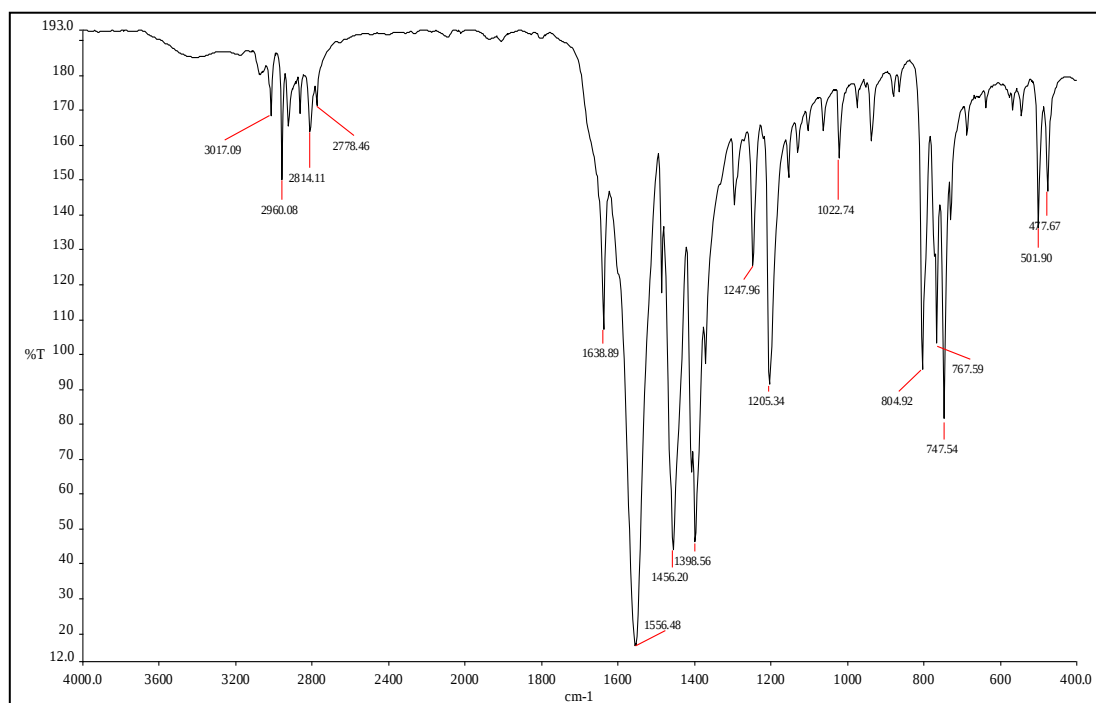
UV-Vis spectrum (solid) of Ni(II) complex 4



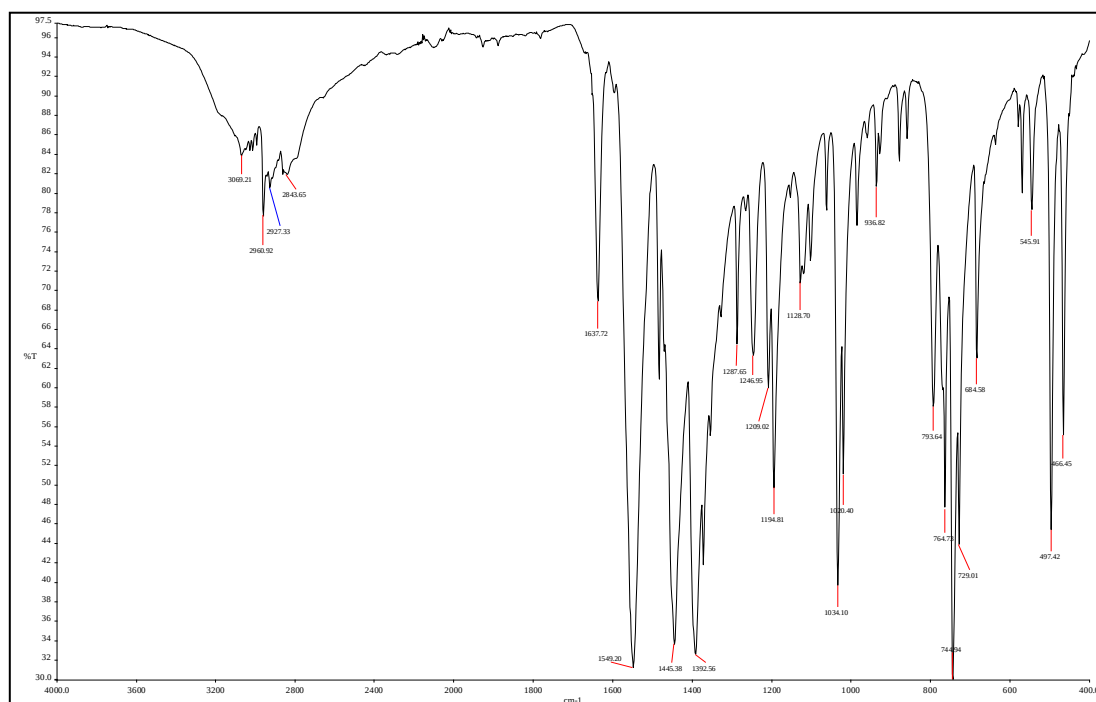
IR spectrum (ATR) of Cu(II) complex 5



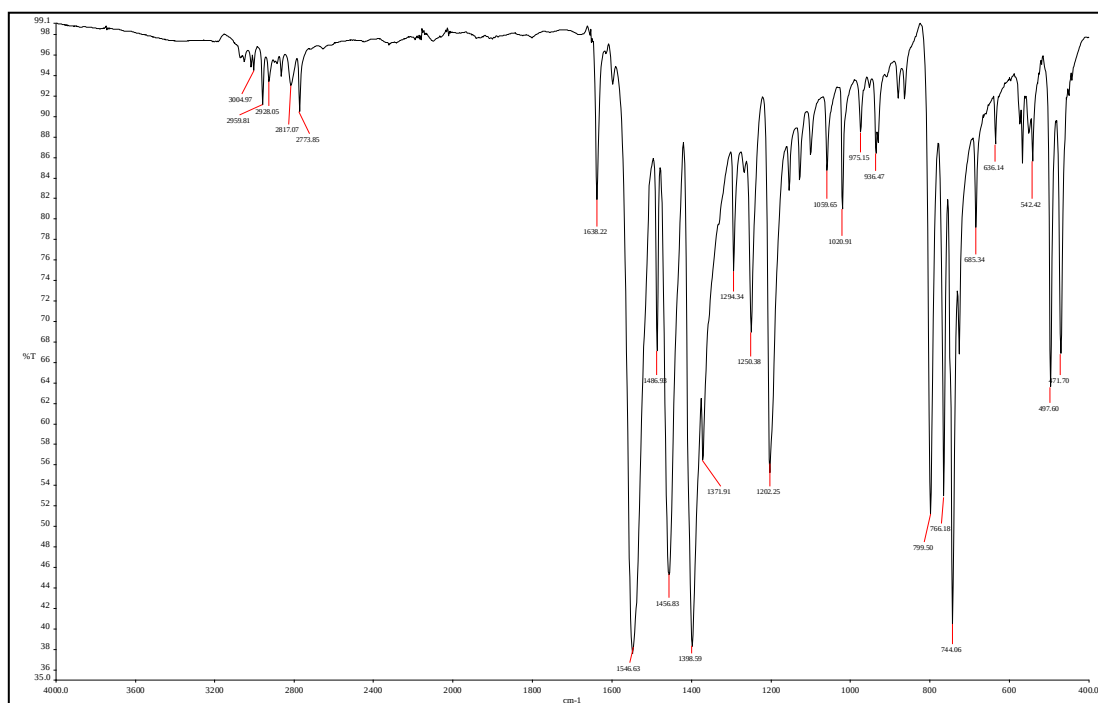
UV-Vis spectrum (solid) of Cu(II) complex 5



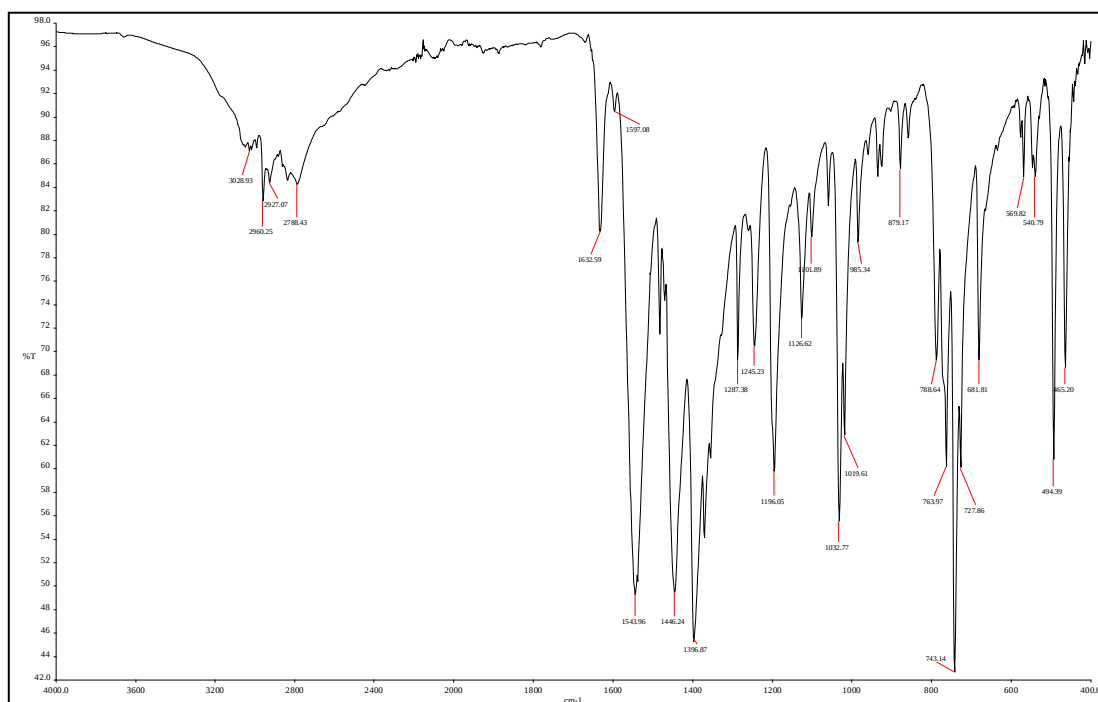
IR spectrum (ATR) of Zn(II) complex 6



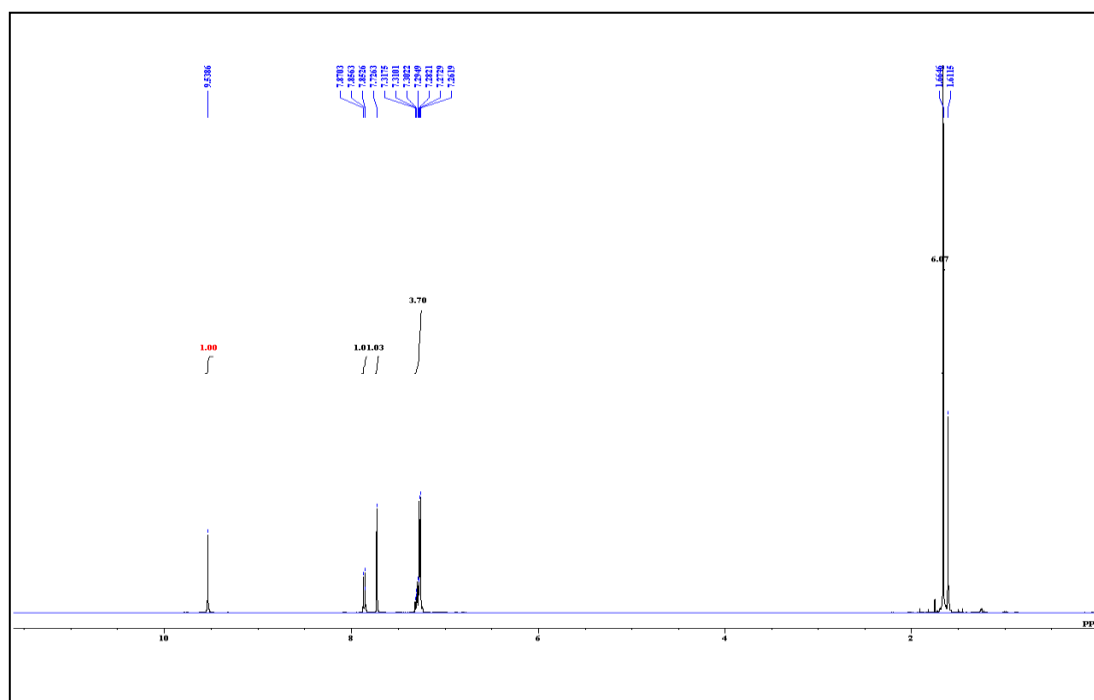
IR spectrum (ATR) of Zn(II) complex 7



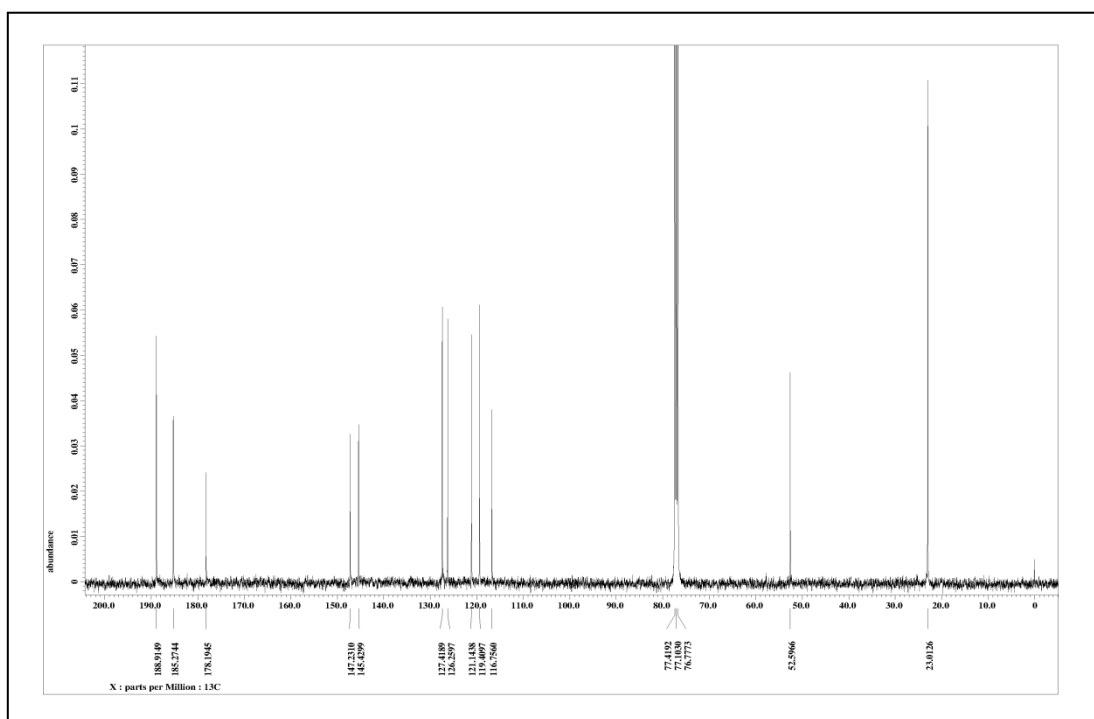
IR spectrum (ATR) of Cd(II) complex **8**



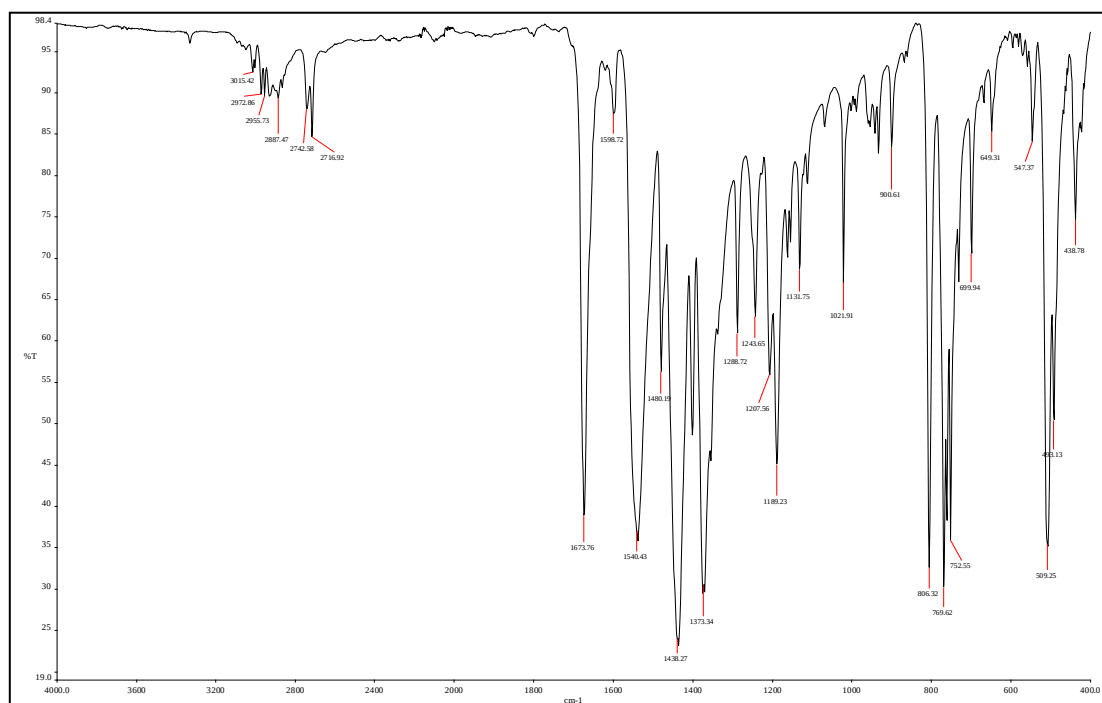
IR spectrum (ATR) of Cd(II) complex **9**



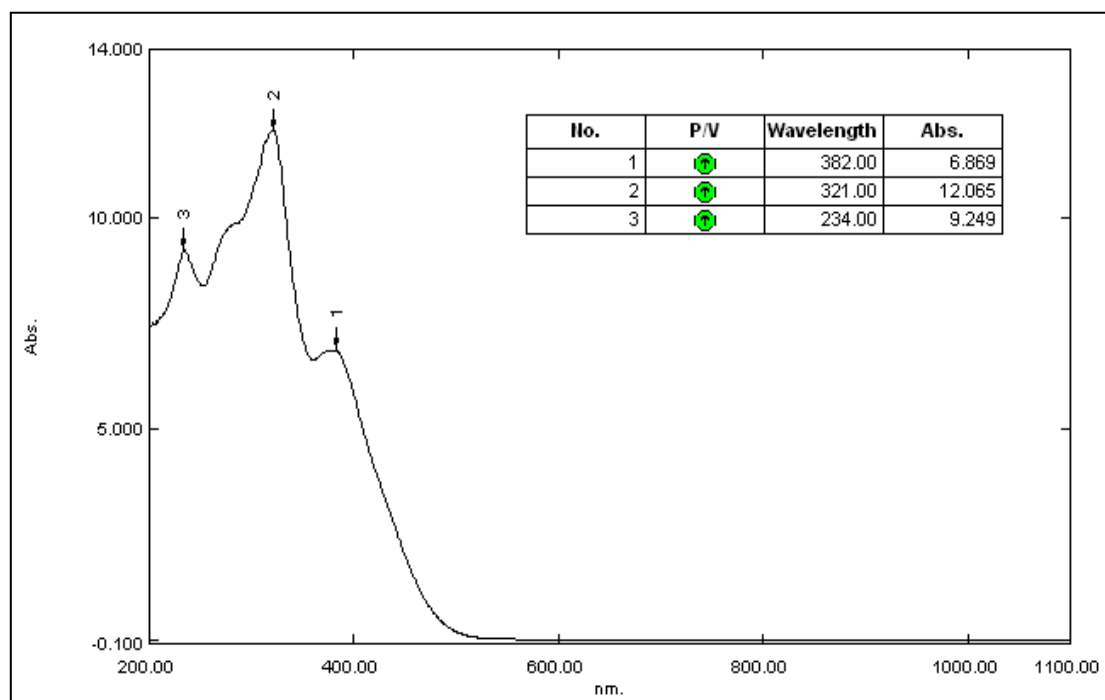
¹H NMR spectrum (400 MHz, CDCl₃) of Pd(II) complex **10**



¹³C NMR spectrum (400 MHz, CDCl₃) of Pd(II) complex **10**



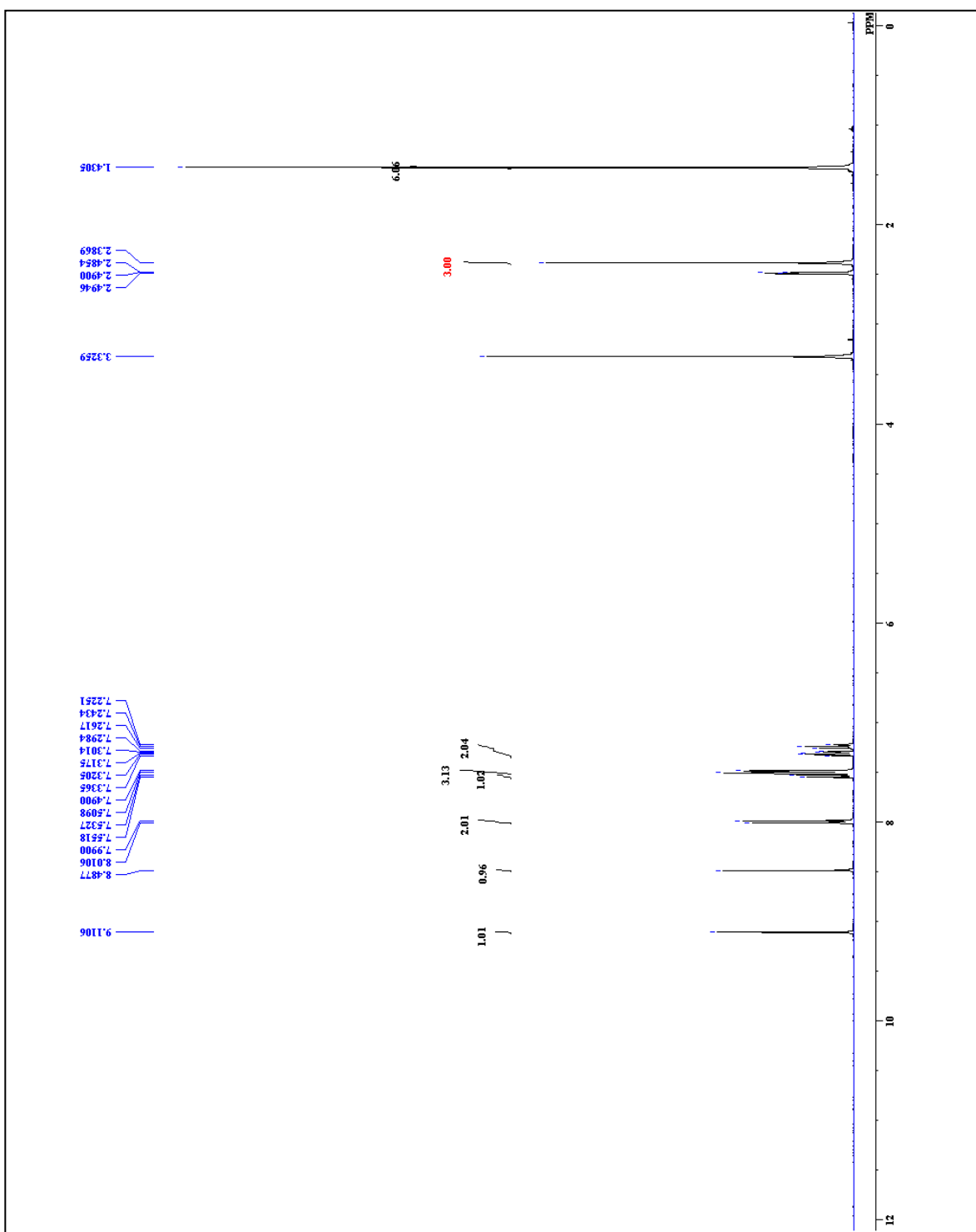
IR spectrum (ATR) of Pd(II) complex **10**



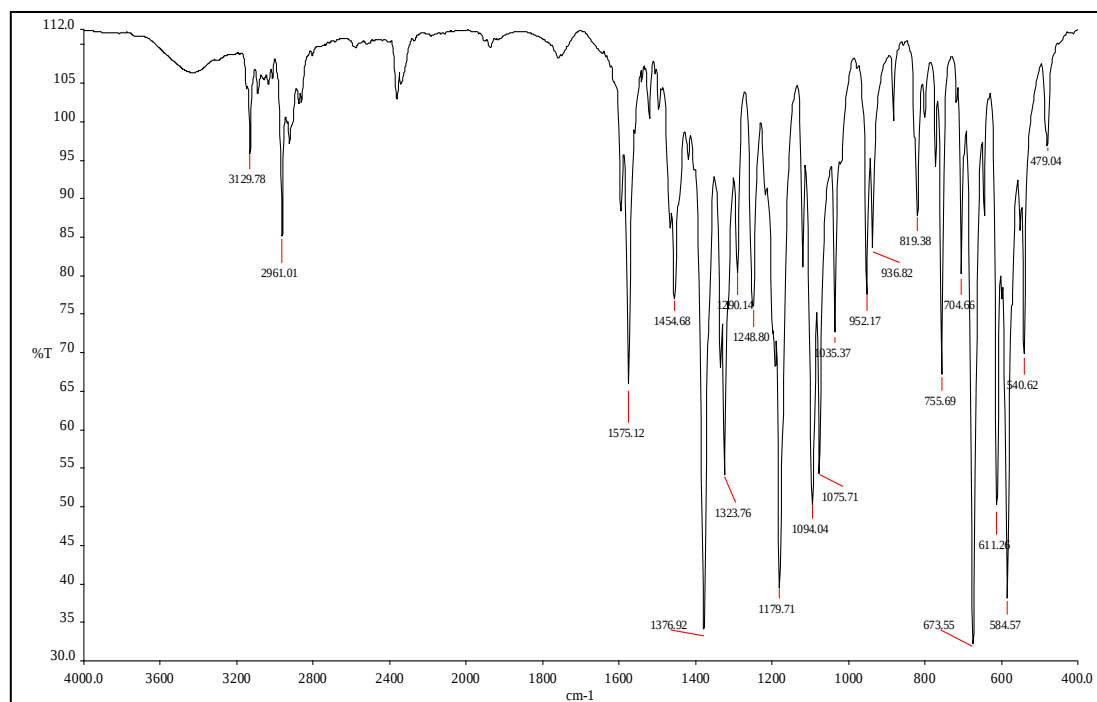
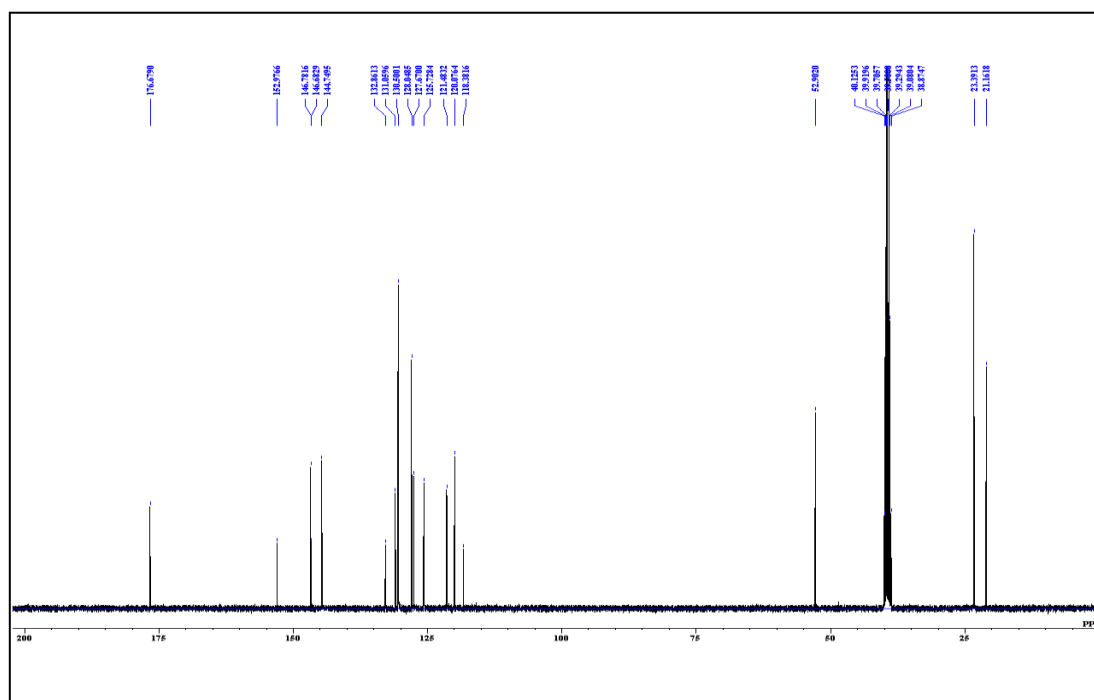
UV-Vis spectrum (solid) of Pd(II) complex **10**

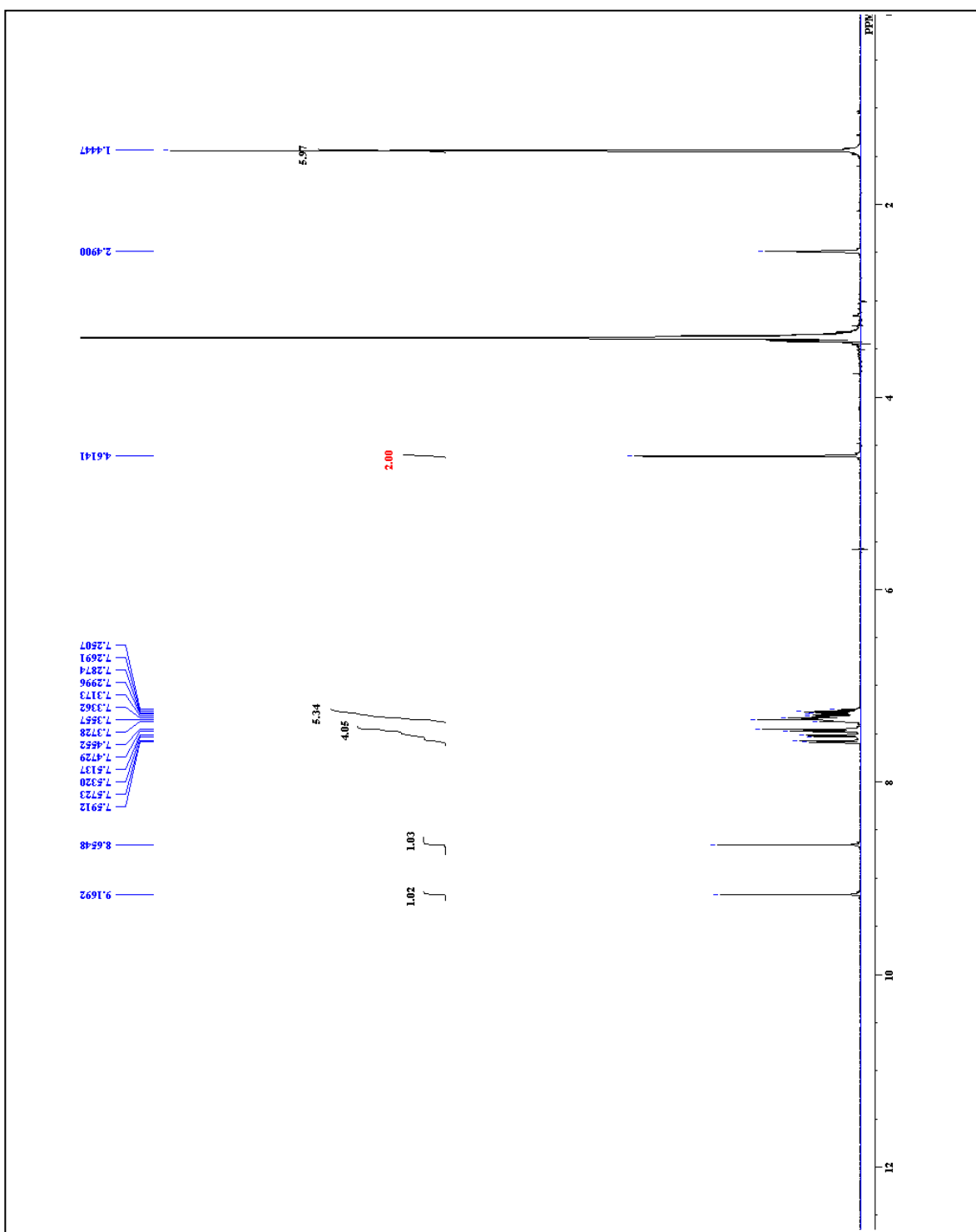
APENDIX D

Spectra of compounds in chapter V

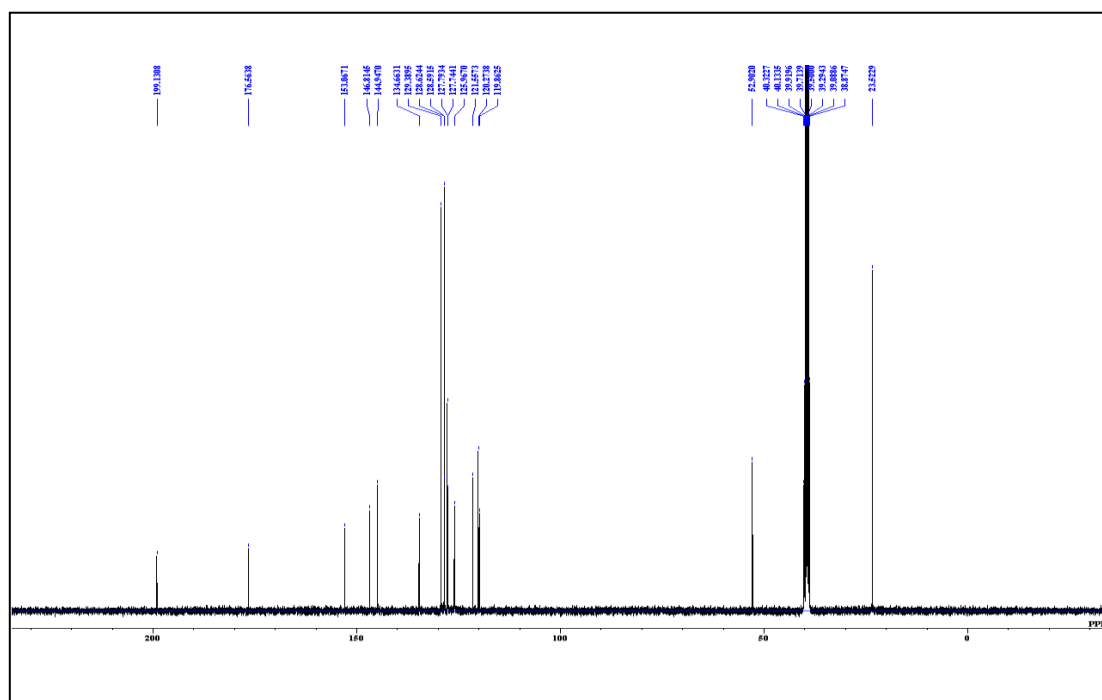


¹H NMR spectrum (400 MHz, DMSO-*d*₆) of 4

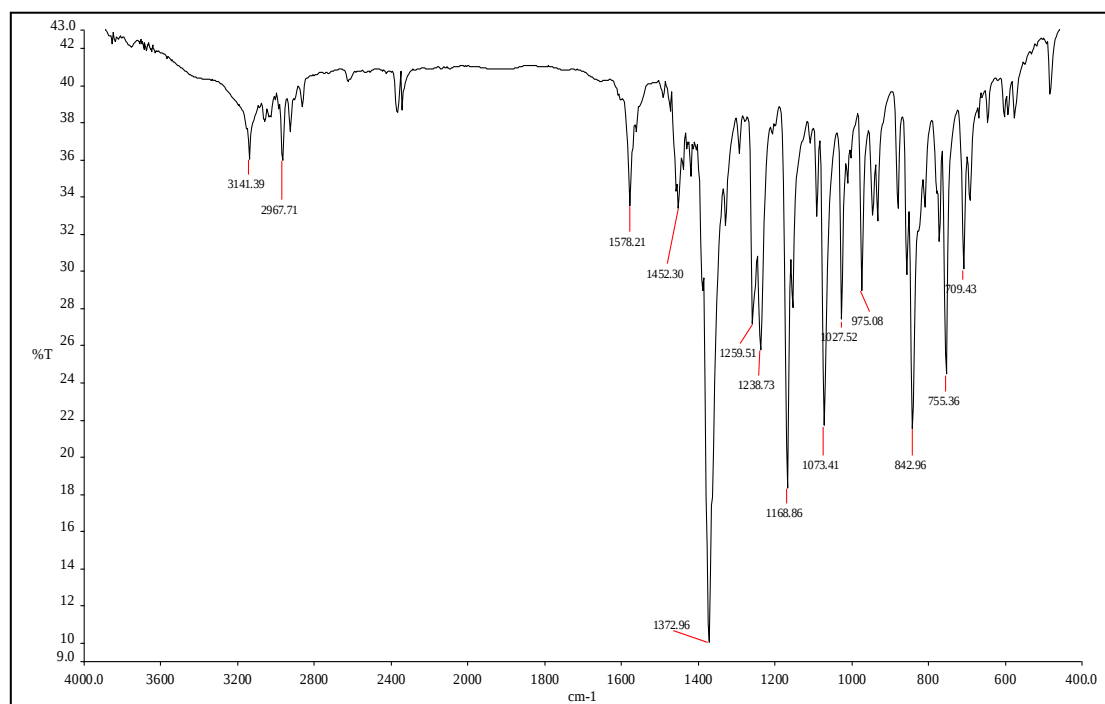




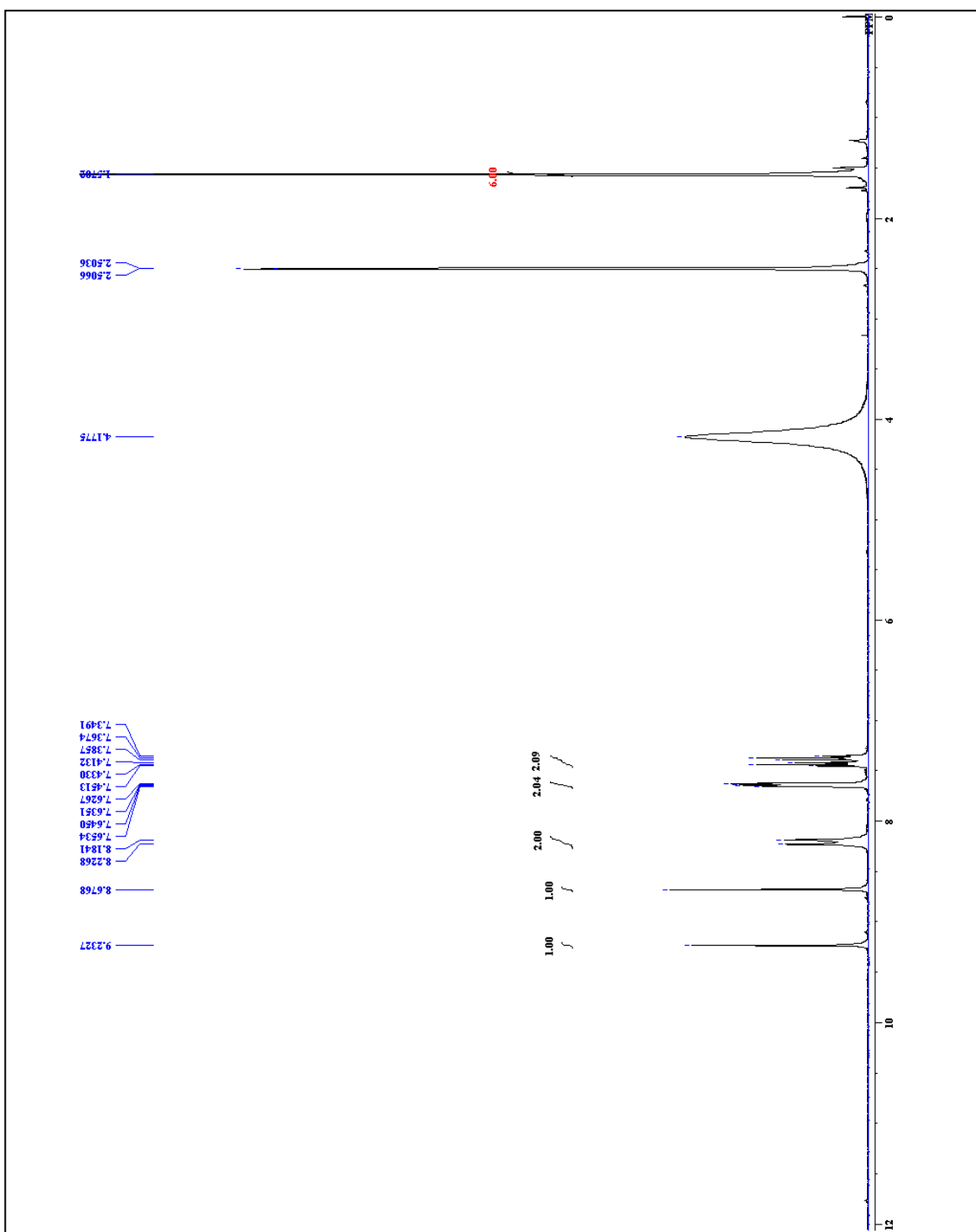
¹H NMR spectrum (400 MHz, DMSO-*d*₆) of 5



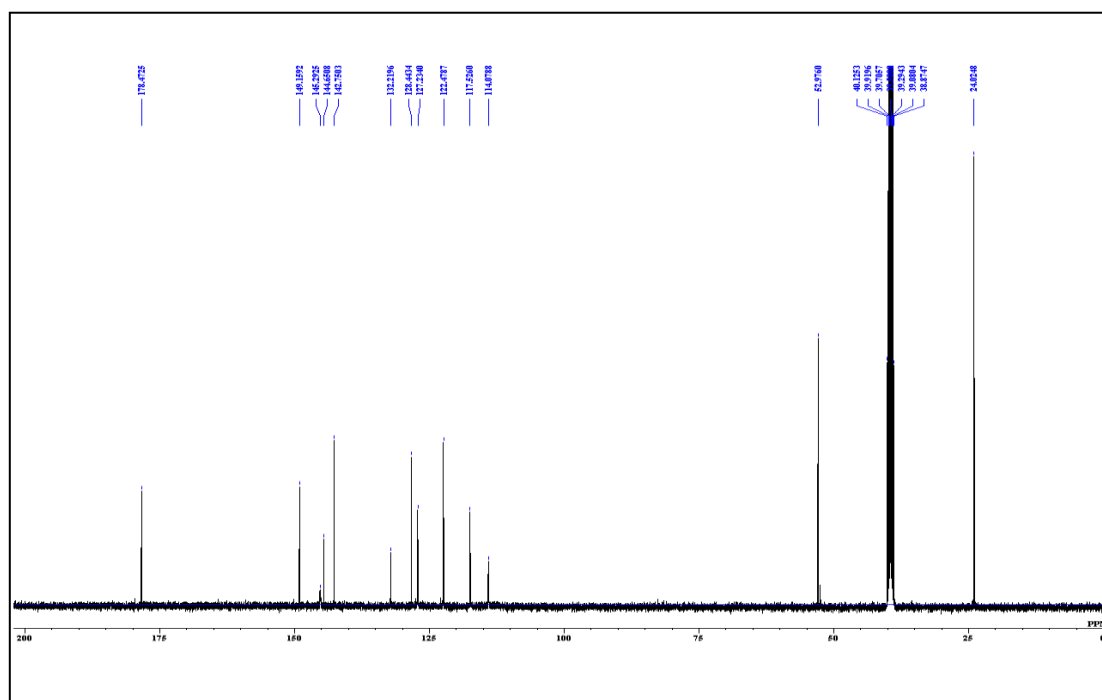
¹³C NMR spectrum (400 MHz, DMSO-*d*₆) of 5



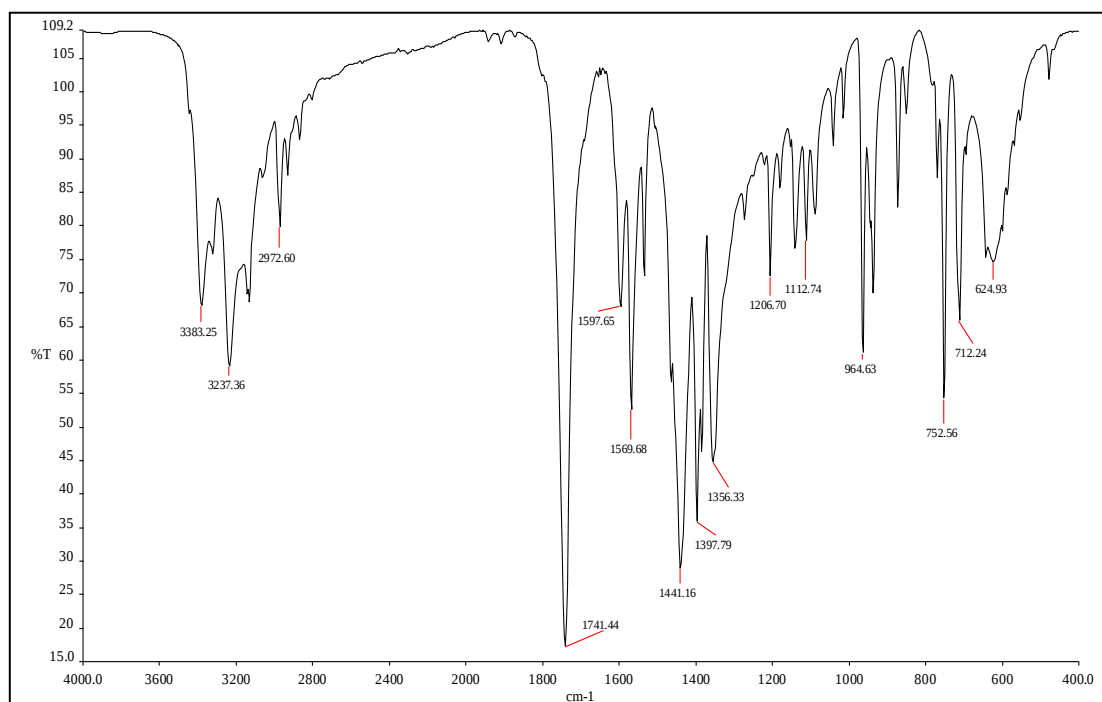
IR spectrum (KBr) of 5



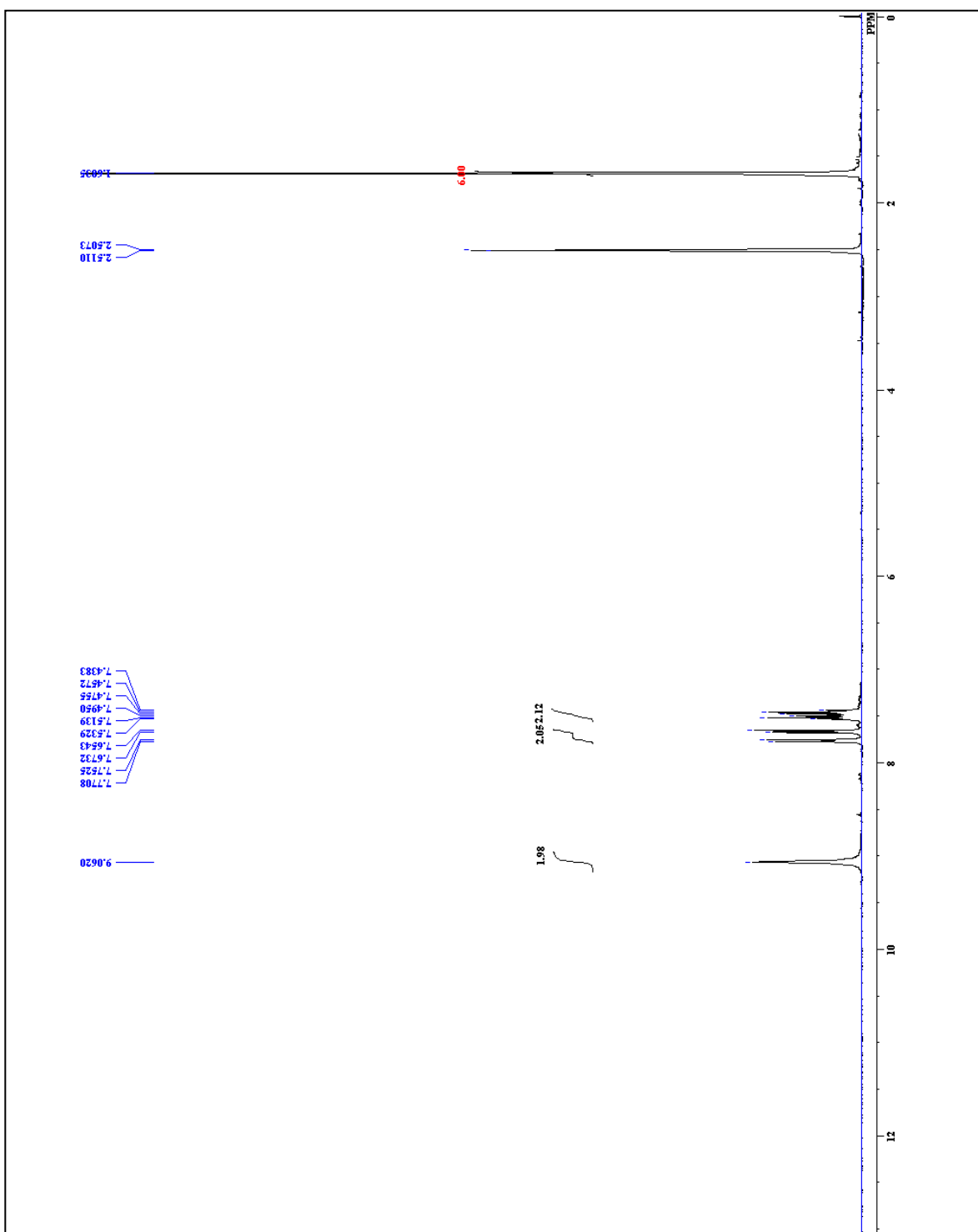
¹H NMR spectrum (400 MHz, DMSO-*d*₆) of **6**



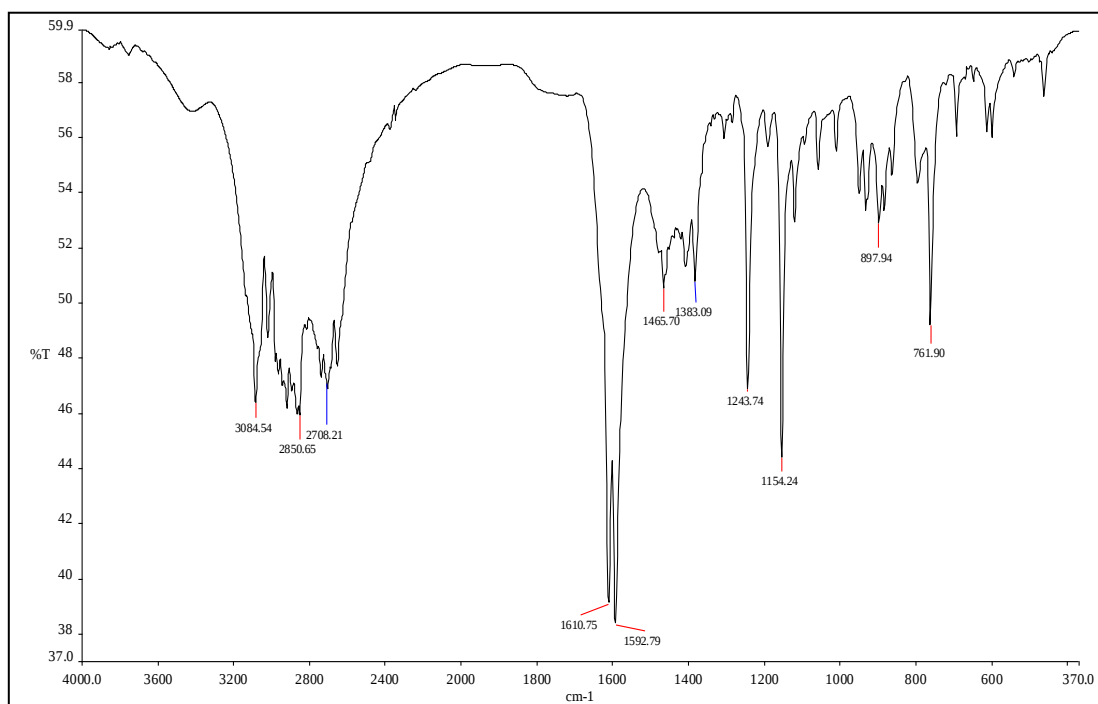
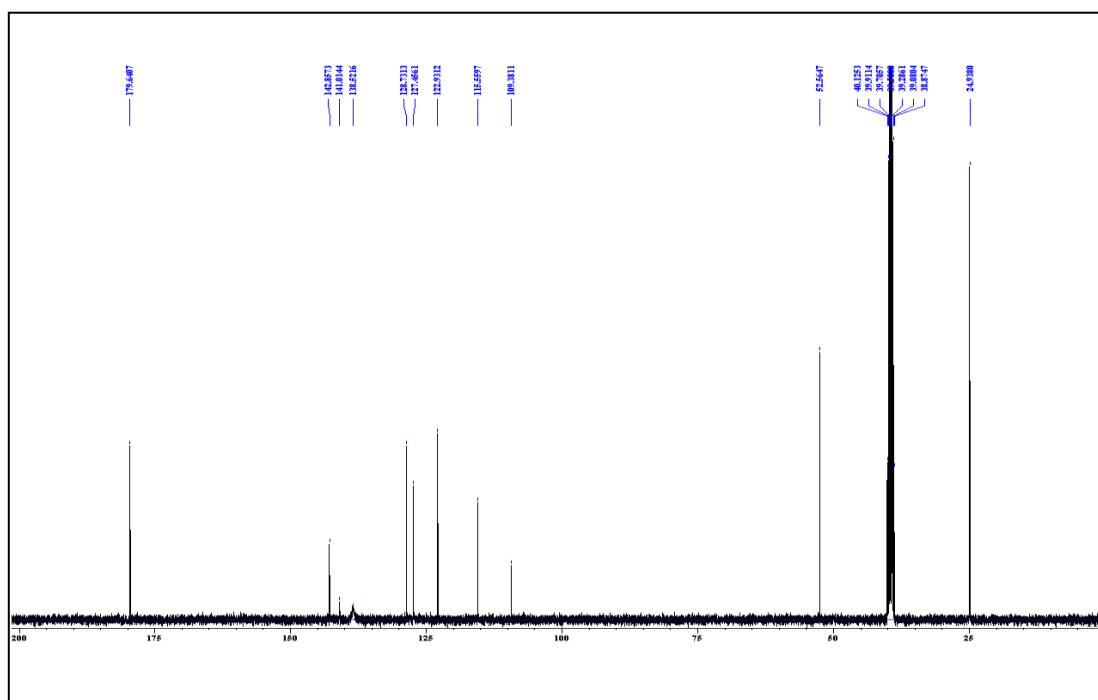
¹³C NMR spectrum (400 MHz, DMSO-*d*₆) of **6**

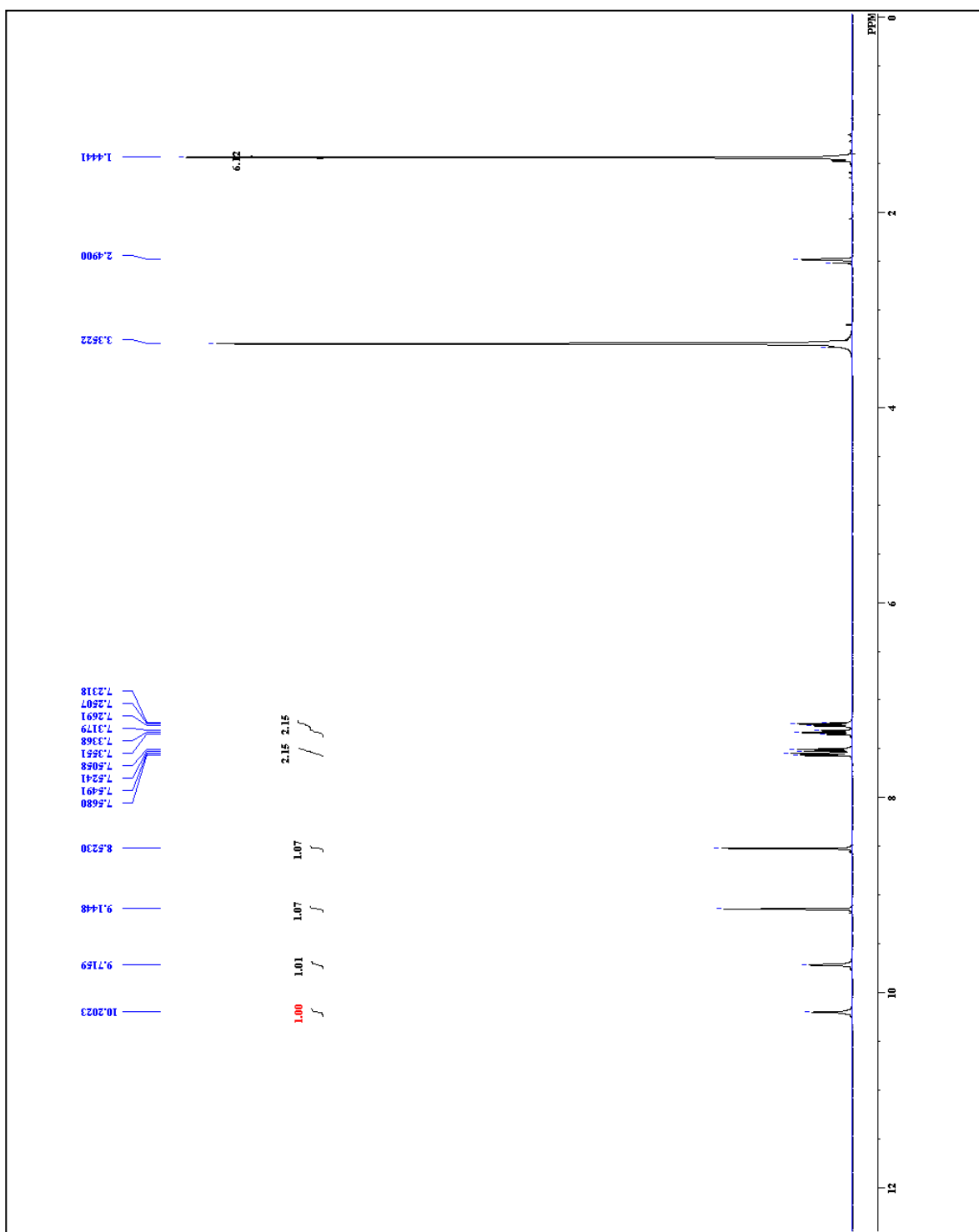


IR spectrum (KBr) of **6**

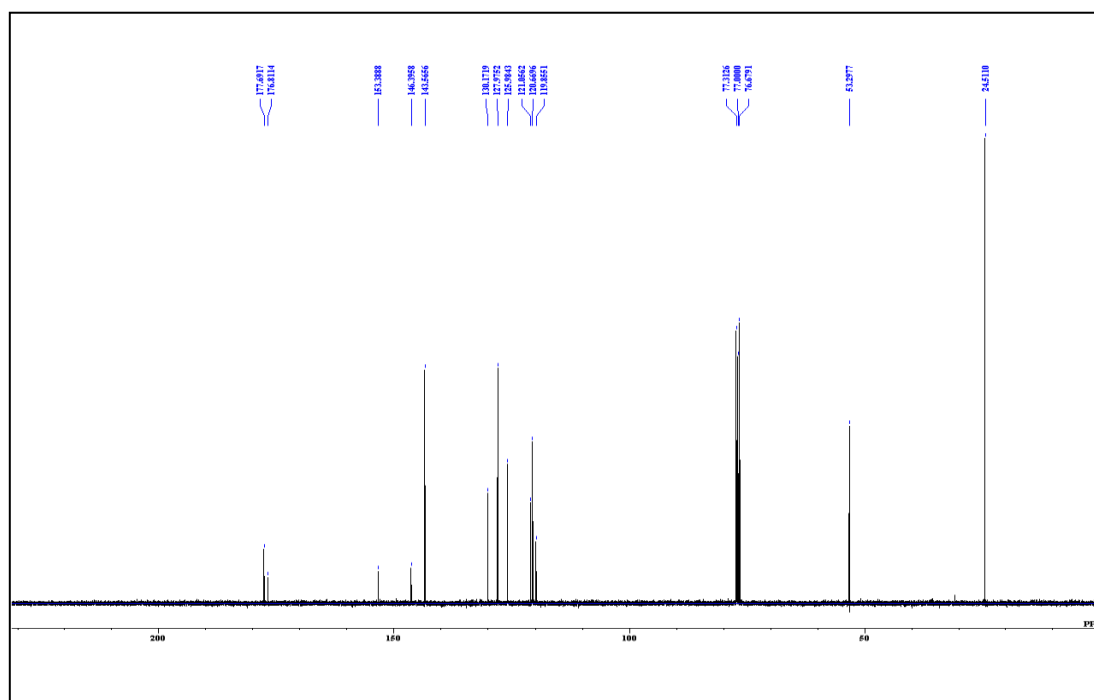


¹H NMR spectrum (400 MHz, DMSO-*d*₆) of 7

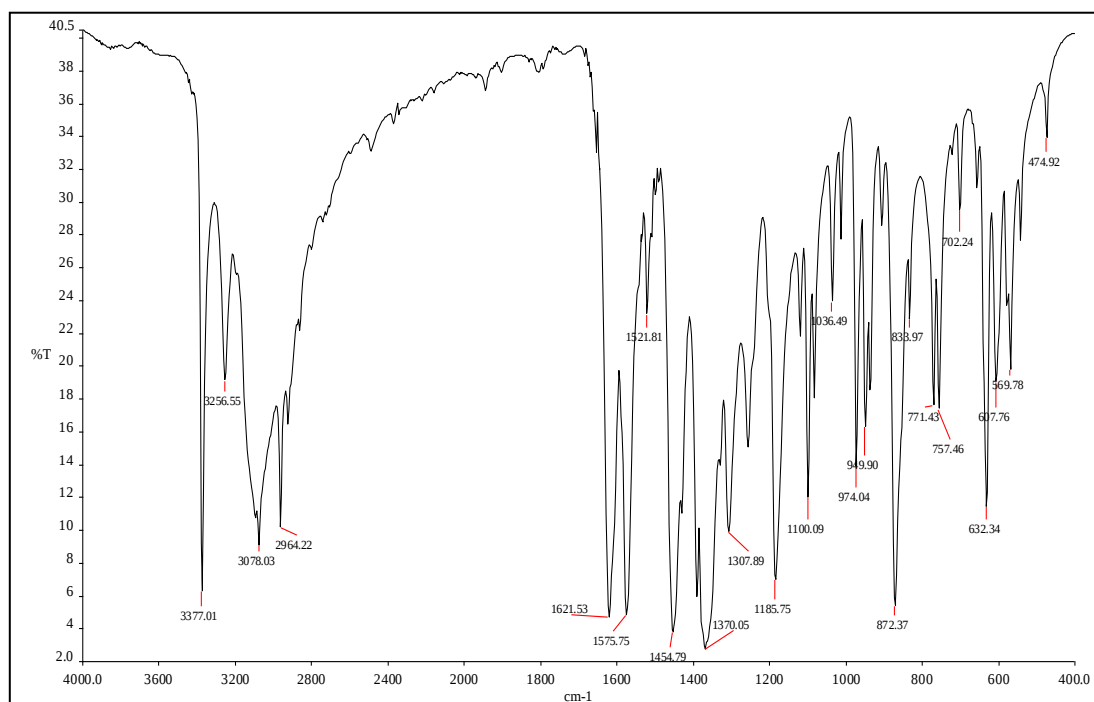




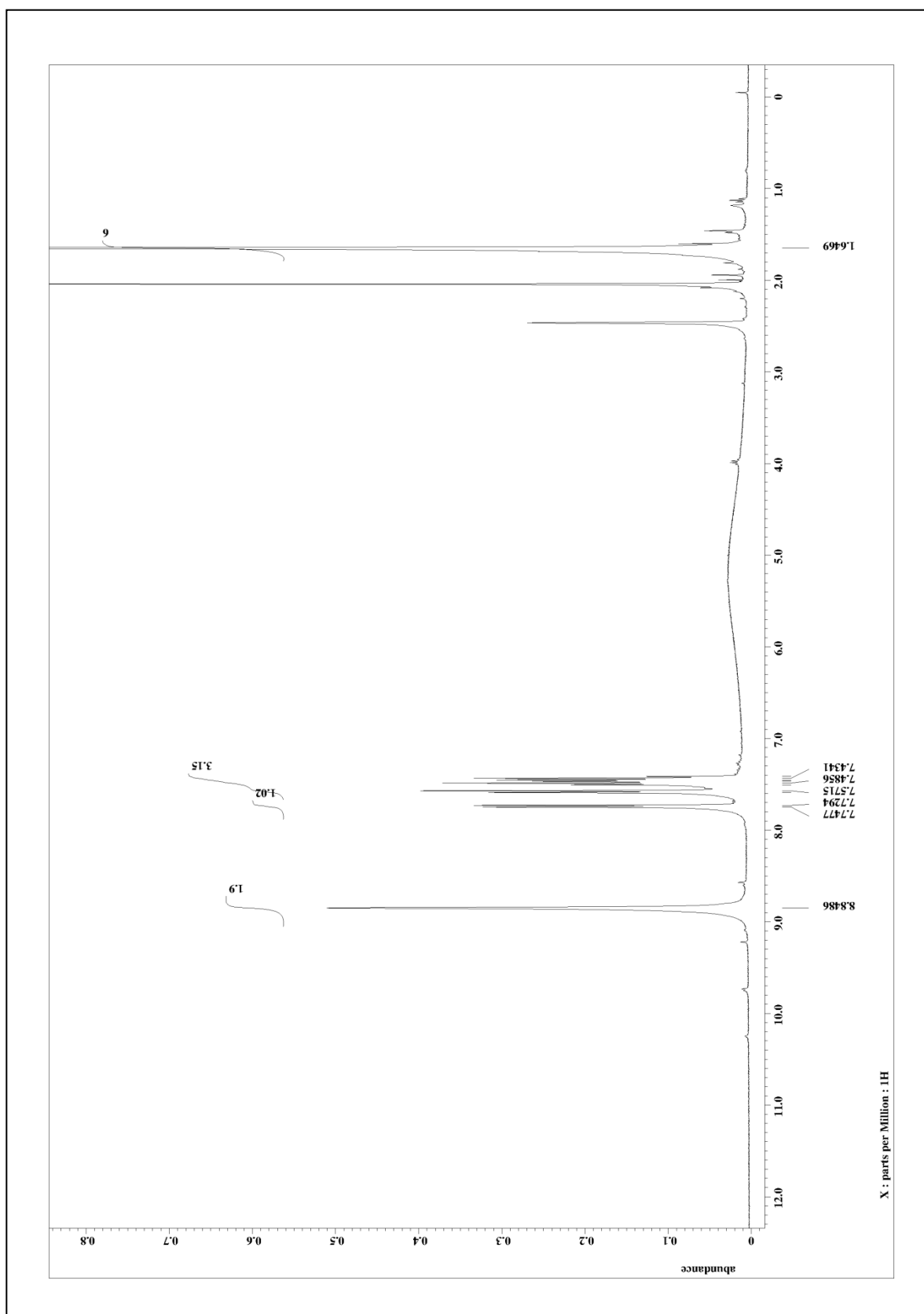
¹H NMR spectrum (400 MHz, DMSO-*d*₆) of **8**



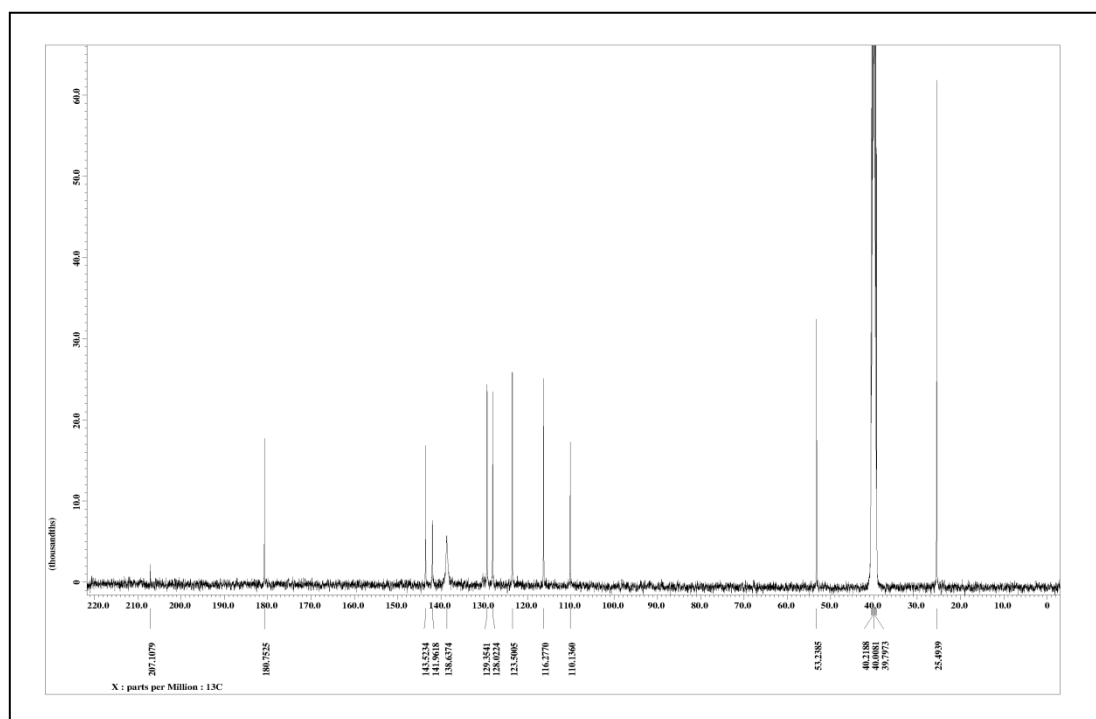
¹³C NMR spectrum (400 MHz, CDCl₃) of **8**



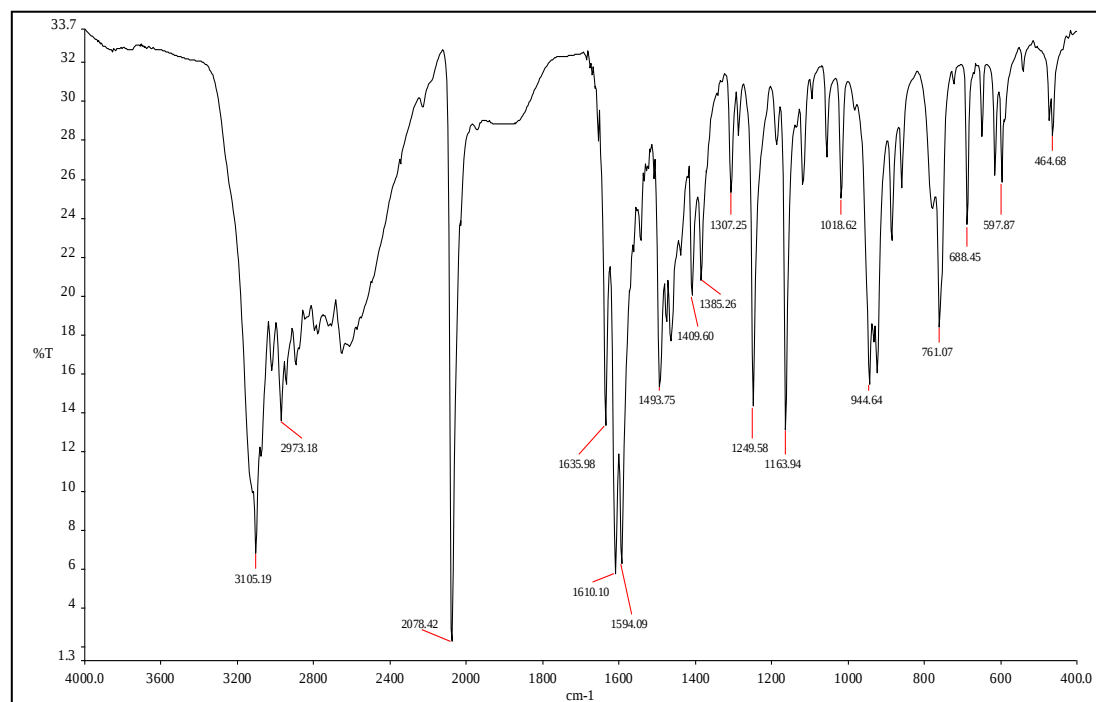
IR spectrum (KBr) of **8**



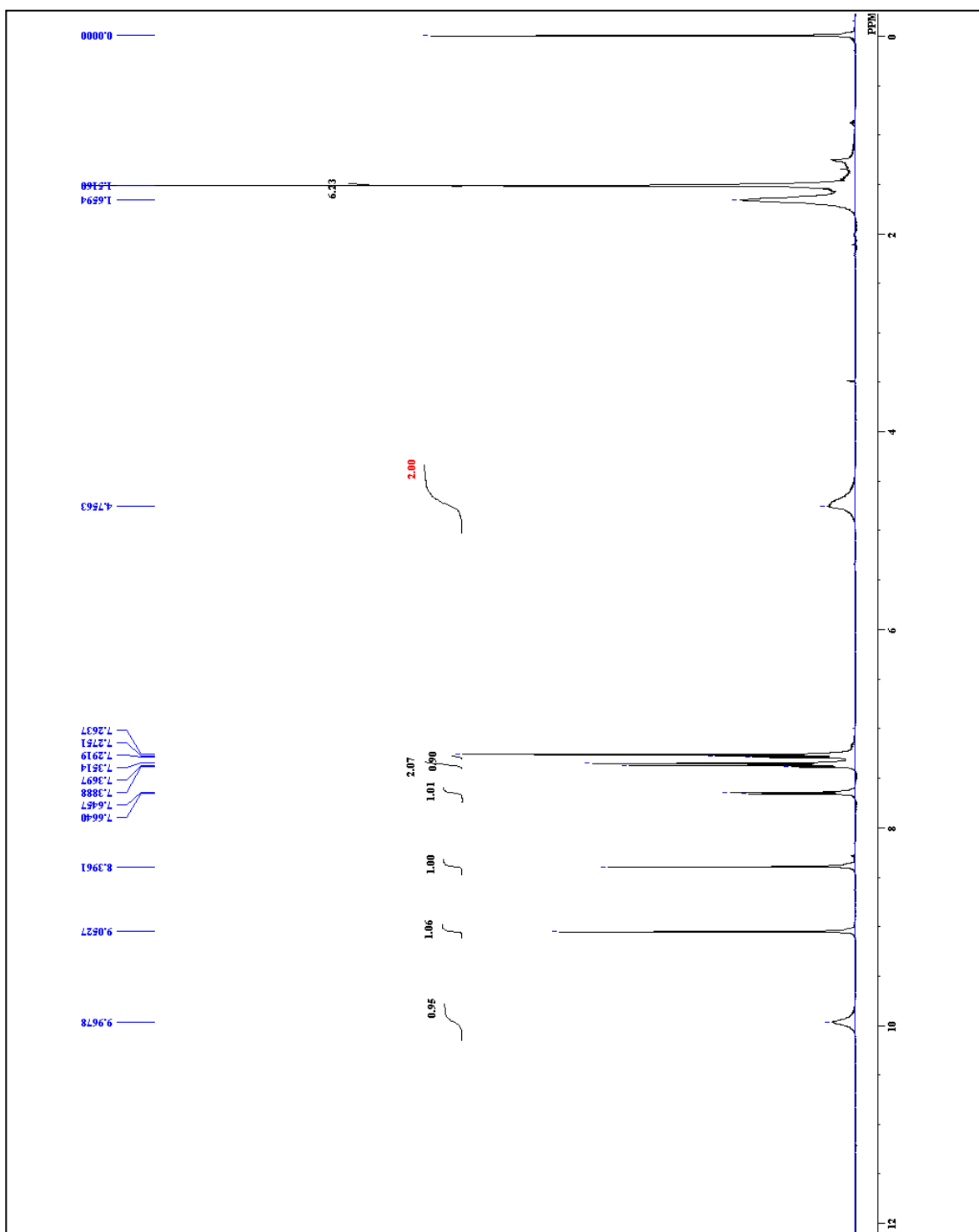
¹H NMR spectrum (400 MHz, DMSO-*d*₆) of **9**



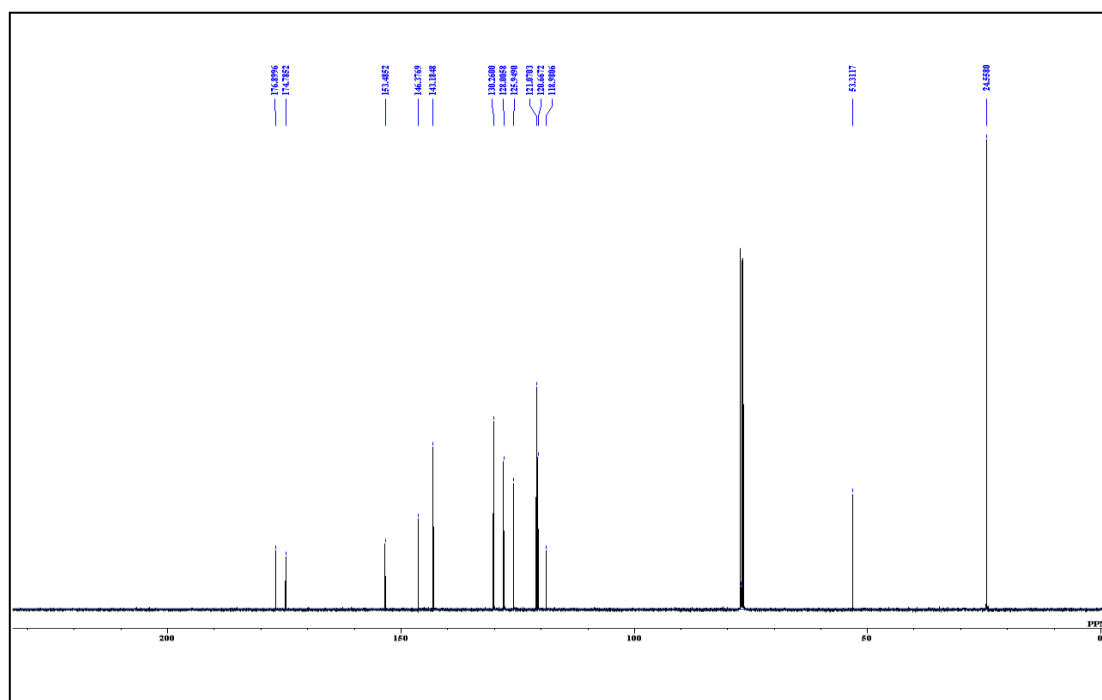
^{13}C NMR spectrum (400 MHz, $\text{DMSO}-d_6$) of **9**



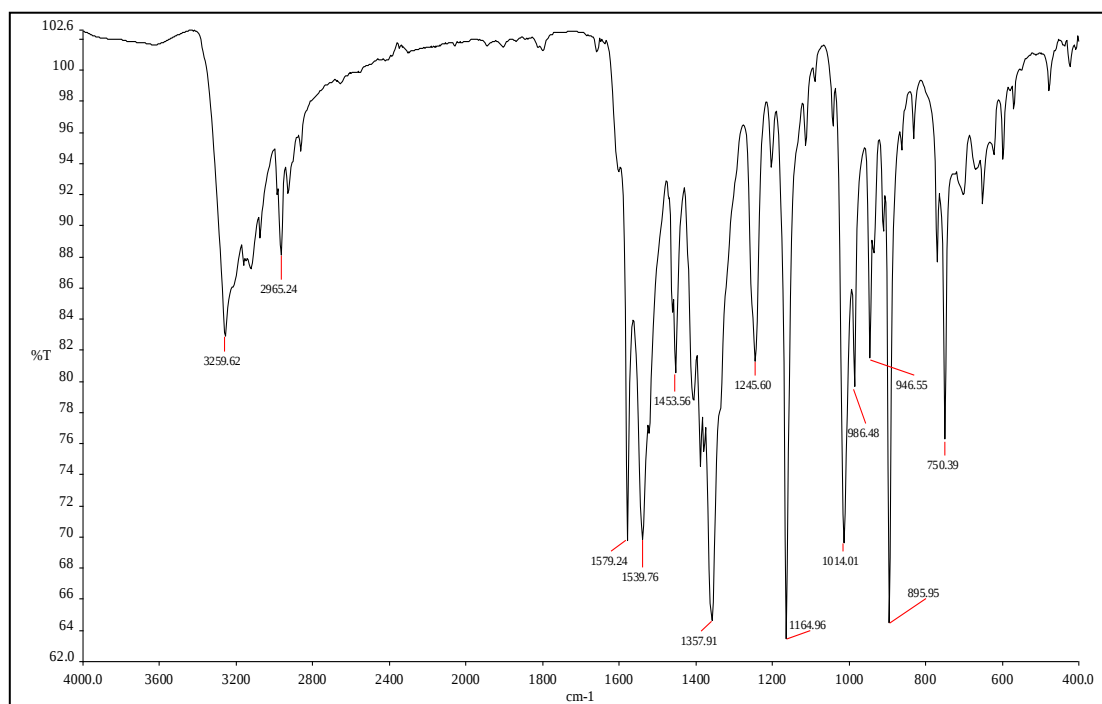
IR spectrum (KBr) of **9**



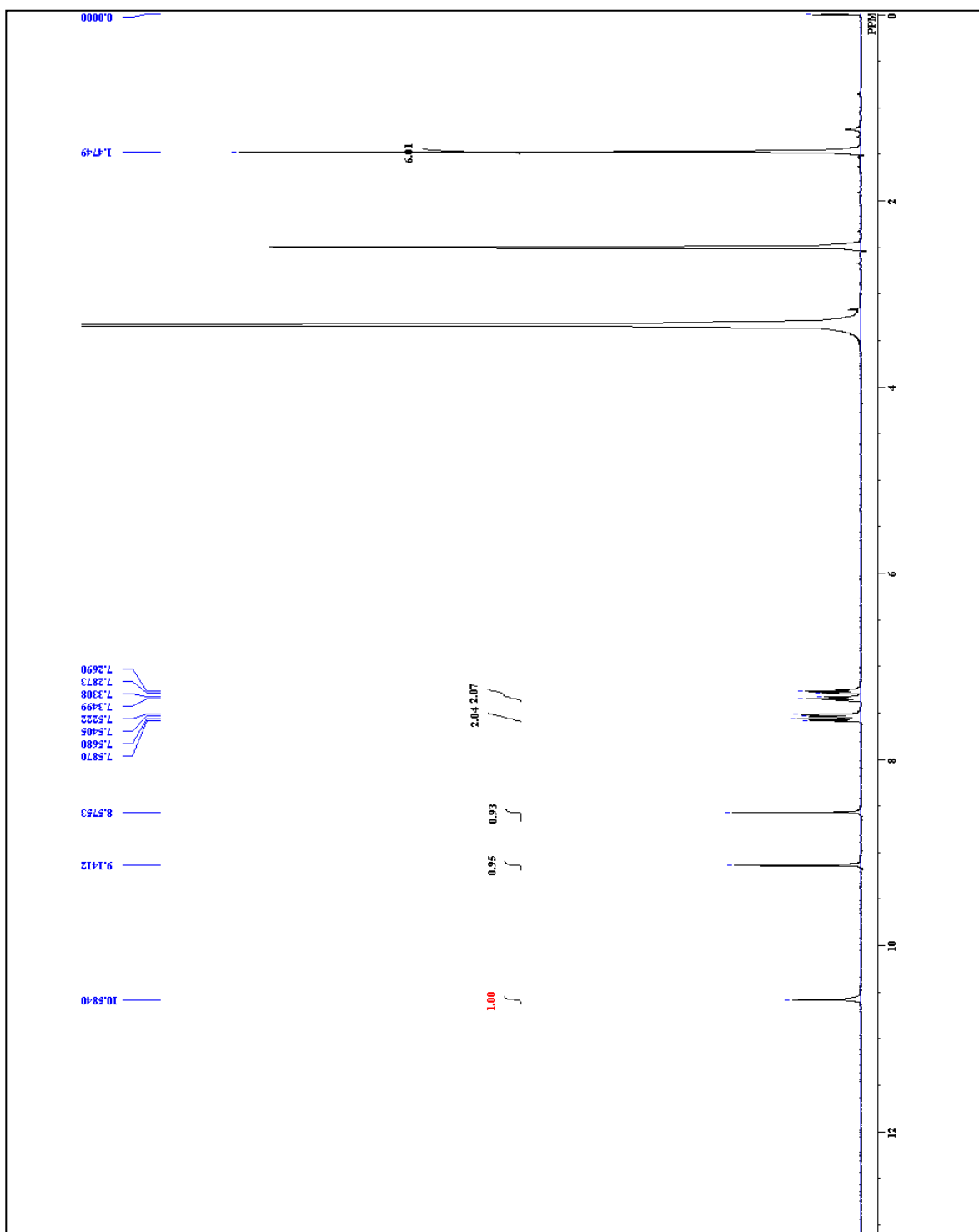
¹H NMR spectrum (400 MHz, CDCl₃) of **11**



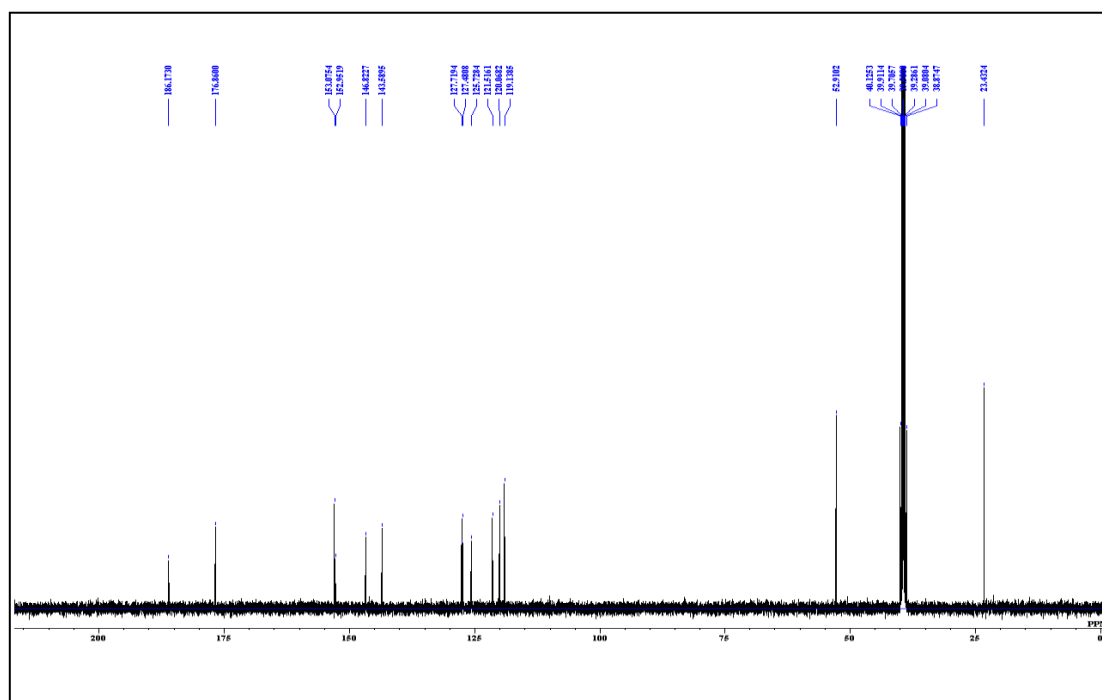
^{13}C NMR spectrum (400 MHz, CDCl_3) of **11**



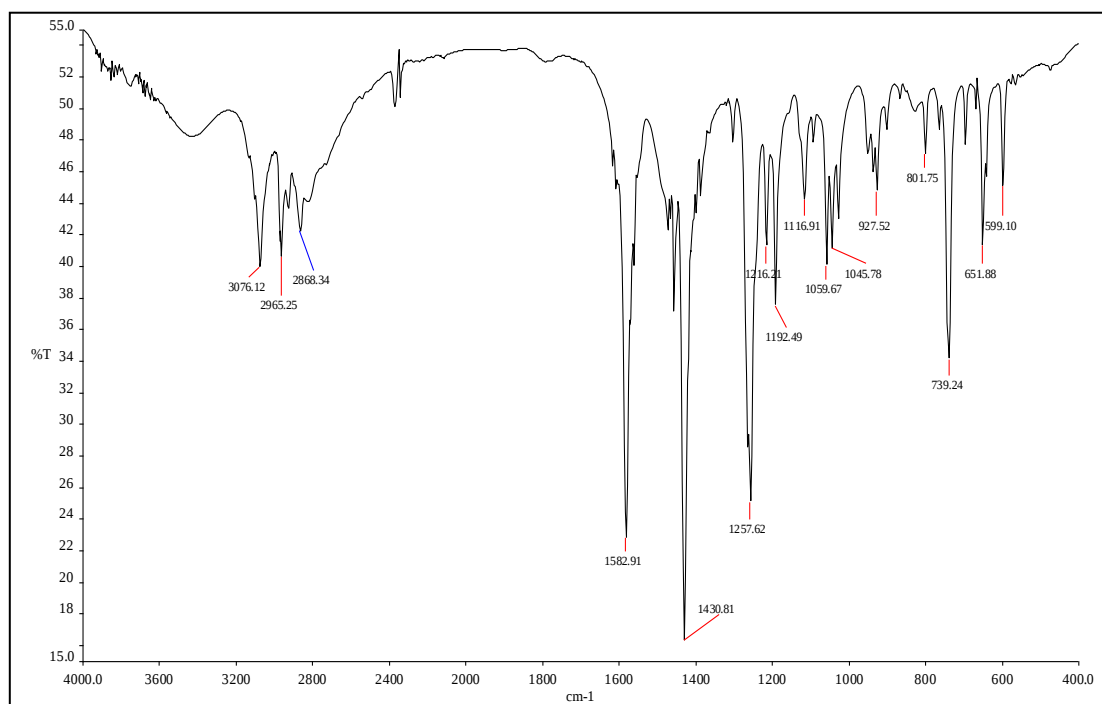
IR spectrum (KBr) of **11**



¹H NMR spectrum (400 MHz, DMSO-*d*₆) of 12



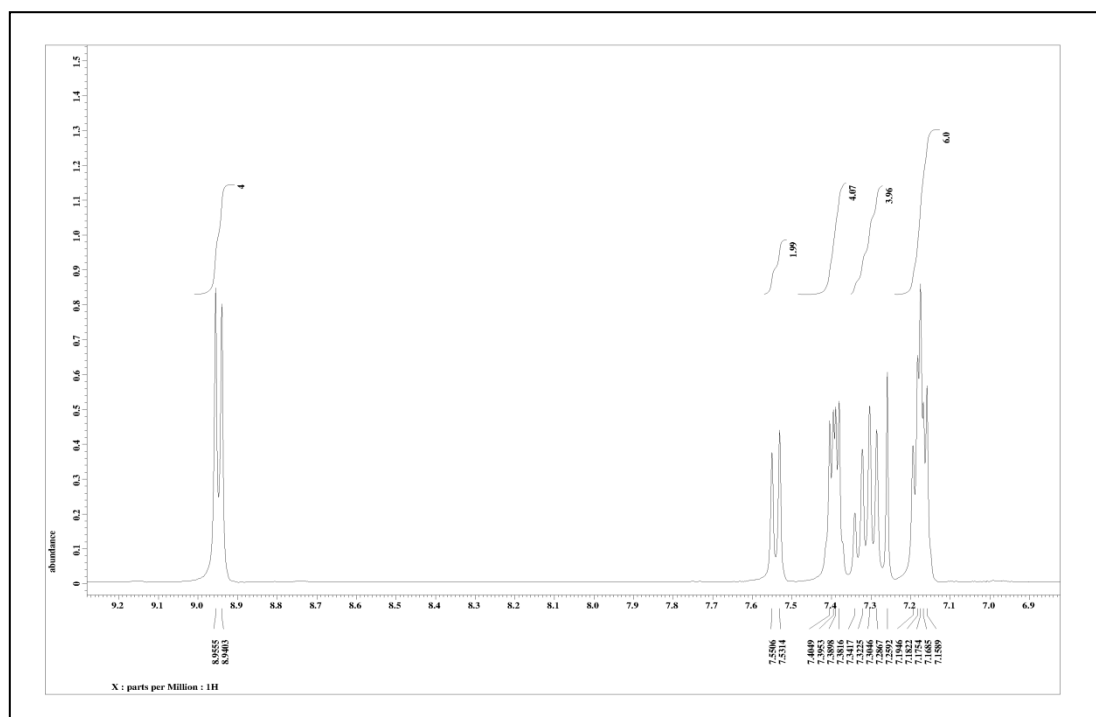
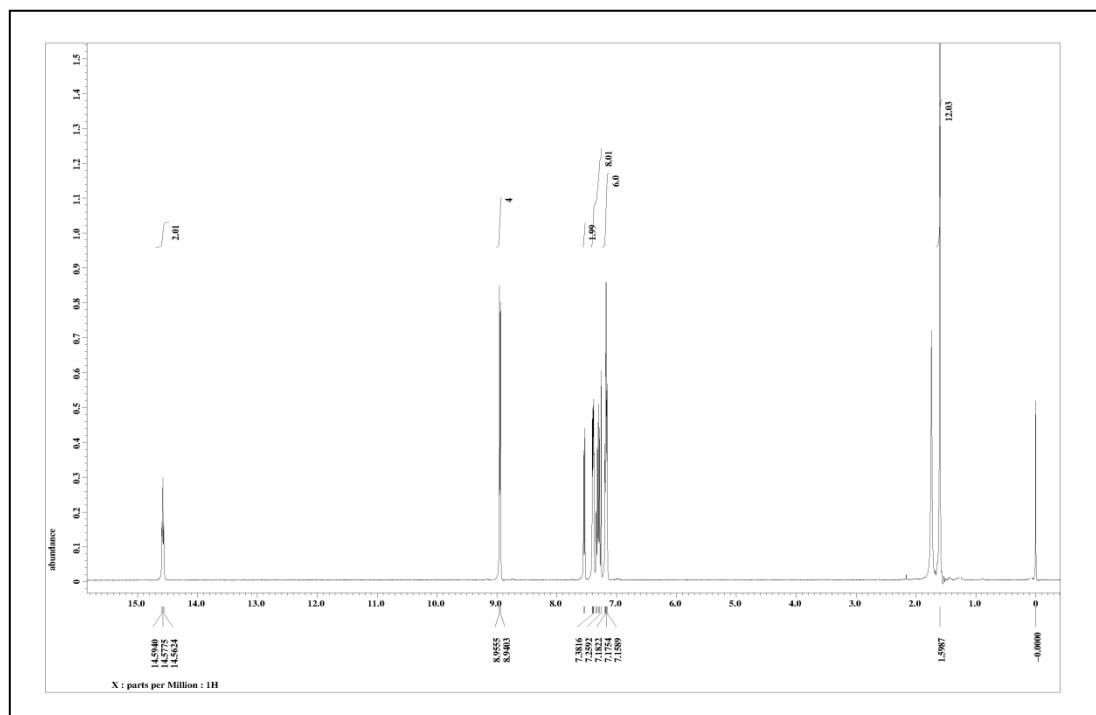
^{13}C NMR spectrum (400 MHz, $\text{DMSO-}d_6$) of **12**



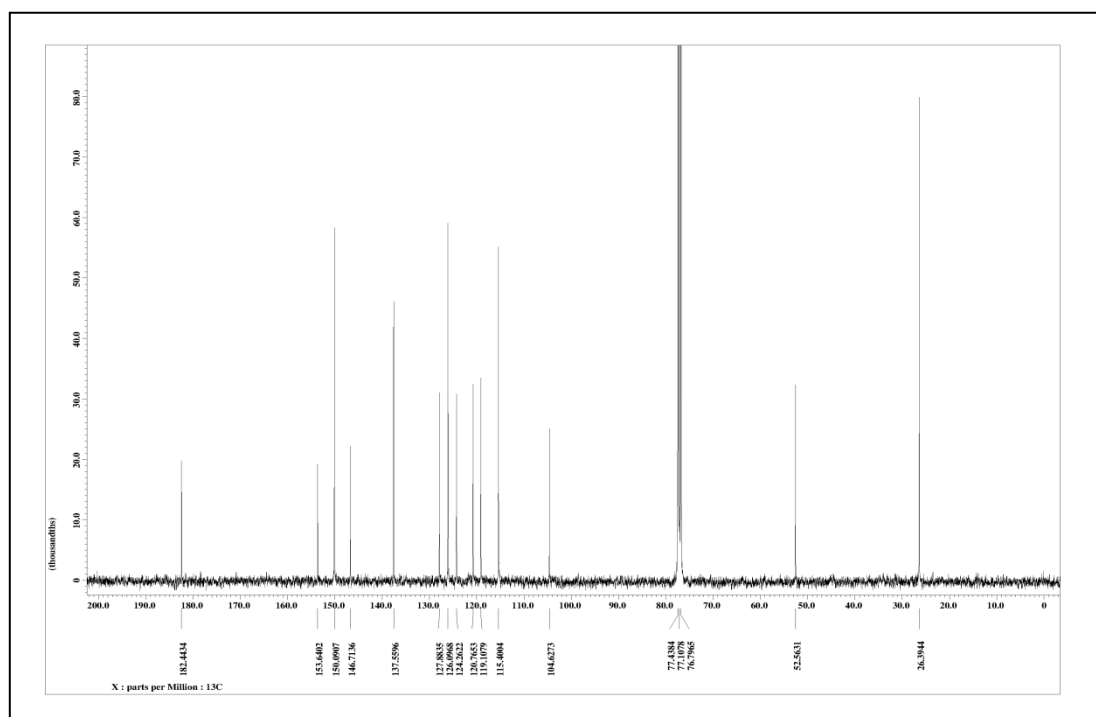
IR spectrum (KBr) of **12**

APENDIX E

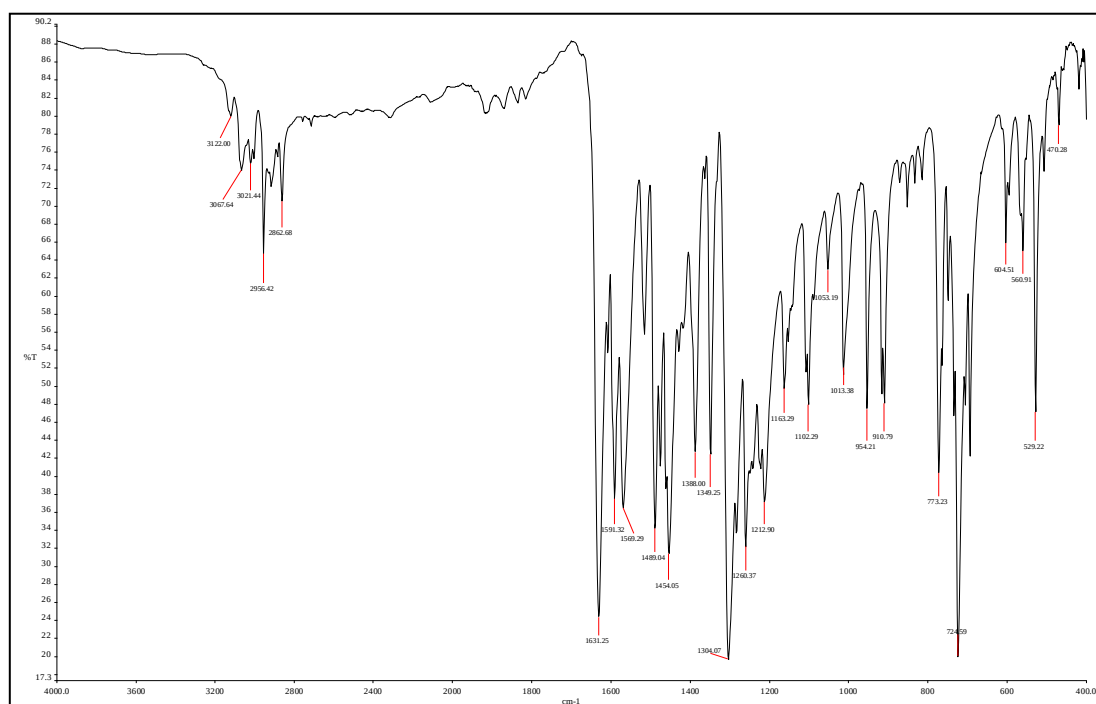
Spectra of compounds in chapter VI



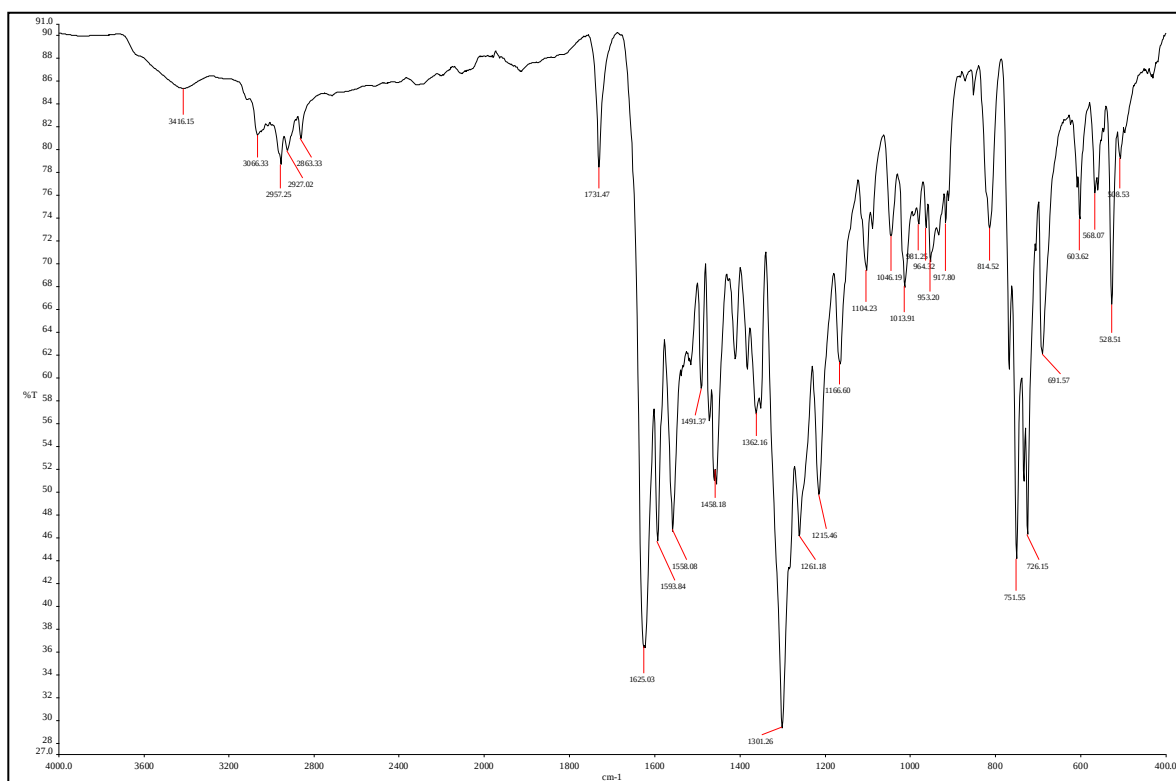
^1H NMR spectrum (400 MHz, CDCl_3) of **1**



^{13}C NMR spectrum (400 MHz, CDCl_3) of **1**



IR spectrum (ATR) of **1**



IR spectrum (ATR) of 5

LIST OF PUBLICATIONS

1. **Coordination behavior of three geometric isomers of indole-based S-benzylthiocarbazone ligands towards nickel, zinc and cadmium divalent ions**
Hamid Khaledi, Hapipah Mohd Ali and Marilyn M. Olmstead
Inorganica Chimica Acta, 2011, 366, 233-240
2. **Versatile Coordination Modes of 2-(Diformylmethylene)-3,3-dimethylindole towards Late-Transition-Metal Ions: C–H Bond Activation and Formation of Cyclic Acyl-Palladium(II) Complexes**
Hamid Khaledi, Hapipah Mohd Ali and Marilyn M. Olmstead
European Journal of Inorganic Chemistry, 2011, pp. 2394-2404.
3. **Reactions of 2-(diformylmethylenidene)-3,3-dimethylindole with hydrazides: Synthesis of new pyrazolyndolenine derivatives—the unprecedented one-pot pyrazole–thiadiazole double annulations**
Hamid Khaledi, Hapipah Mohd Ali, Noel Francis Thomas and Seik Weng Ng
Journal of Heterocyclic Chemistry, 2011, 48, 663-670.
4. **Antioxidant, Cytotoxic Activities, and Structure-Activity Relationship of Gallic Acid-based Indole Derivatives**
Hamid Khaledi, Abeer A. Alhadi, Wagee A. Yehye, Hapipah Mohd Ali, Mahmood A. Abdulla and Pouya Hassandarvish
Archiv der Pharmazie - Chemistry in Life Sciences Accepted: September 24, 2010
DOI: 10.1002/ardp.201000223

5. **Benzyl *N'*-(1*H*-indol-2-ylmethylene)-hydrazinecarbodithioate ethanolhemisolvate**
Hamid Khaledi, Hapipah Mohd Ali and Seik Weng Ng
Acta Crystallographica Section E., 2008, 64, o2445

6. **Benzyl *N'*-(1*H*-indol-3-ylmethylidene)-hydrazinecarbodithioate**
Hamid Khaledi, Hapipah Mohd Ali and Seik Weng Ng
Acta Crystallographica Section E., 2008, 64, o2107

7. **Bis[benzyl *N'*-(1*H*-indol-3-ylmethylene)-hydrazinecarbodithioato- $\kappa^2 N', S$]-nickel(II) *N,N*-dimethylformamide disolvate**
Hamid Khaledi, Hapipah Mohd Ali and Seik Weng Ng
Acta Crystallographica Section E., 2008, 64, m1615

8. **3,4,5-Trihydroxy-*N'*-(1*H*-indol-3-ylmethylidene)benzohydrazide pentahydrate**
Hamid Khaledi, Hapipah Mohd Ali and Seik Weng Ng
Acta Crystallographica Section E., 2008, 64, o2481

9. ***N'*-(5-Chloro-1*H*-indol-3-ylmethylidene)-3,4,5-trihydroxybenzohydrazide**
Hamid Khaledi, Hapipah Mohd Ali and Seik Weng Ng
Acta Crystallographica Section E., 2009, 65, o169

10. ***N'*-(5-Bromo-1*H*-indol-3-ylmethylidene)-3,4,5-trihydroxybenzohydrazide**
Hamid Khaledi, Hapipah Mohd Ali and Seik Weng Ng
Acta Crystallographica Section E., 2008, 64, o2108

11. A second monoclinic polymorph of 2-(diformylmethylidene)-3,3 dimethyl-2,3- dihydro-1H-indole

Hamid Khaledi, Siti Munirah Saharin, Hapipah Mohd Ali, Ward T. Robinson and Mahmood A. Abdulla

Acta Crystallographica Section E., 2009, 65, o2585

PRESENTATIONS AT THE FOLLOWING CONFRENECES

- *International Conference on Molecular Chemistry, 25-27 november 2008, University of Malaya*
- *Singapore International Chemical Conference 6, 15 to 18 December 2009.*
- *14th Asian Chemical Congress 2011, 5 – 8 September 2011, Bangkok, Thailand*