

Referências Bibliográficas

- [1] HALL, N.. Neoquímica, a química moderna e suas aplicações. Bookman, São Paulo, Brasil, 2004.
- [2] ANTONIO BIANCHI, K. B.-J.; GARCÍA-ESPAÑA, E.. Supramolecular Chemistry of Anions. Wiley-VCH, USA, 1997.
- [3] SILVA, J. A.. Estudo de Complexos de Cu(II) e Pd(II) com algumas Poliaminas e o Adenosina 5'Trifosfato (ATP). PhD thesis, Pontifícia Universidade Católica do Rio de Janeiro, 2001.
- [4] GUGLIUSHI, A.. Polyamines as clinical laboratories tools. Clinica Chimica Acta, 344:23–35, 2004.
- [5] SILVA, J. A.; FELCMAN, J.; MERCÊ, A. L. R.; MANGRICH, A. S.; LOPES, R. S. C. ; LOPES, C. C.. Study of binary and ternary complexes of copper (II) with some polyamines and adenosine 5' triphosphate. Inorganica Chimica Acta, 356:155–166, 2003.
- [6] LOMOZICK, L.; GASOWSKA, A. ; BOLEWSKI, L.. Copper (II) ions as a factor interfering in the interaction between bioligands in systems with adenosine and polyamines. Journal of Inorganic Biochemistry, 63:191–206, 1996.
- [7] LOMOZICK, L.; GASOWSKA, A.. Complexes of copper (II) with spermine and non-covalente interactions in the systems including nucleosides or nucleotides. Journal of Inorganic Biochemistry, 72:37–47, 1998.
- [8] LOMOZICK, L.; JASTRZAB, R.. Copper (II) complexes with uridine, uridine 5' -monophosphate, spermidine, or spermine in aqueous solution. Journal of Inorganic Biochemistry, 93:132–140, 2003.
- [9] MARQUES, M.; GIRÃO, T.; DE LIMA, M.; GAMEIRO, A.; PEREIRA, E. ; GARCIA, P.. Biochimica et Biophysica Acta, 1589:63–70, 2002.
- [10] WALTRES, D. R.; A., M. C.. Physiol. Plantasum, 100:689, 1997.

- [11] REGUERA, R.; TEKWANI, B. L. ; BALAÑA-FOUCE, R.. Comparative Biochemistry and Physiology, Part C, 140:151–164, 2005.
- [12] CREAVER, P. J.; PEREZ, R.; PENDYALA, L.; MEROPOL, N. J.; LOEWEN, G. ; AL, E.. Unusual central nervous system toxicity in a phase I study of N1N11 diethylnorspermine in patients with malignancy. Invest New Drugs, 15:227–34, 1997.
- [13] MEDINA, M. A.; QUESADA, A. R.; CASTRO, I. N. ; SÁNCHEZ-JIMENES, F.. Histamine, polyamines and cancer. Biochemical Pharmacology, 57:1341–1344, 1999.
- [14] CHOI, K. S.; SUH, Y. H. ; ET. AL.. Stable siRNA-mediated silencing of antizyme inhibitor: regulation of ornithine decarboxylase activity. Biochemical and Biophysical Research Communications, 328:206–212, 2005.
- [15] LOMOZICK, L.. Handbook of Metal-Ligand Interactions in biological fluids, vol. 1. Metal complexes with Polyamines, in: G. Berthon (Ed.), Tolouse, France, 1995.
- [16] LOMOZICK, L.; GASOWSKA, A. ; JASTRZAB, R.. Mixed-ligand complexes of copper (II) ions with AMP and CMP in the systems with poliamines and non-covalent interaction between bioligands. Journal of Inorganic Biochemistry, 78:139–147, 2000.
- [17] RESCK, I. S.. Poliaminofosfazenos: as superbases nitrogenadas. Química Nova, 14:4, 317–322, 1994.
- [18] GARCIA-ESPAÑA, E.; DIAZ, P.; LLINHARES, J. ; BIANCHI, A.. Anion coordination chemistry in aqueous solution of polyammonium receptors. Coordination Chemistry Reviews, 341:2953–2956, 2006.
- [19] CALDARERA, C. M.; BARBIROLI, B. ; MORUZZI, G.. Polyamines and nucleic acid during development of the chick embryo. Biochemistry J., 97:81, 1965.
- [20] KOCULI, E.; LEE, N.; THIRUMALAI, D. ; WOODSON, S. A.. Folding of the tetrahymena ribozyme by polyamines: Importance of counterion valence and size. J. Mol. Biol., 341:27–36, 2004.
- [21] HEILMAN-MILER, S. L.; THIRUMALAI, D. ; WOODSON, S. A.. Role of counterion condensation in folding of the tetrahymena ri-

- bozyme ii: Counterion dependence of folding kinetics. *J. Mol. Biol.*, 309:57–68, 2001.
- [22] BUNCE, S.; KONG, E. S. W.. *Biophys. Chem*, 8:357–368, 1978.
- [23] YAMAUCHI, O.. **Handbook of Metal-Ligand Interactions in biological fluids**, vol. 1. Mixed Ligand Complex Formation, in: G. Berthon (Ed.), Nagoya, Japão, 1995.
- [24] GASOWSKA, A.. **Interactions centres of purine nucleotides: adenosine 5' diphosphate and adenosine 5' triphosphate in their reastions with tetramines and Cu (I) ions.** *Journal of Inorganic Biochemistry*, 96:346–356, 2003.
- [25] LLINHARES, J.; POWELL, D. ; BOWMAN-JAMES, K.. **Ammonium based anion receptors.** *Coordination Chemistry Reviews*, 240:57–75, 2003.
- [26] BIRCZYŃSKA, A. W.; PALUSZKIEWICZ, C.. **Analysis of tetrachlorocuprate(ii) and tetrachlorocobaltate(ii) anion vibrations in their compounds with cinchonine. ft-ir and raman study.** *Journal of Molecular Structure*, 614:339–343, 2002.
- [27] LEHNINGER, A. L.. **Princípios de Bioquímica.** Sarvier, São Paulo, 1989.
- [28] SILVA, A. M.. **Estudo de Complexos de Cobre(II) e alumínio(III) com a fosfocreatina (PCr) e o Adenosina 5'Trifosfato (ATP) e alguns aminoácidos.** PhD thesis, Pontifícia Universidade Católica do Rio de Janeiro, 2003.
- [29] LOPES, D. C. N.. **Estudo de Complexos da Fosfocreatina e Ligantes similares com os íons Cu(II), Cd(II) e Al(III).** PhD thesis, Pontifícia Universidade Católica do Rio de Janeiro, 2001.
- [30] SOMASUNDARAM, I.; PALANIANDAVAR, M.. **Factors influencing the stability of ATP in ternary complexes: Spectroscopic investigation of the interaction of certain biomimetic copper(II) complexe with ATP and AMP.** *Journal of Inorganic Biochemistry*, 53:95–108, 1994.
- [31] CINI, R.; BOZZI, R.. **Synthesis and characterization of crystalline copper(II)- and zinc(II)-adenosine 5'-triphosphate (ATP)-2,2'':6',2''-terpyridine (TPY) ternary compounds.** *Journal of Inorganic Biochemistry*, 61:109–115, 1996.

- [32] EMSLEY, J. W.; J., F.. Pergamon Press, 1997.
- [33] CORBRIDGE, D. E. C.. **Phosphorus: An Outline of its Chemistry Biochemistry and Technology**. Elsevier Scientific Pub, Amsterdam, 1995.
- [34] ALLEN, G. W.; HAAKE, P.. **Mechanism of phosphorylation by n²-phosphocreatine. concurrent formation of creatine and creatinine**. Journal of American Chemical Society, 98:4990–4996, 1976.
- [35] CECCONI, F.; FRASSINETI, C.; GANS, P.; IOTTI, S.; MIDOLLINI, S.; SABATINI, A. ; VACCA, A.. **Complex formation equilibria of phosphocreatine with sodium, potassium and magnesium ion**. Polyhedron, 21:1481–1484, 2002.
- [36] HULLLOW, R. A.; ET AL. J. Clinical Pharmacol., 13:803–806, 1982.
- [37] SEMENOVSKY, M. L.; ET AL. J. Thorac. Cardio. Surg., 94:762–769, 1987.
- [38] KLEIHUES, P.; ET AL. **Resuscitation of the monkey brain after one hour complete ischemia. III. indications of metabolic recovery**. Brain Research, 95:61–73, 1975.
- [39] CHAO, J. C. J.; ET AL. **Cardiac nucleotide level and mitochondrial respiration in copper deficient rats**. Comparative Biochemistry and Physiology Part A: Physiology, 104:163–168, 1992.
- [40] DOYLE, A.; FELCMAN, J.; T., G. M.; N., V. C. ; TRISTÃO., M. L.. Polyhedron, 19:2621–2627, 2000.
- [41] LI, J.; LOCK, A. C.; M., K. P. H.; SWARTS, H. G. P.; STEKHOVEN, F. M. A. H.; BONGA, S. E. W. ; FLIK, G.. **Kinetics of Cu inhibition of Na⁺/K⁺-ATPases**. Toxicology Letters, 87:31–38, 1996.
- [42] BURTIS, A.; ASHWOOD., E. R.. **Tietz Fundamentos de Química Clínica**. Editora Guanabara Koogan S. A., Brasil, 1998.
- [43] NASULEWICZ, A.; MAZUR, A. ; OPOLSKI, A.. **Role of copper in tumor angiogenesis—clinical implications**. Journal of Trace Elements in Medicine and Biology, 18:1–8, 2004.
- [44] ALMEIDA, B. L.. **Síntese e caracterização de novos derivados do ácido glutâmico e seus complexos com os íons cobre (II)**,

- estanho (IV) e platina (II). Master's thesis, Universidade Federal de Juiz de Fora, 2003.
- [45] SILVA, J. J. R. F.; WILLIAMS, R. J. P.. **The biological chemistry of life**. Oxford, second edition, 2001.
- [46] OCHIAI, E.. **Bioinorganic Chemistry: an Introduction**. LTC, Rio de Janeiro, 1976.
- [47] SORENSON, J. R. J.. **Copper in the Enviroment - Part 2, Health Effects, Nriagus**. J. O. Ed. Wiley, New York, 1979.
- [48] J. R. J. SORENSON, L. W. OBERKELEY, V. K.. *Inorg. Chim. Acta.*, 79:45, 1973.
- [49] KIMURA, E.; SAKONAKA, A. ; NAKAMOTO, M.. **Superoxido dismutase activity of macrocyclic polyamine complexes**. *Biochimica et Biophysica Acta (BBA) General Subjects*, 678:172–179, 1982.
- [50] ROGERS, M. S.; YIM, K. C. L.; WANG, C. C. ; ARUMANAYAGAM, M.. **Cervical intraepithelial neoplasia is associated with increased poliamine oxidase and diamine oxidase concentration in cervical mucus**. *Gynecologic Oncology*, 84:383–387, 2002.
- [51] GREENWOOD, N. N.; EARNSHAW, A.. **Chemistry of the Elements**. Butterworth H, Second Edition, 1997.
- [52] COTTON, F. A.; WILKINSON, G.; MURILLO, C. A. ; BOCHMANN, M.. **Advanced Inorganic Chemistry**. Wiley-Interscience, Sixth Edition, 1997.
- [53] PHELPS, D.; LOSEE, D. B.; E., H. W. ; HODGSON, D. J.. **Two-dimensional megnetic systems. structural and magnetic characterization of bis(porpylene-1,3-diammonium) tetrachlorocuprate(ii)**. *Inorganic Chemitry*, 15:3147, 1976.
- [54] RUSSEL, J. B.. **Química Geral**. Editora Pearson Makron Books, Volume 2, 2ª Edição, 2006.
- [55] SHRIVER, D. F.; ATKINS, P. W.. **Química Inorgânica**. Bookman, 3ª Edição, 2003.
- [56] DEMICHELI, C. P.; MAIA, E. C. P.. **Química de Coordenação em Sistemas Biológicos in: Química de Coordenação**. Editora Átomo, Robson F. Farias, organizador, 2003.

- [57] LIANG, F. AND, E. A.. Nickle(ii) and cobalt(ii) complexes of hydroxyl-substituted trizamacrocyclic ligand as potential antitumor agents. *Bioorganic and Medicinal Chemistry Letters*, 14:1901–1904, 2004.
- [58] VISSER, H. G.; PURCELL, W.; BASSON, S. S. ; CLAASSEN, Q.. The syntheses and crystal structures of $Cs_2[Co_2(NTA)_2(\mu - OH)_2] \cdot 4H_2O$ and $(C_{10}H_{10}N_3)_2[CoCl_4]$. *Polyhedron*, 16:2851–2856, 2004.
- [59] KIM, D. Y.; ET AL. Synthesis and crystal structure of the trans-dichloro(*N,N* – bis – [2(*S*) – pyrrolidylmethyl] – ethane – 1,2 – diamine)cobalt(III) tetrachlorocobaltate(II) complex. *Inorganica Chimica Acta*, 267:127–132, 1998.
- [60] GÁLVEZ, N.; MORENA-MANÁZ, M.; PADRÓS, I.; SEBASTIÁN, R. M.; SERRA, N. ; VALLRIBERA, A.. Preparations of transition metal complexes of chiral derivatives of acetoacetic acid. tetraalkylammonium tetrachlorometallates as an organic source of metals. *Polyhedron*, 14:1397–1399, 1995.
- [61] GASOWSKA, A.; LOMOZIK, L.. Spectroscopic and potentiometric investigation of the solution structure and stability of ni(ii) and co(ii) complexes with adenosine-5-monofosphate and 1,12-diamino-4,9-diazadodecane(spermine) or 1,11-diamino-4,8-diazaundecane. *Polyhedron*, 21:745–751, 2002.
- [62] BAÑARES, M. A.; , ANGOSO, A. ; RODRIGUEZ, E.. Preparations and characterization of tetrachlorocobaltates of α, ω -alkanediammonium. *Polyhedron*, 3:363–364, 1984.
- [63] POURAHMAD, J.; O'BRIEN, P.. Contrasting role of Na^+ ion in modulating Cu^+ ou Cd^+ induced hepatocyte toxicity. *Chemico-Biological Interactions*, 126:159–169, 2000.
- [64] LEE, J. D.. *Química Inorgânica Não Tão Concisa*. Editora Edgard Blucher, 5ª Edição, 2004.
- [65] FELCMAN, J.; LOPES, D. C. N.; CATTAPAN, R. A. ; SOTO, C. A. T.. Synthesis and characterization of cadmium complexes with phosphorylated ligands. *Synth. React. Inorg. Met-org. Chem*, 31:507–516, 2001.

- [66] KUTHANOVÁ, A.; ET AL. Cytological changes and alterations in polyamines contents induced by cadmium in tobacco by-2 cell. *Plants Physiology and Biochemistry*, 42:149–156, 2004.
- [67] GROPPA, M. D.; TOMARO, M. L. ; BENAVIDES, M. P.. Polyamines as protectors against cadmium or copper-induced oxidative damage in sunflower leaf discs. *Plant Science*, 161:481–488, 2001.
- [68] GROPPA, M. D.; TOMARO, M. L. ; BENAVIDES, M. P.. Polyamine metabolism in sunflower and wheat discs under cadmium or copper stress. *Plant Science*, 164:293–299, 2003.
- [69] KONG, L. Y. E. A.. Unusual one-dimensional branched-chain structures assembled by a novel imidazole-containing tripodal ligand with cadmium(ii) salts and their fluorescent property. *Journal of solid state chemistry*, 180:331–338, 2007.
- [70] VOGEL. *Análise Química Quantitativa*. Editora LTC, 5ª Edição, 1992.
- [71] BRAUER, G.. *Handbook of Preparative Inorganic Chemistry*. Ed. G. Brauer, 1965.
- [72] SILVA, A. M.; MERCÊ, A. L. R.; MANGRICH, A. S.; TÉLLEZ, C. A. S. ; FELCMAN, J.. *Polyhedron*, 25:1319–1326, 2006.
- [73] FELCMAN, J.; CAMACHO, J. A.. Estudos de complexos mistos cu(ii), poliaminas e fosfocreatina em solução. Em: 29ª REUNIÃO ANUAL DA SOCIEDADE BRASILEIRA DE QUÍMICA - RESUMO, 2006.
- [74] TÉLLEZ, C. A. S.; FELCMAN, J. ; SILVA, A. M.. *Spectrochim. Acta Part A*, 56:1563–1574, 2000.
- [75] TÉLLEZ, C. A. S.; HOLLAUER, E.; FELCMAN, J.; LOPES, D. C. N. ; CATTAPAN, R. A.. *Spectrochim. Acta Part A*, 58:1853–1866, 2002.
- [76] BELLAMY, L.. *The Infrared Spectra of Complex Molecules*. Methuen and Co. LTD, London, 1996.
- [77] DEACON, G. B.; PHILLIPS, R. J.. *Coordination Chemistry Reviews*, 33:227 – 250, 1980.
- [78] NAKAMOTO, K.. *Infrared and Raman Spectra of Inorganic and Coordination Compounds*. Wiley, 5ª Edição, 1997.

- [79] REY, N. A.; SANTOS, K. C.; MENÊZES, M. A. B. C.; MANGRICH, A. S.; PEREIRA-MAIA, E. C.. J. Braz. Chem. Soc., 1:497–504, 2006.
- [80] PARR, R. G.; YANG, W.. **Density - Functional Theory of Atoms and Molecules**. Oxford University Press, Oxford, 1989.
- [81] FRISCH, M. J.; TRUCKS, G. W.; SCHLEGEL, H. B.; SCUSERIA, G. E.; ROBB, M. A.; CHEESEMAN, J. R.; JR., V. G. Z.; MONTGOMERY, J. A.; STRATMANN, R. E.; BURANT, J. C.; DAPPRICH, S.; MILLAM, J. M.; DANIELS, A. D.; KUDIN, K. N.; STRAIN, M. C.; FARKAS, O.; TOMASI, J.; BARONE, V.; COSSI, N.; CAMMI, R.; MENNUCCI, B.; POMELLI, C.; ADAMO, C.; CLIFFORD, S.; OCHTERSKI, J.; PETERSON, G. A.; AYALA, P. Y.; CUI, Q.; MOROKUMA, K.; MALICK, D. K.; RABUCK, A. D.; RAGHAVACHARI, K.; FORESMAN, J. B.; CIOŚŁOWSKI, J.; ORTIZ, J. V.; BABOUL, A. G.; STEPANOV, B. B.; LIU, G.; LIASHENKO, A.; PISKORZ, P.; KOMAROMI, I.; GOMPERTS, R.; MARTIN, R. L.; FOX, D. J.; KEITH, T.; AL-LAHAM, M. A.; PENG, C. Y.; NANAYAKKARA, A.; GONZÁLEZ, C.; CHALLACOMBE, M.; GILL, P. M. W.; JOHNSON, B.; CHEN, W.; WONG, M. W.; J. L. ANDRESW, C. G.; HEAD-GORDON, M.; REPOGLE, E. S.; POPLE, J. A.. Gaussian 98 Revision A. Gaussian Inc. , 7:2968, 1998.
- [82] TÉLLEZ, C. A. S.; HOLLAUER, E.; MONDRAGON, M. A. ; CASTAÑO, V. M.. Spectrochim. Acta Part A, 57:993, 2001.
- [83] RAMOS, J.; VERSIANE, O.; FELCMAN, J. ; TÉLLEZ, C. A. S.. Spectrochim. Acta Part A, 67:1037, 2007.
- [84] Chemcraft. Documento on line em <http://www.chemkraft-prog.com/order.html>, última visita em: 11/12/2007.
- [85] FLEMING, G. D.; SHEPHERD, E.. Spectrochim. Acta, 125:77, 1986.
- [86] SILVESTEIN, R. M.; BASSLER, G. C. ; C., M. T.. **Spectrometric Identification of Organic Compounds**. John Wiley, 6^a Edição, 1991.
- [87] MALLE, E.; MARSCHE, G.; ARNHOLD, J. ; DAVIES, M. J.. Biochimica and Biophysica Acta, 4:392–415, 2006.
- [88] KWIK, W. L.; TAY, A. W. N.. Polyhedron, 9:1293, 1990.
- [89] DIAZ, G.; DIEZ, S.; LOPEZ, L.; MUNOZ, R. ; PESSOA, H.. Vib. Spectrosc., 3:315, 1992.
- [90] MERCK INDEX. **The Merck Index**. Merck and Co. Rahway, 7th Edition, 1960.

- [91] BENCINI, A.; BIANCHI, A.; FORNASARI, P.; GIORGI, C.; PAOLETTI, P. ; VALTANCOLI, B.. *Polyhedron*, 21:1329 – 1335, 2002.
- [92] LEVER, A. B. P.. **Inorganic Electronic Spectroscopy**. Elsevier Publishing Company, 2ª Edição, 1968.
- [93] LODEIRO, C.; PAROLA, A. J.; BAZZICALUPI, C.; BIANCHI, A.; GIORGI, C.; MAZZOTI, A. ; VALTANCOLI, B.. *Inorg. Chem.*, 40:2968, 2001.
- [94] SILVA, J. A.; FELCMAN, J.; LOPES, R. S. C.; LOPES, C. C. ; VILLAR, J. D. F.. *Spectrosc. Letter*, 2:643, 2002.
- [95] DONG, Y.; LINDOY, L. F.. *Coordination Chemistry Reviews*, 245:11–16, 2003.
- [96] GUANTIERI, V.; VENZO, A.; DI MARCO, V.; ACAMPORA, M. ; BIONDI, B.. *Inorganica Chimica Acta*, In Press, 2007.
- [97] GUIBIN, M.; FISCHER, A.; NIEUWENDAAL, R.; RAMASWAMY, K. ; HAYES, S. E.. *Inorganica Chimica Acta*, 328:3165–3173, 2005.
- [98] BUTTERWORTH, P.; HILLIER, I. H.; BURTON, N. A.; VAUGHAN, D. J.; GUEST, M. F. ; TOSSEL, J. A.. *J. Phys. Chem.*, 96:6494–6500, 1992.
- [99] DRAKENBERG, T.; BJORK, N. ; PORTANOVA, R.. *J. Phys. Chem.*, 82:2423–2426, 1978.
- [100] GARLAND, J. K.; EMERSON, K. ; PRESSPRICH, M. R.. *Acta Crystallog., Sect. C: Cryst. Struct. Commun.*, 46:1603, 1990.
- [101] NING, G.; YONG-HUA, L.; GUANG-FU, Z. ; SHI-QUAN, X.. *Acta Crystallog., Sect. C: Cryst. Struct. Commun.*, 48:542, 1992.
- [102] SMITH, H. W.; STRATTON, W. J.. *Inorg. Chem*, 16:1640, 1977.

A

Apêndice

A.1

Lista de Abreviaturas

- ADC: arginina descarboxilase
- AdoMet: 5-adenosilmetionina
- AdoMetDC: 5-adenosilmetionina descarboxilase
- ADP: Adenosina 5'difosfato
- AMP: Adenosina 5'monofosfato
- ATP: Adenosina 5'trifosfato
- Calc.: Calculado
- dec.: Decomposição
- DFT: Teoria do Funcional de Densidade
- DMFO: α -(difluorometil)ornitina
- DNA: Ácido deoxirribonucleico
- DPG: Diisopropilfosfoguanidina
- DTA: Derivada segunda do TGA
- En: Cloridrato de etilenodiamina
- EPR: Ressonância paramagnética de elétron
- Exp.: Experimental
- F.M.: Fórmula mínima
- IV: Infravermelho
- $\log \beta$: Logaritmo da constante de formação
- MGBG: Metilglioxal-bis(guanilhidrazona)
- M.M.: Massa molecular
- NAD: Dinucleotideo adenina nicotinamida
- ODC: Ornitidina descarboxilase
- PAO: Poliamina oxidase

- PCr: Fosfocreatina
- PDPG: Porcentagem normalizada do desvio do parâmetro geométrico
- PED: Distribuição de energia potencial
- P.F.: Ponto de fusão
- Put: cloridrato de putrescina
- Rend: Rendimento
- RMN: Ressonância magnética nuclear
- RNA: Ácido ribonucleico
- Spd: Cloridrato de espermidina
- Spd: Cloridrato de espermina
- SSAT: 23
- TG: Termogravimetria
- TGA: Análise termogravimétrica
- Tn: Cloridrato de 1,3-diaminopropano
- UV: Ultravioleta
- UV-VIS: Ultravioleta - visível

A.2

Análise Termogravimétrica

A.2.1

Ligantes

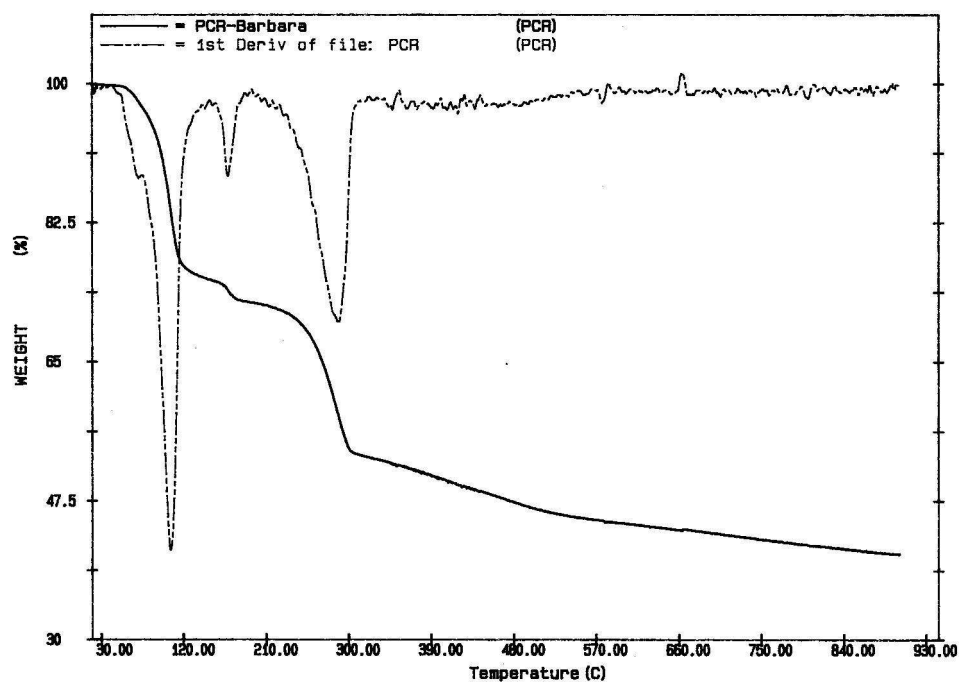


Figura A.1: TGA da fosfocreatina

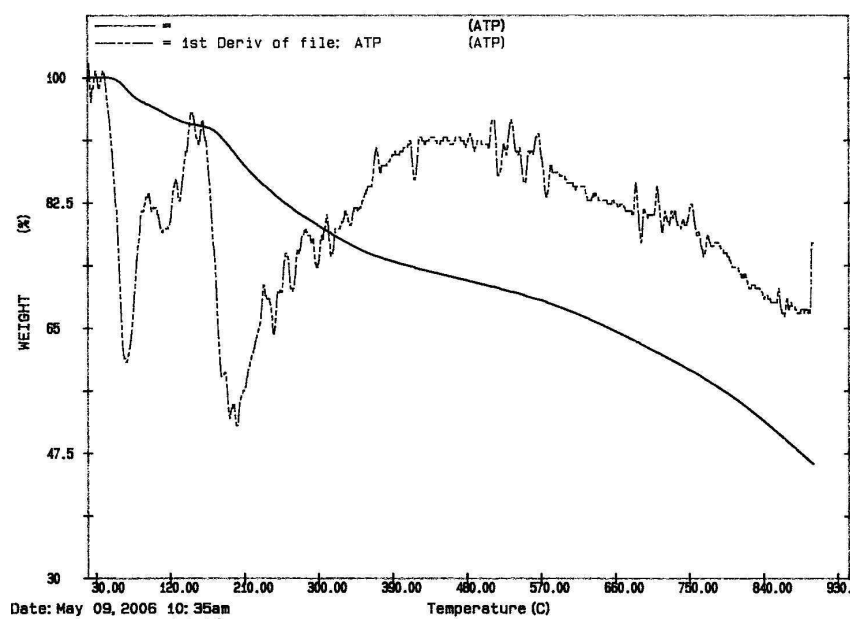


Figura A.2: TGA do ATP

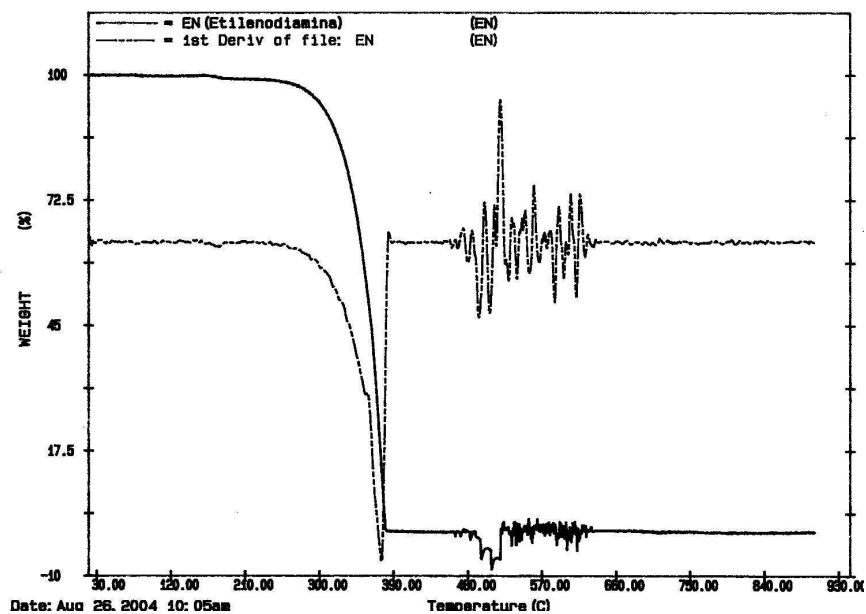


Figura A.3: TGA da etilenodiamina.2HCl

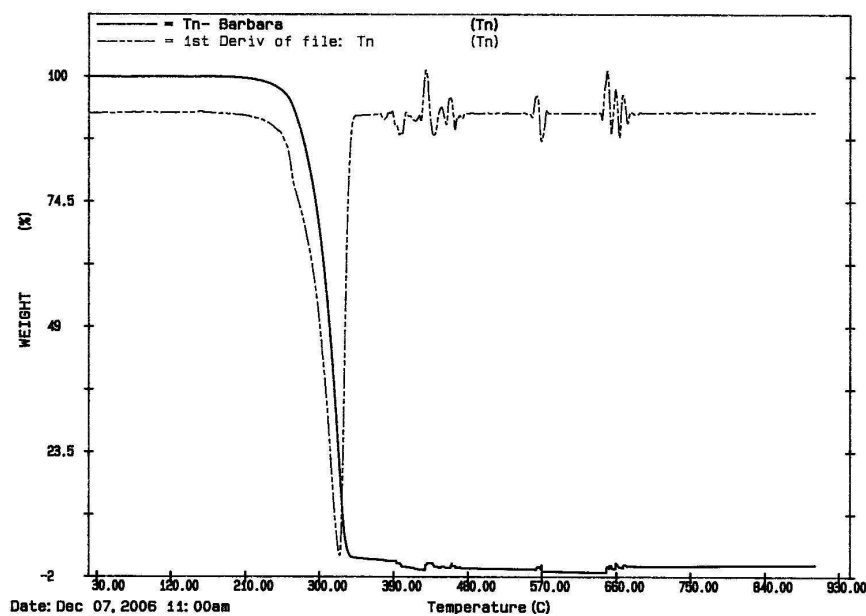


Figura A.4: TGA do 1,3-diaminopropano.2HCl

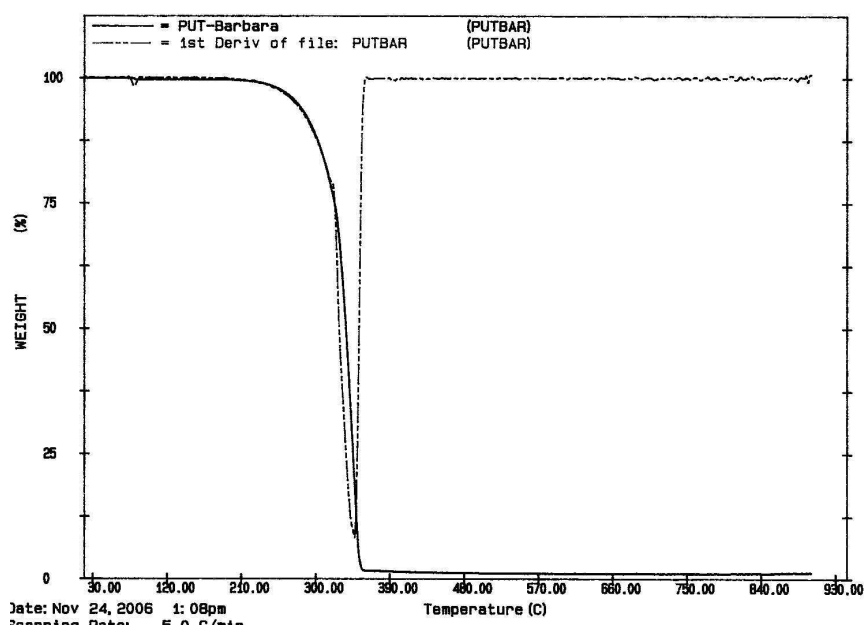


Figura A.5: TGA da putrescina.2HCl

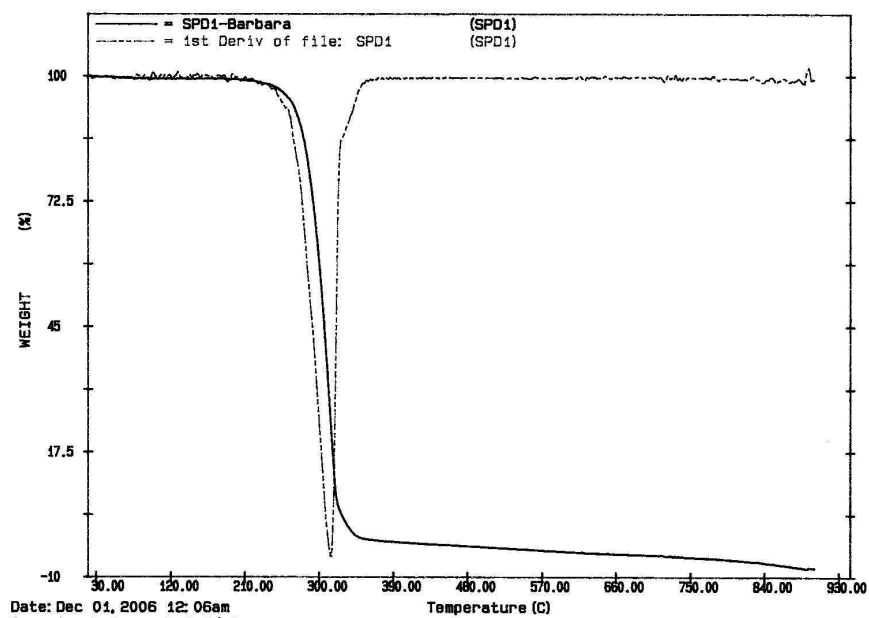


Figura A.6: TGA da espermdina.3HCl

PUC-Rio - Certificação Digital Nº 0410382/CA

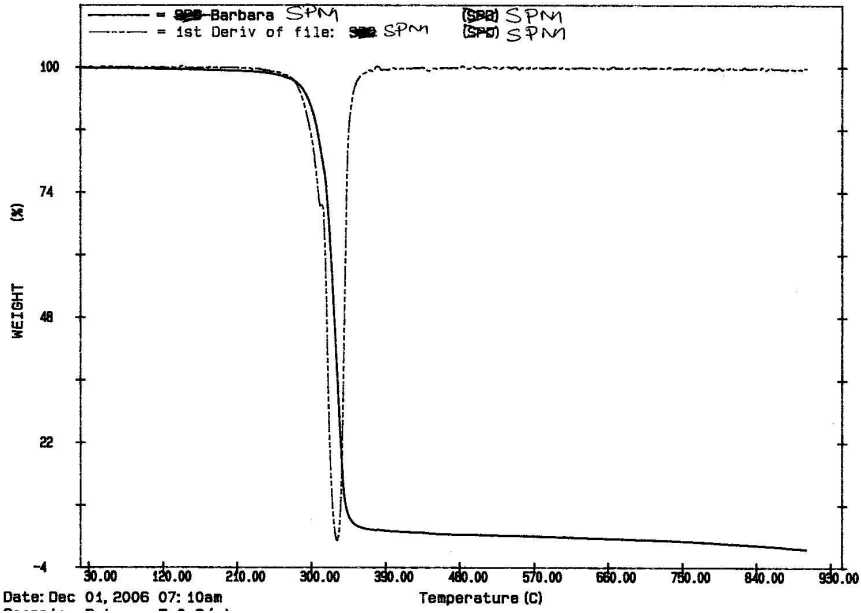


Figura A.7: TGA da espermina.4HCl

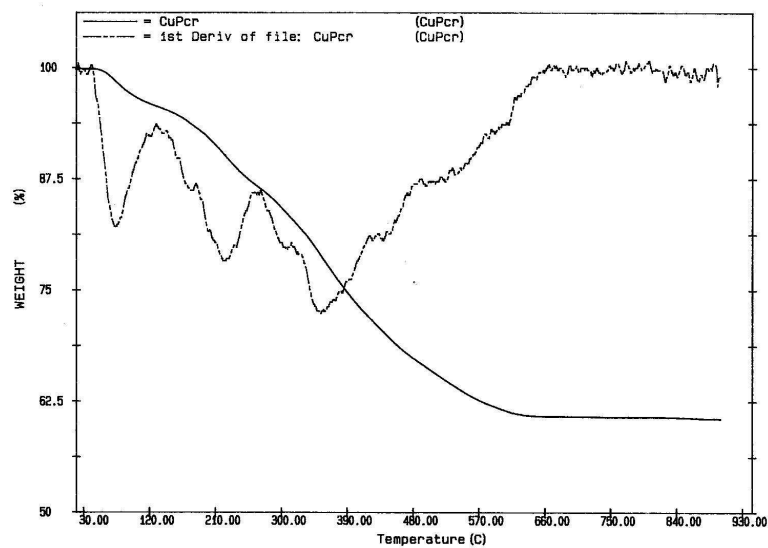
A.2.2**Complexos de Cobre(II)**

Figura A.8: TGA do complexo CuPCr

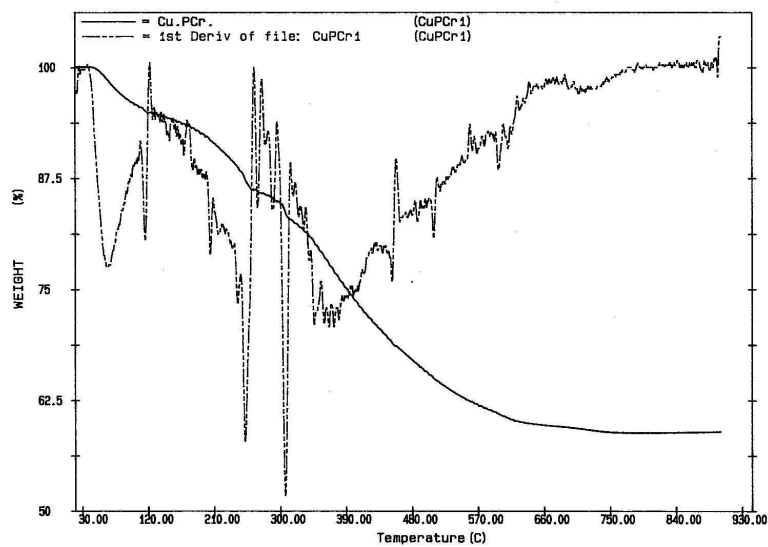


Figura A.9: TGA do complexo CuTnPCr

A.2.3**Complexos de Cobalto(II)**

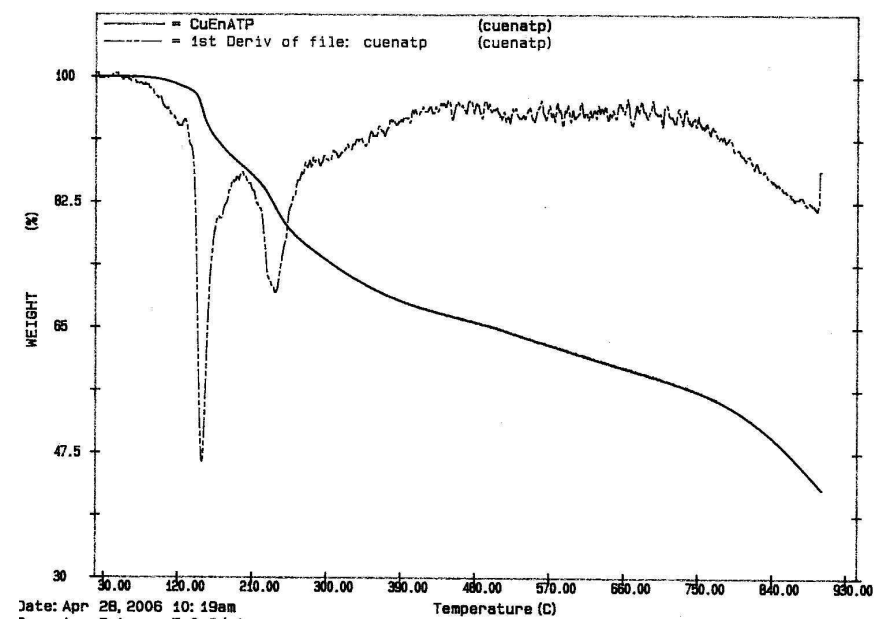


Figura A.10: TGA do complexo CuEnATP

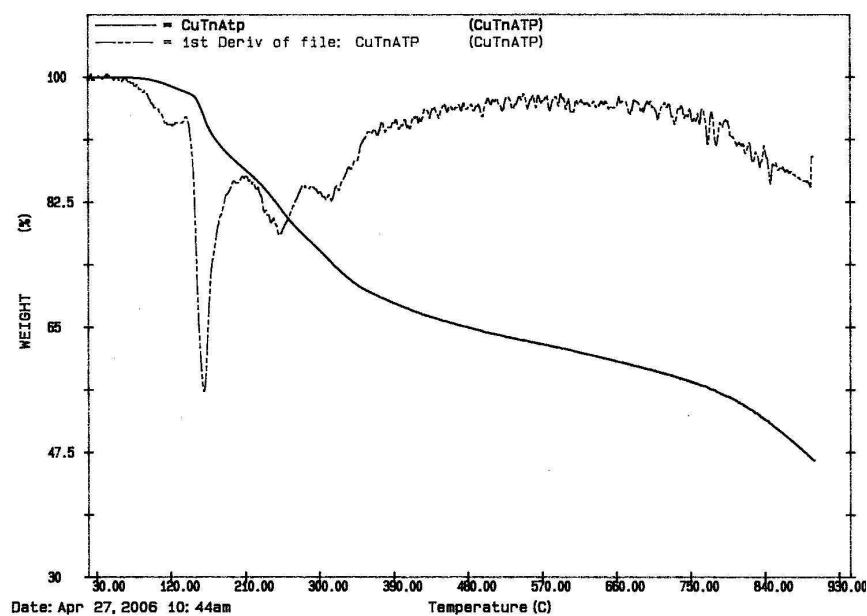


Figura A.11: TGA do complexo CuTnATP

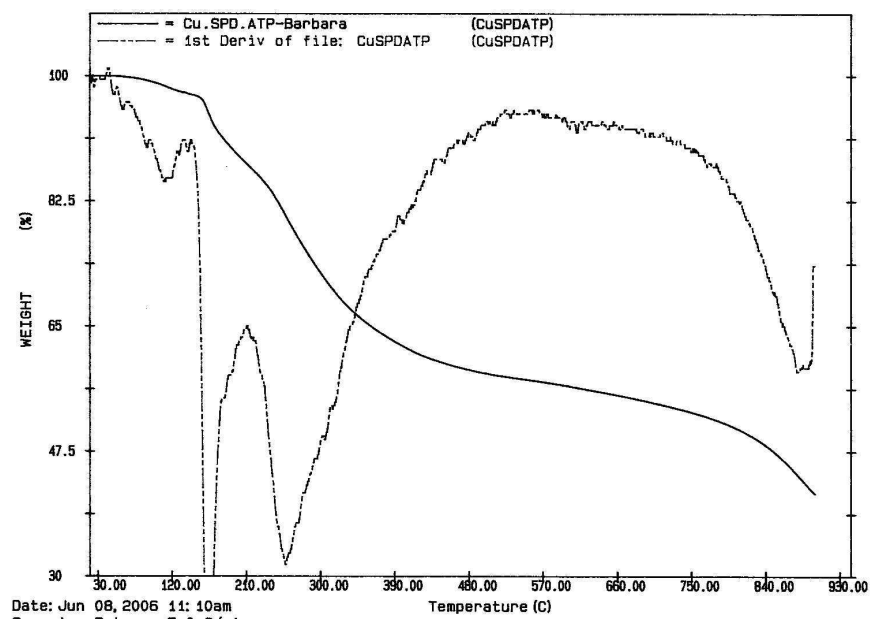


Figura A.12: TGA do complexo CuSpdATP

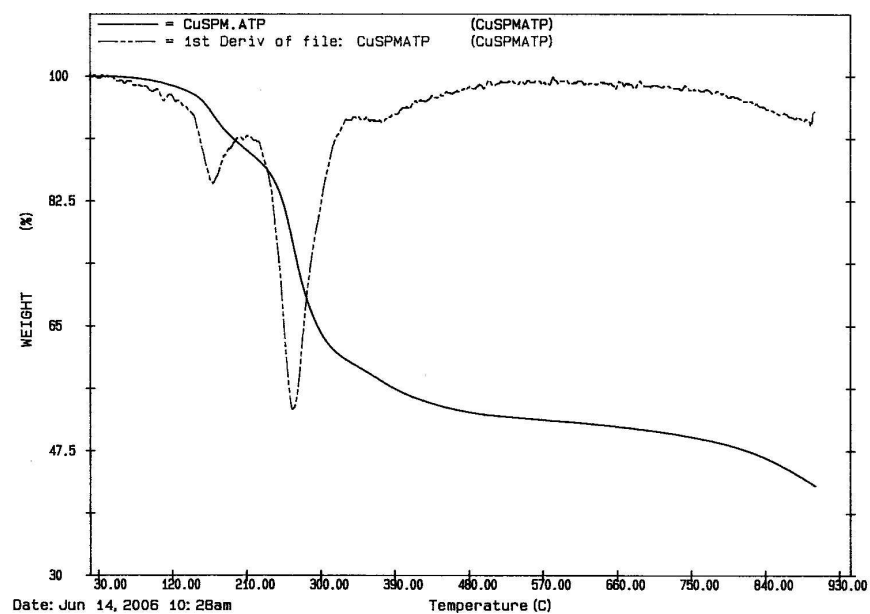


Figura A.13: TGA do complexo CuSpmATP

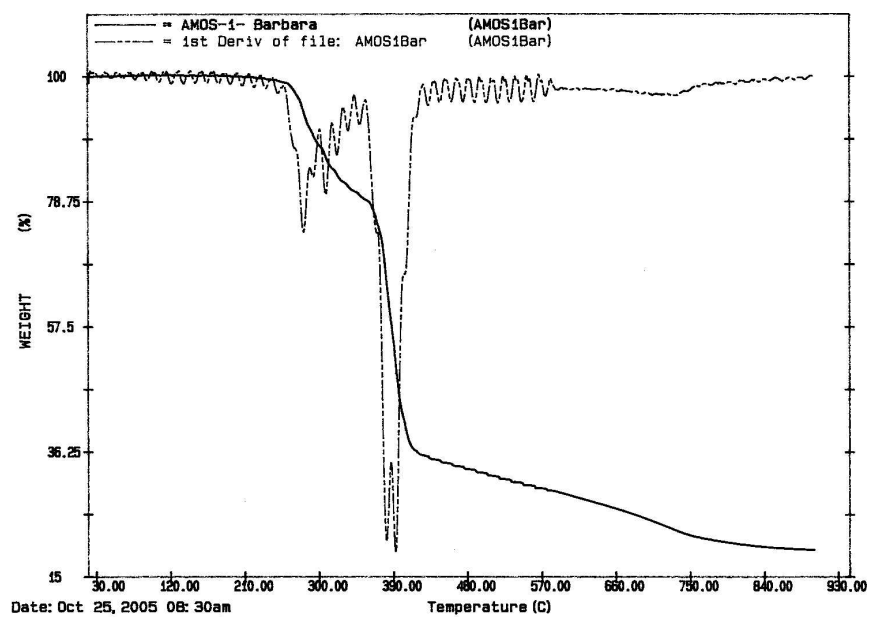


Figura A.14: TGA do complexo CuEn

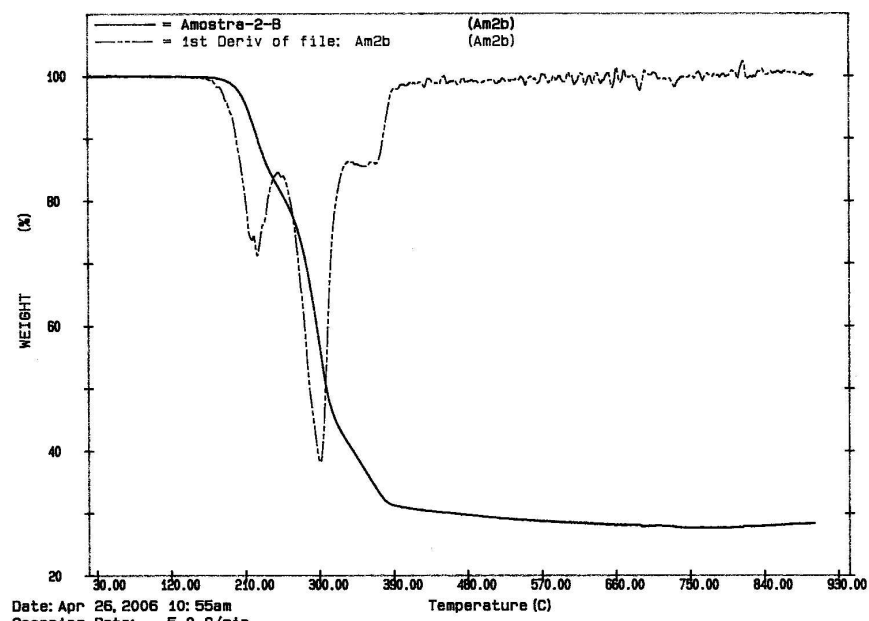


Figura A.15: TGA do complexo CuTn

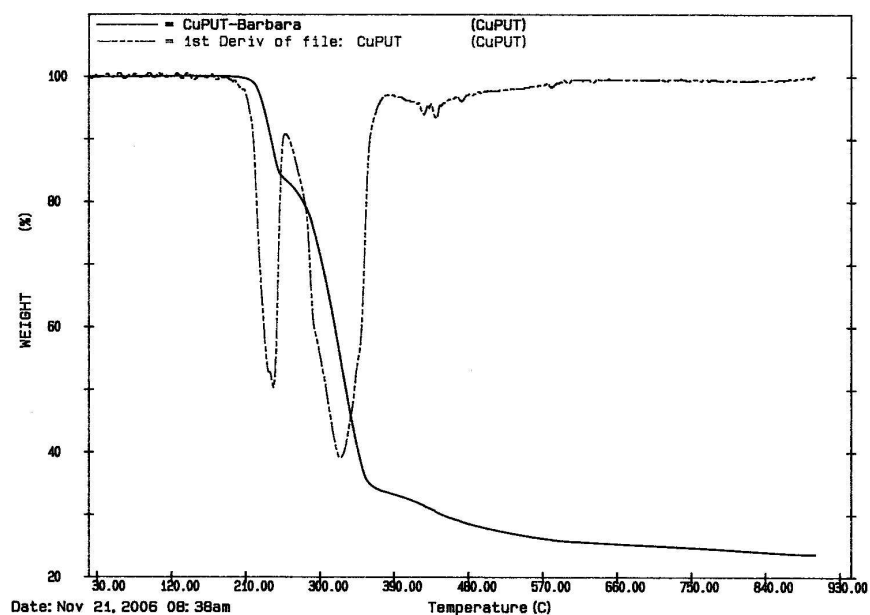


Figura A.16: TGA do complexo CuPut

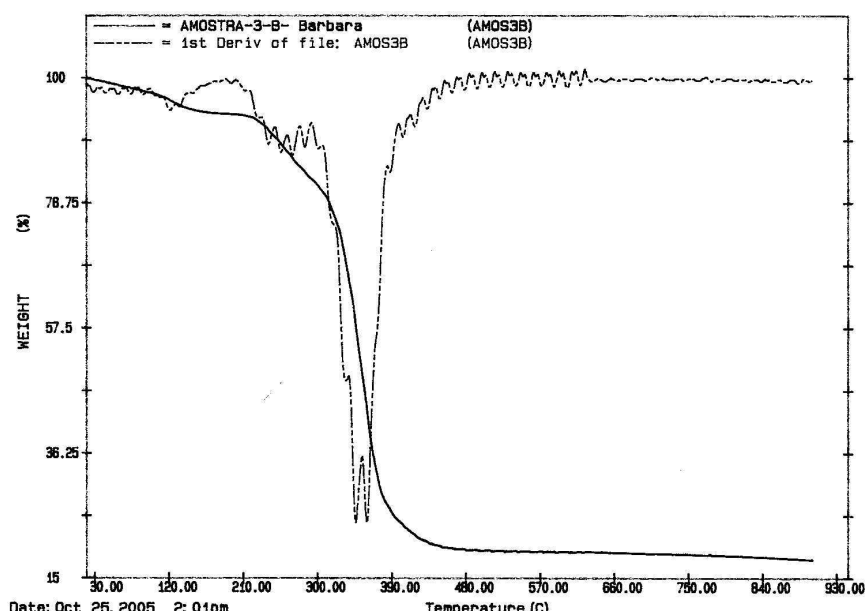


Figura A.17: TGA do complexo CuSpd

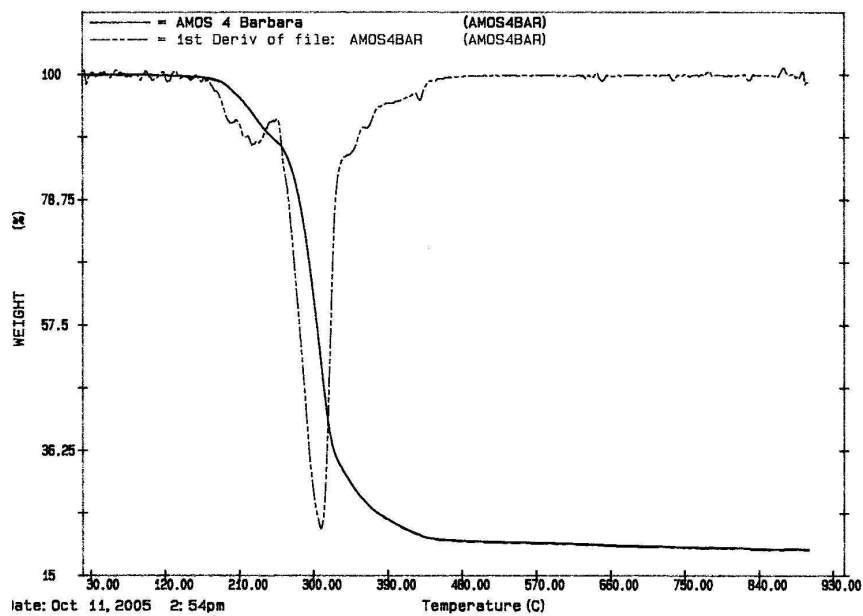


Figura A.18: TGA do complexo CuSpm

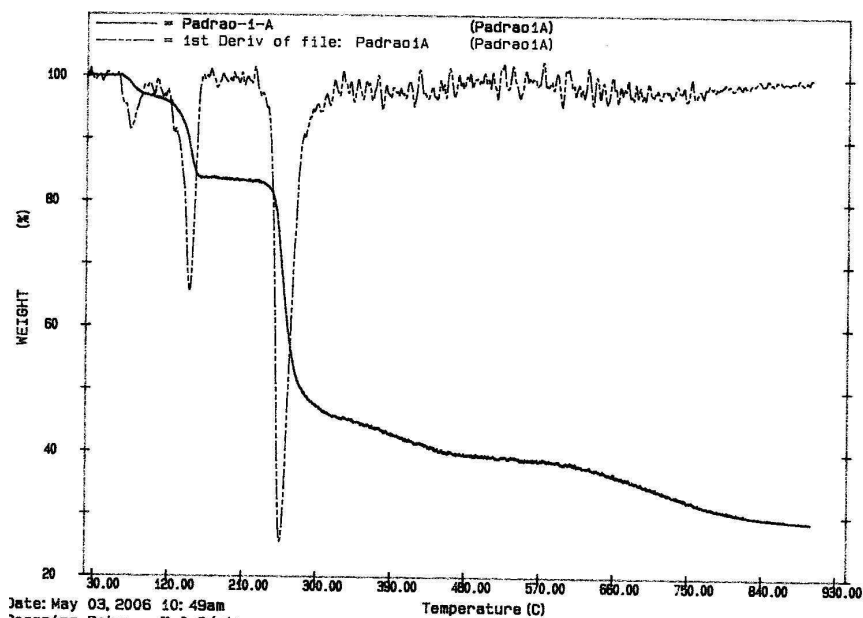


Figura A.19: TGA do complexo CuEn 1:1

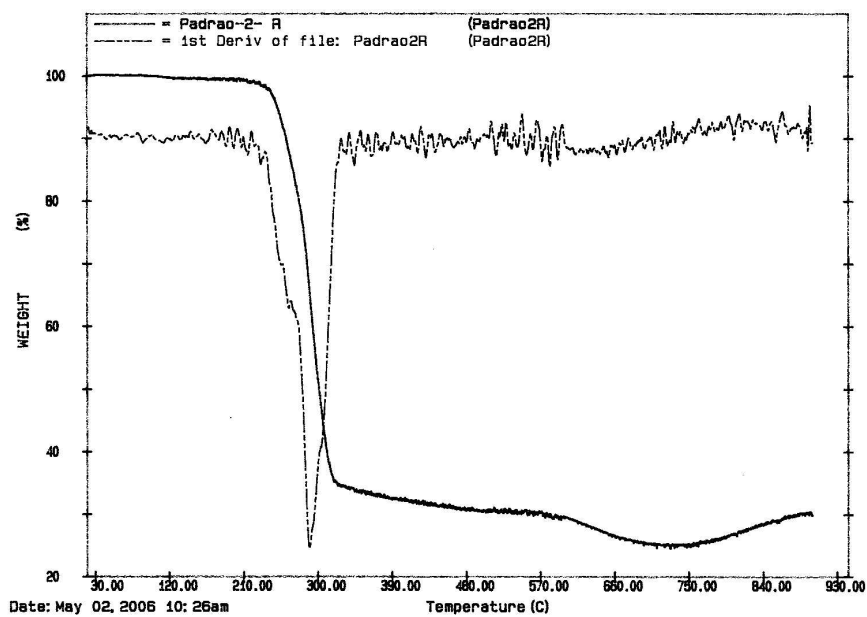


Figura A.20: TGA do complexo CuEn 2:1

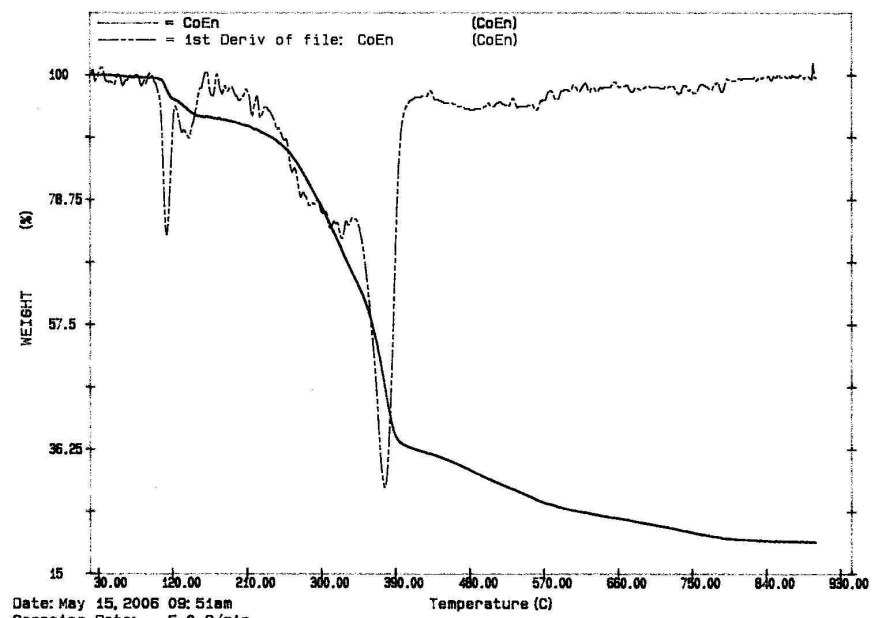


Figura A.21: TGA do complexo CoEn

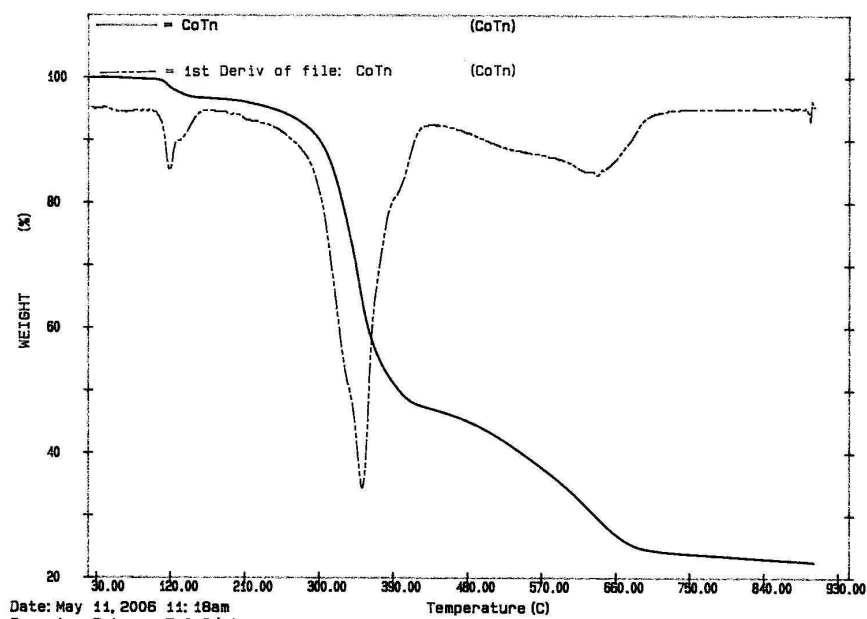


Figura A.22: TGA do complexo CoTn

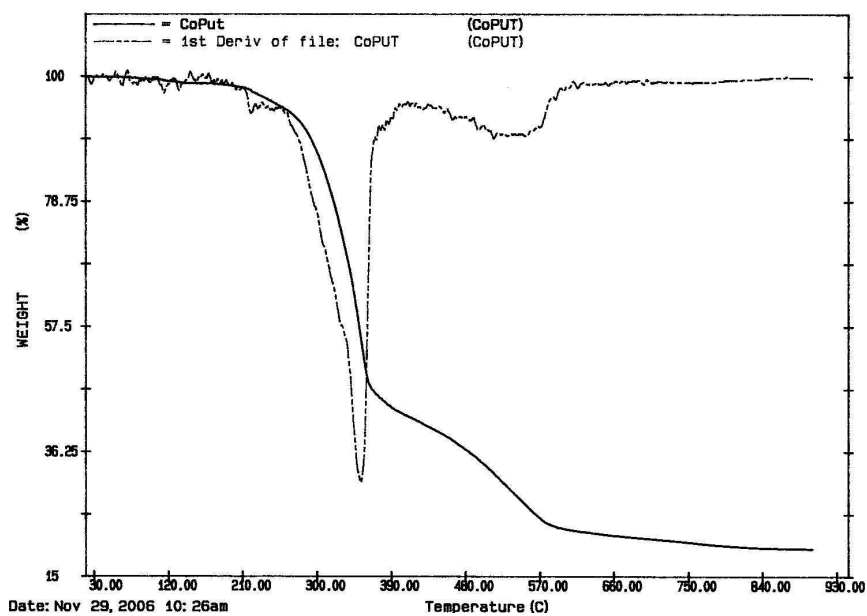


Figura A.23: TGA do complexo CoPut

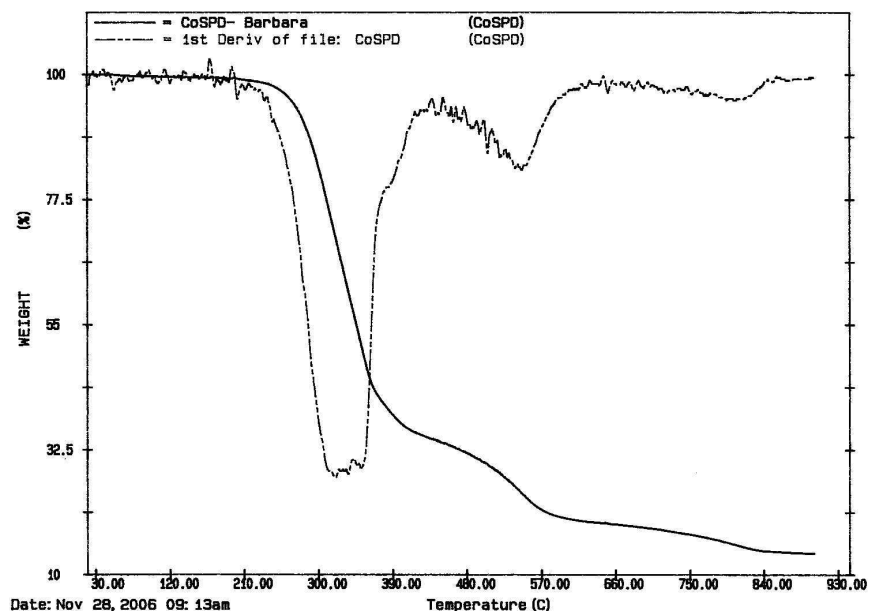


Figura A.24: TGA do complexo CoSpd

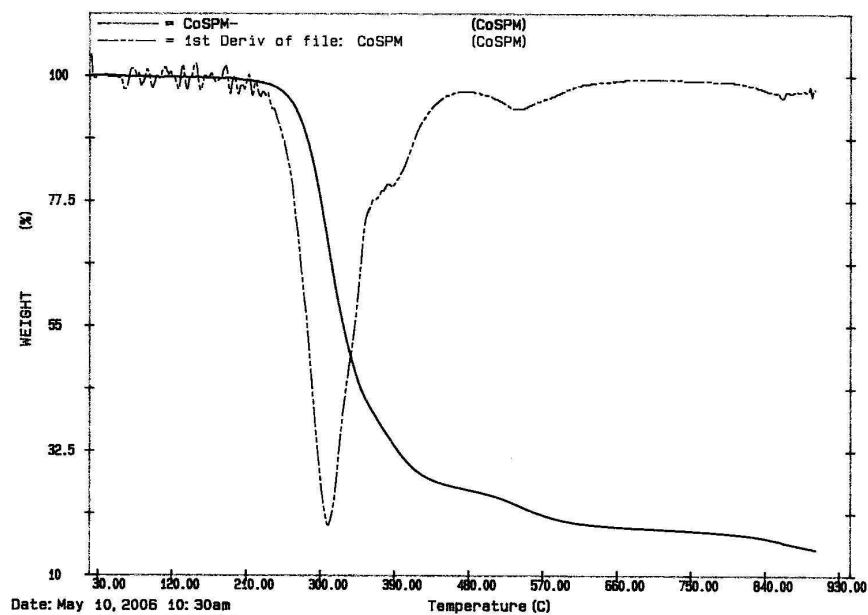


Figura A.25: TGA do complexo CoSpm

A.2.4

Complexos de Cádmiu(II)

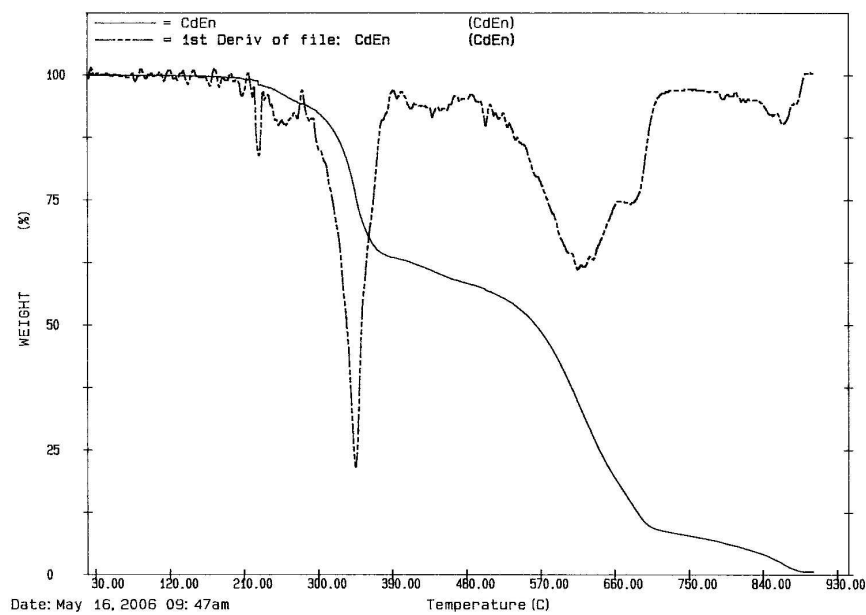


Figura A.26: TGA do complexo CdEn

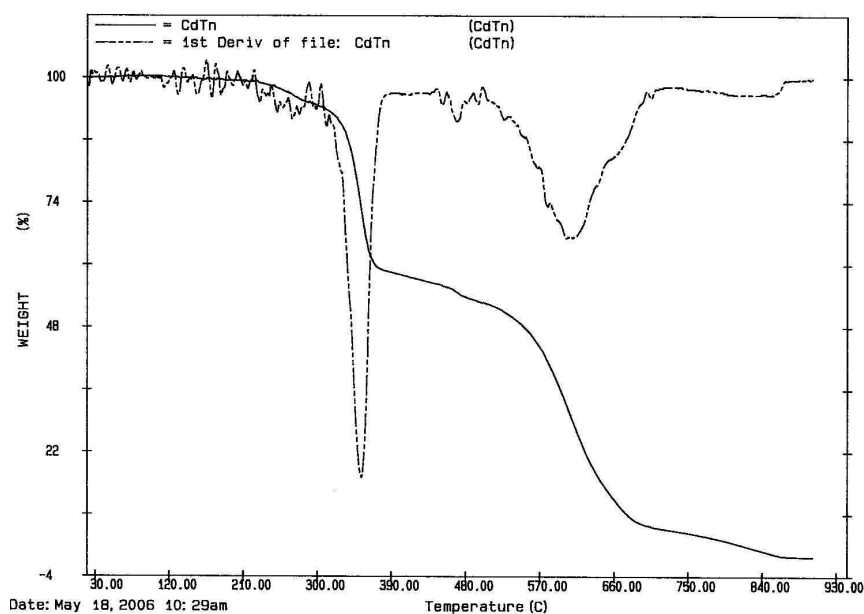


Figura A.27: TGA do complexo CdTn

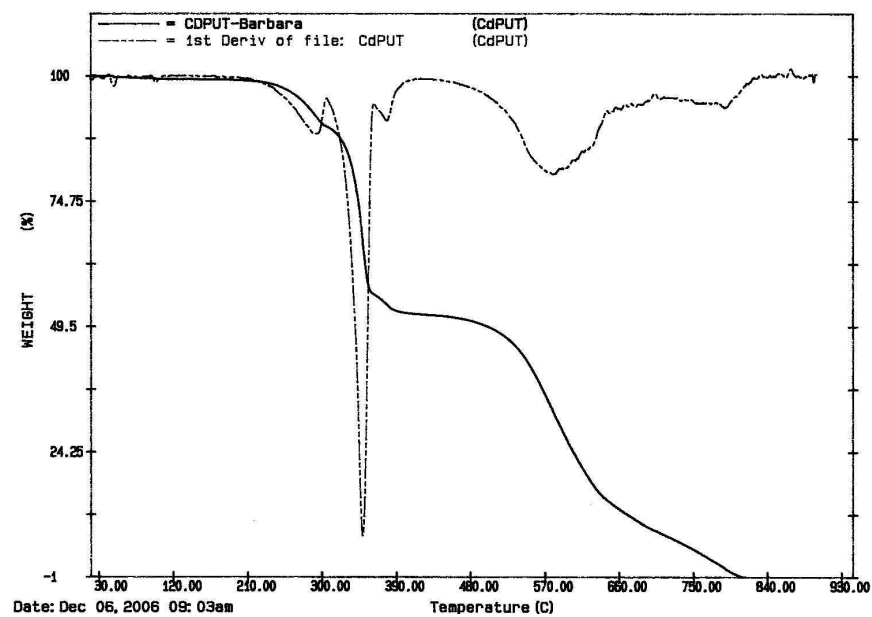


Figura A.28: TGA do complexo CdPut

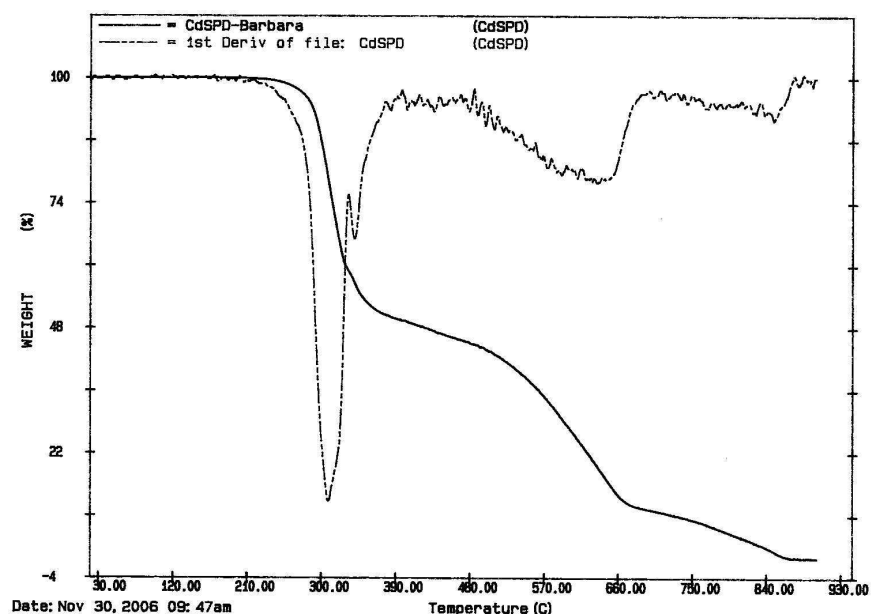


Figura A.29: TGA do complexo CdSpd

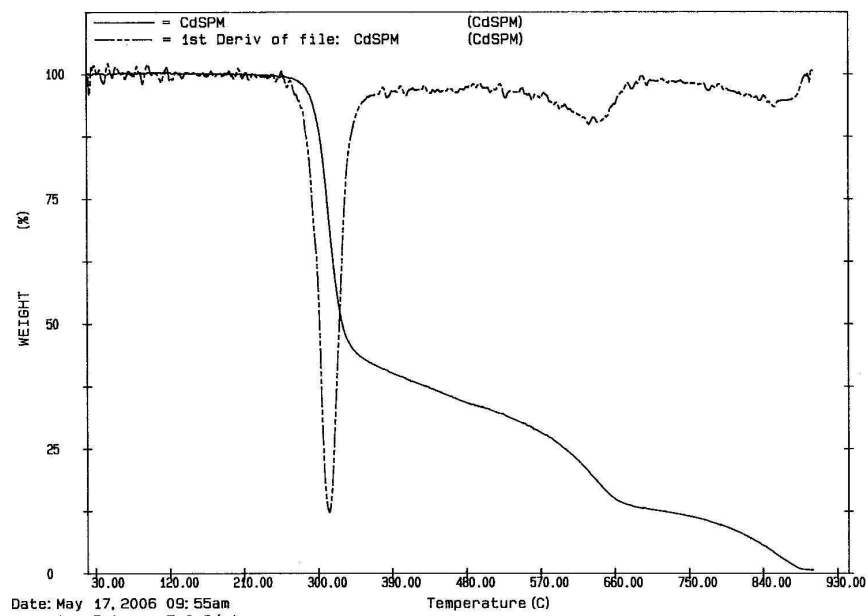


Figura A.30: TGA do complexo CdSpm

A.3

Infravermelho

A.3.1

Ligantes

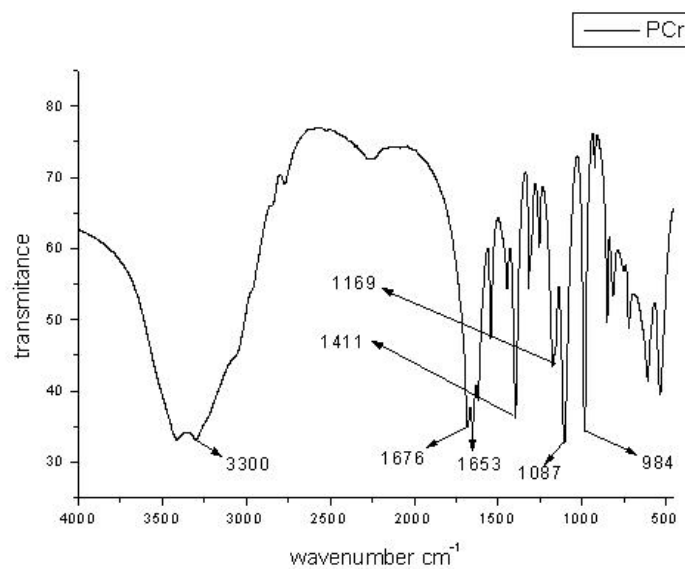


Figura A.31: IV do ligante PCr(4000 - 450 cm^{-1})

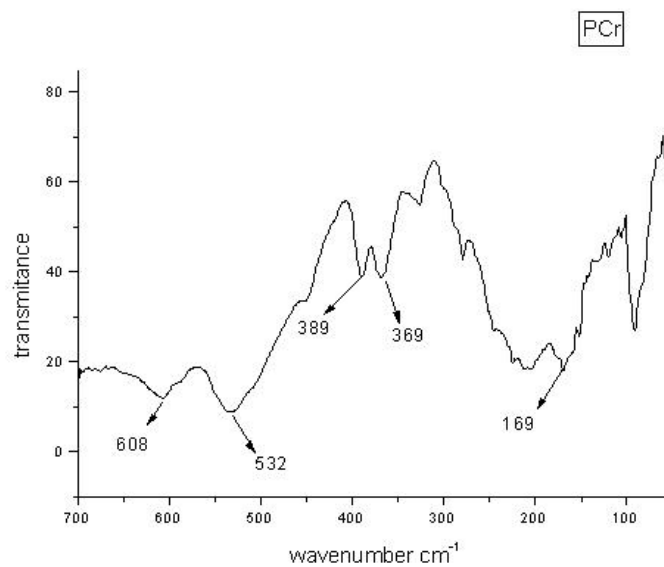


Figura A.32: IV do ligante PCr (700 - 30 cm^{-1})

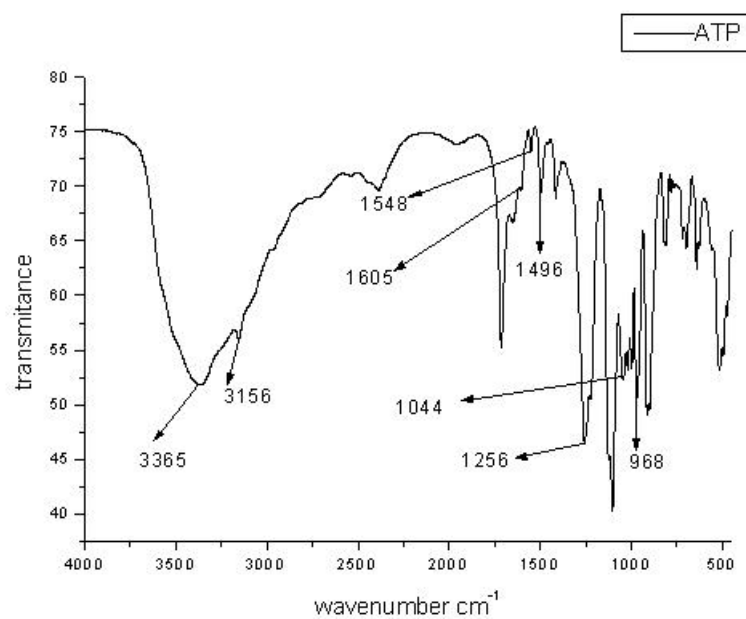


Figura A.33: IV do ligante ATP(4000 - 450 cm^{-1})

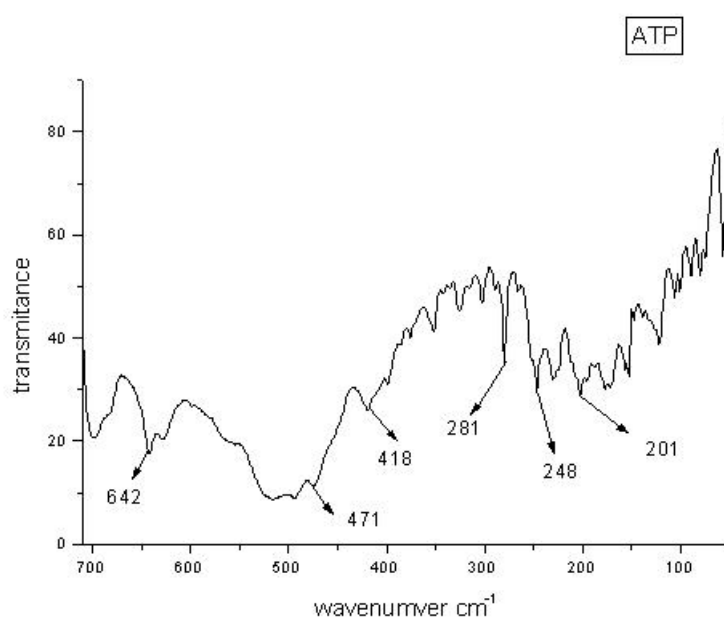


Figura A.34: IV do ligante ATP (700 - 30 cm^{-1})

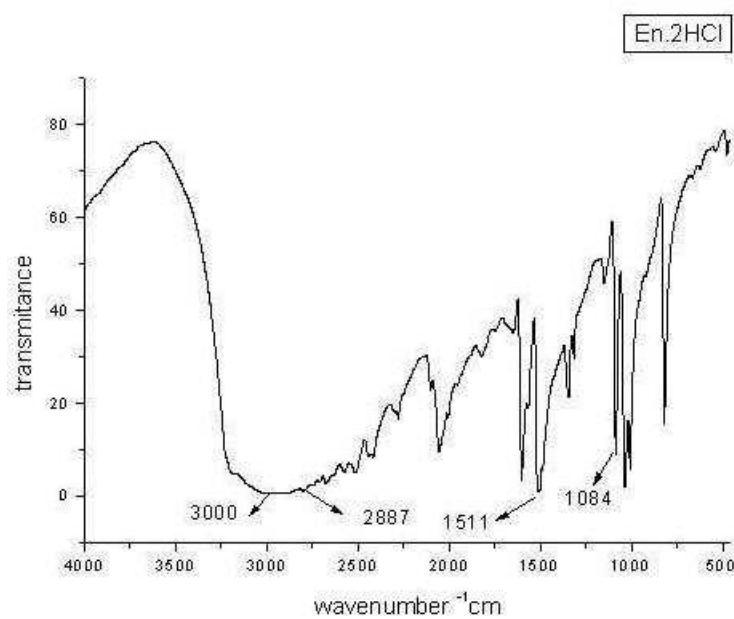


Figura A.35: IV do ligante En.2HCl ($4000 - 450 \text{ cm}^{-1}$)

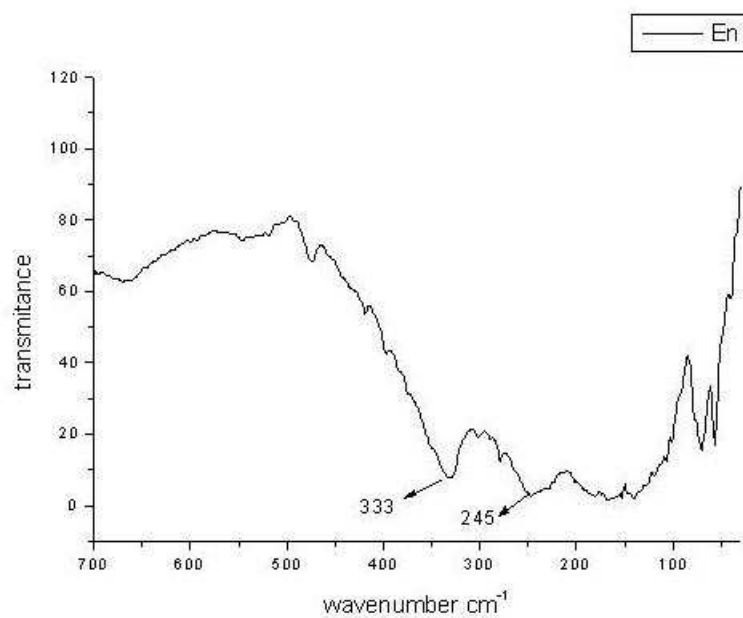


Figura A.36: IV do ligante En.2HCl ($700 - 30 \text{ cm}^{-1}$)

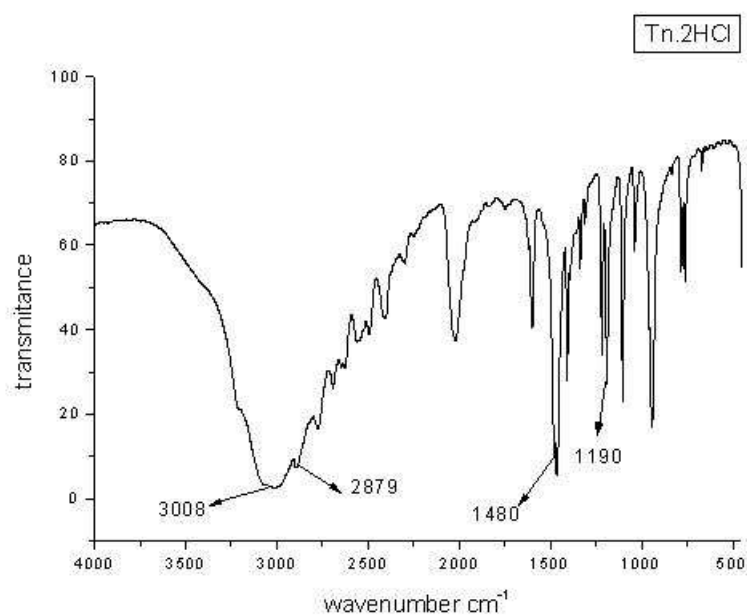


Figura A.37: IV do ligante Tn.2HCl (4000 - 450 cm^{-1})

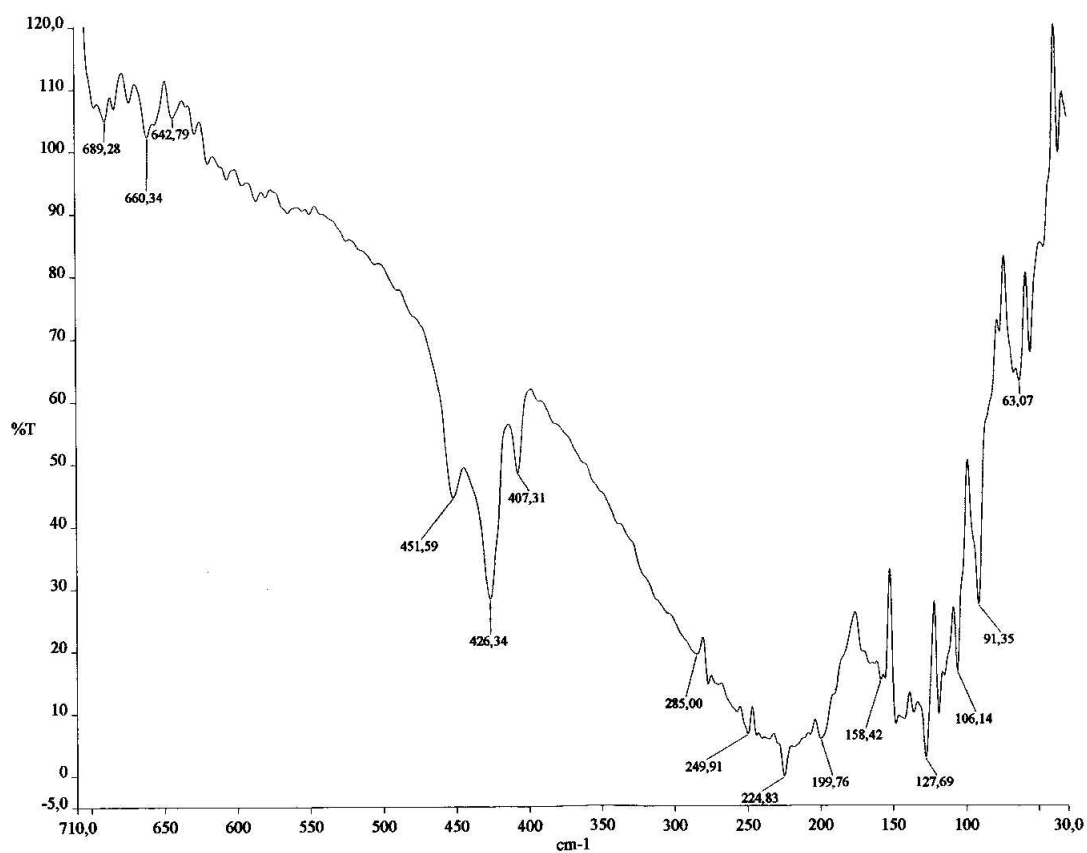


Figura A.38: IV do ligante Tn.2HCl (700 - 30 cm^{-1})

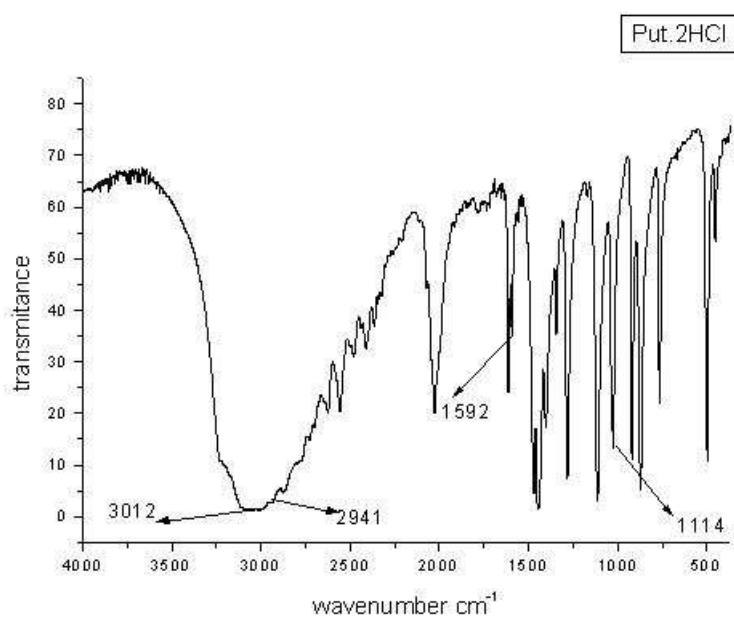


Figura A.39: IV do ligante Put.2HCl ($4000 - 450 \text{ cm}^{-1}$)

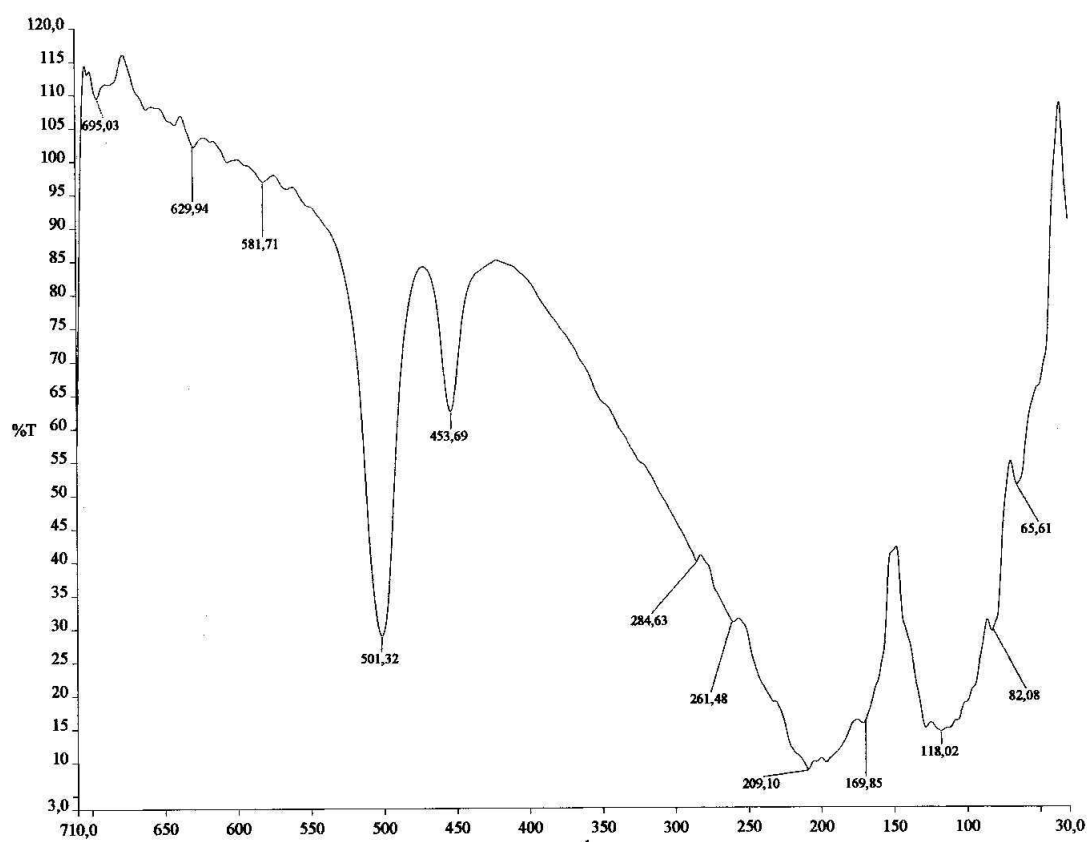


Figura A.40: IV do ligante Put.2HCl ($700 - 30 \text{ cm}^{-1}$)

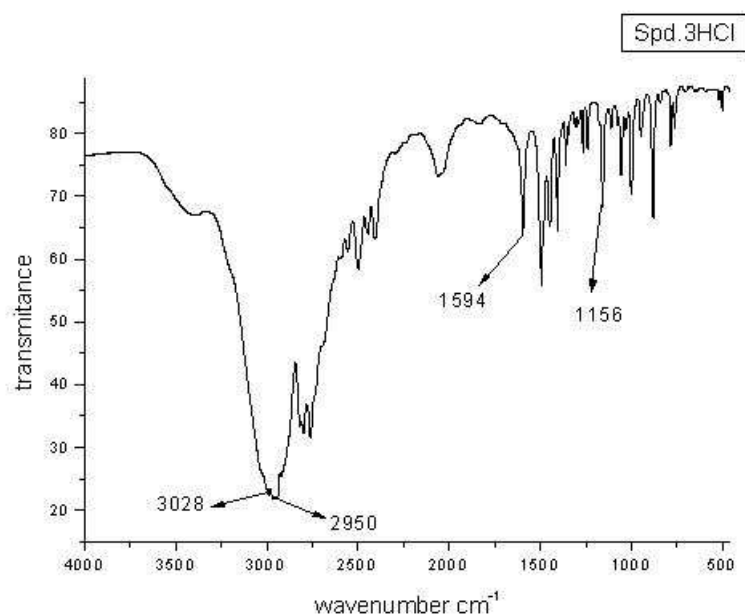


Figura A.41: IV do ligante Spd.3HCl ($4000 - 450 \text{ cm}^{-1}$)

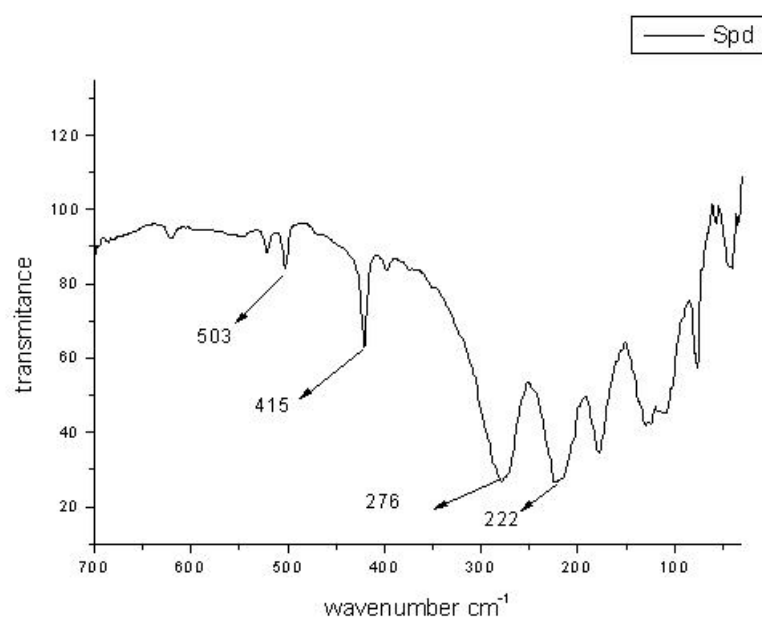


Figura A.42: IV do ligante Spd.3HCl ($700 - 30 \text{ cm}^{-1}$)

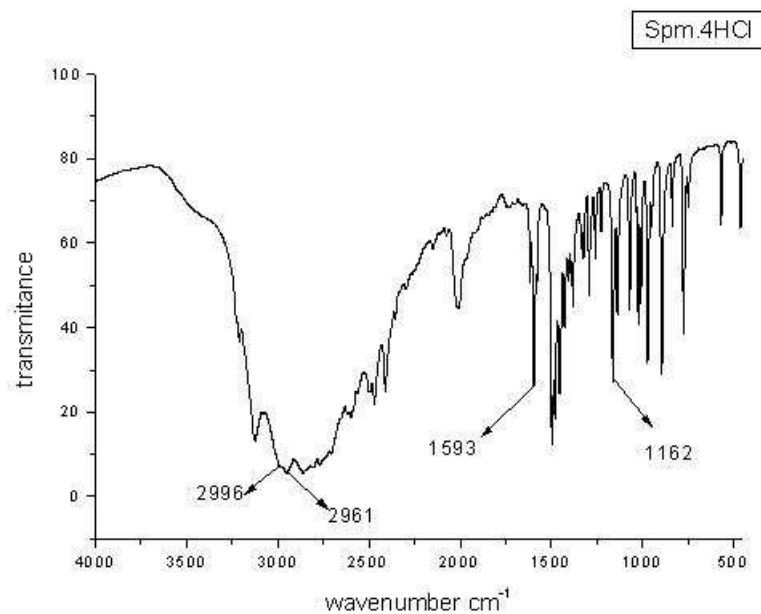


Figura A.43: IV do ligante Spm.4HCl ($4000 - 450 \text{ cm}^{-1}$)

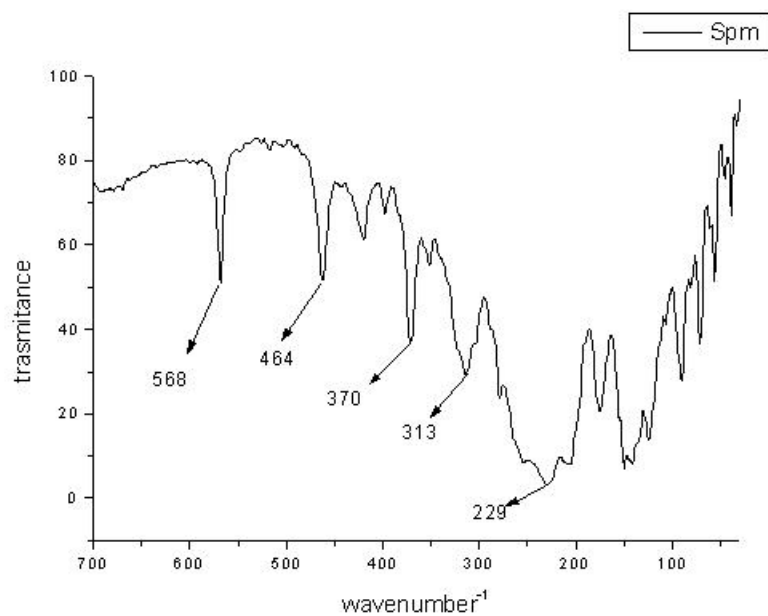


Figura A.44: IV do ligante Spm.4HCl ($700 - 30 \text{ cm}^{-1}$)

A.3.2

Complexos de cobre

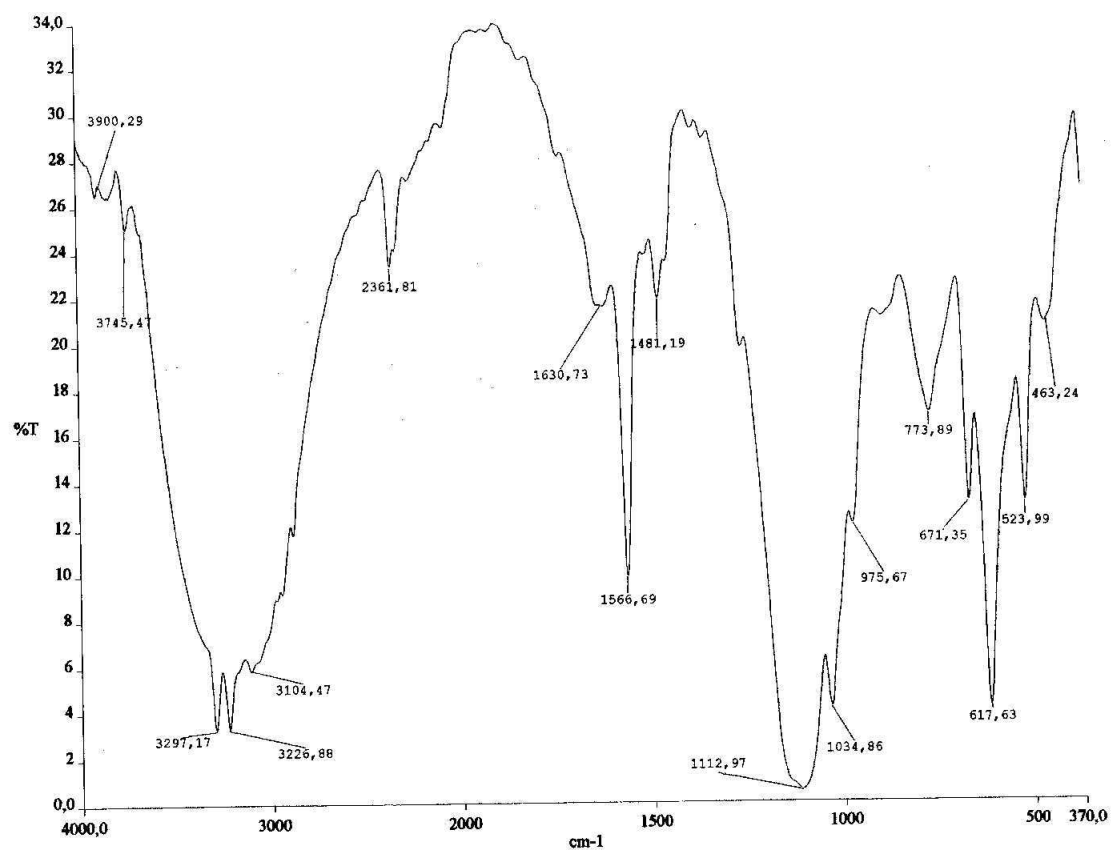


Figura A.45: IV do Complexo CuEn1:1 (4000 - 450 cm^{-1})

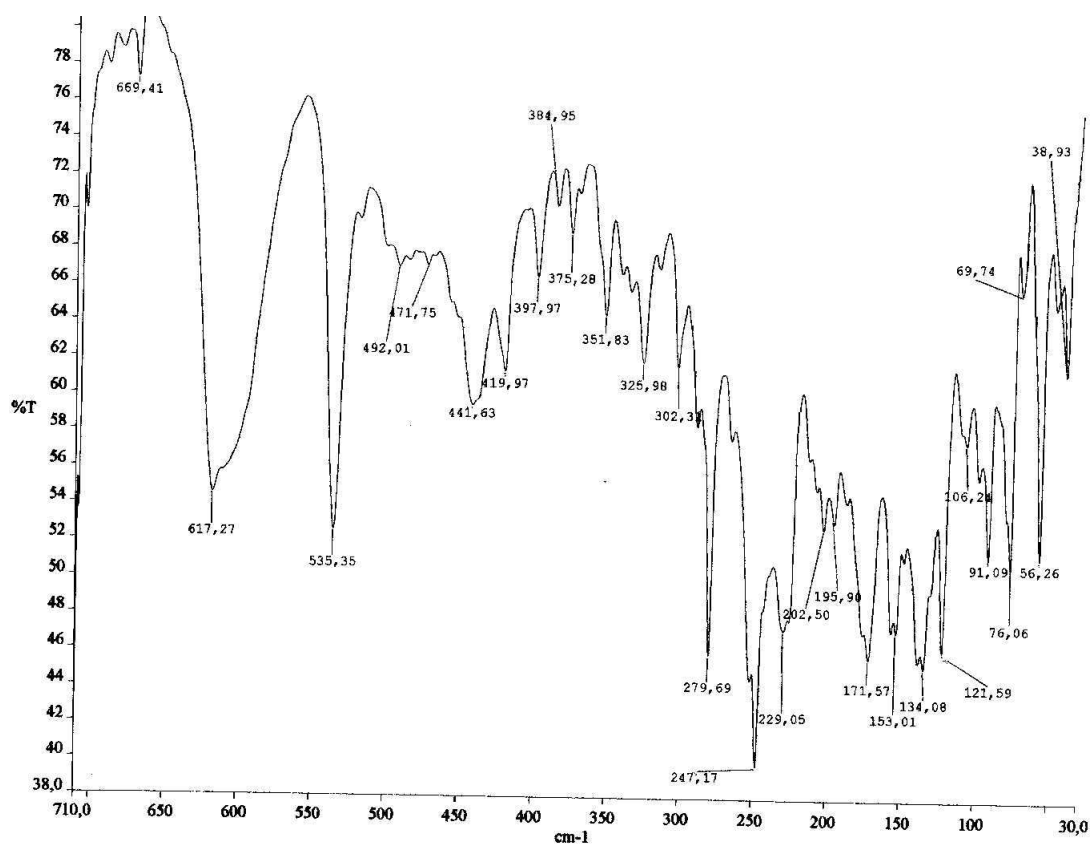


Figura A.46: IV do Complexo CuEn1:1 ($700 - 30 \text{ cm}^{-1}$)

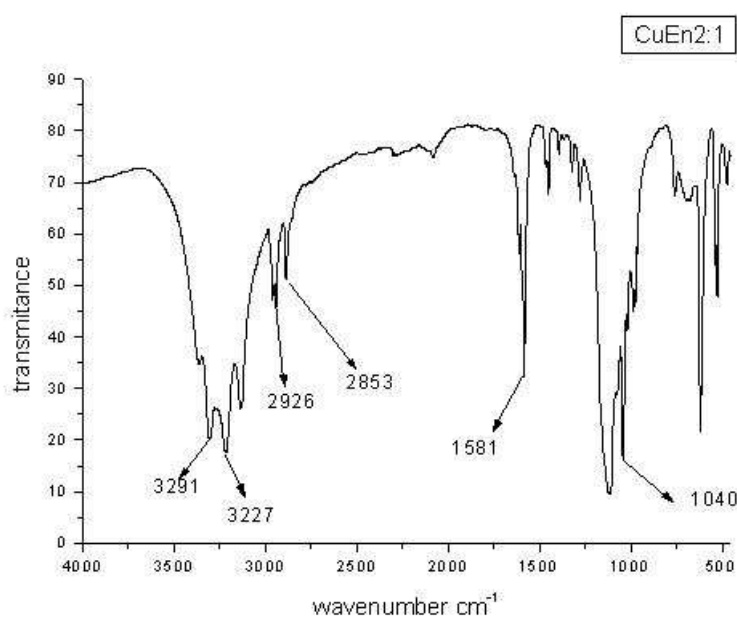


Figura A.47: IV do Complexo CuEn2:1 ($4000 - 450 \text{ cm}^{-1}$)

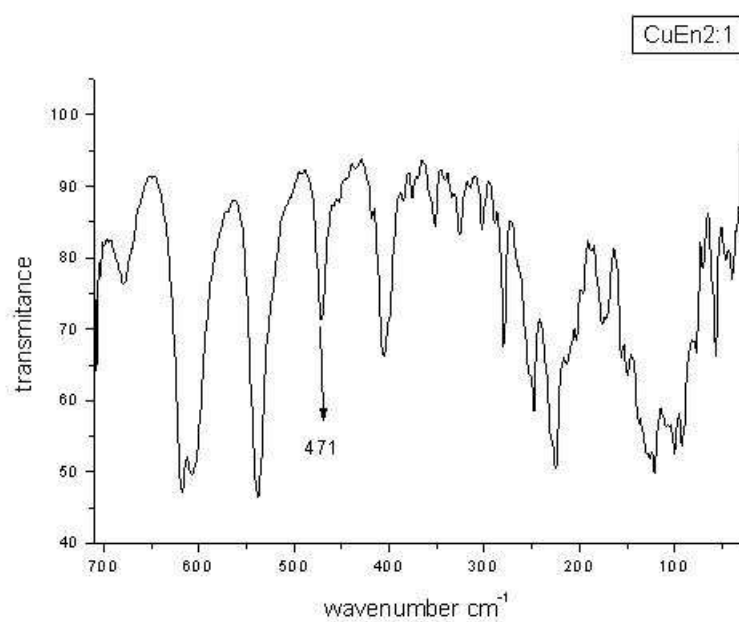


Figura A.48: IV do Complexo CuEn2:1 ($700 - 30 \text{ cm}^{-1}$)

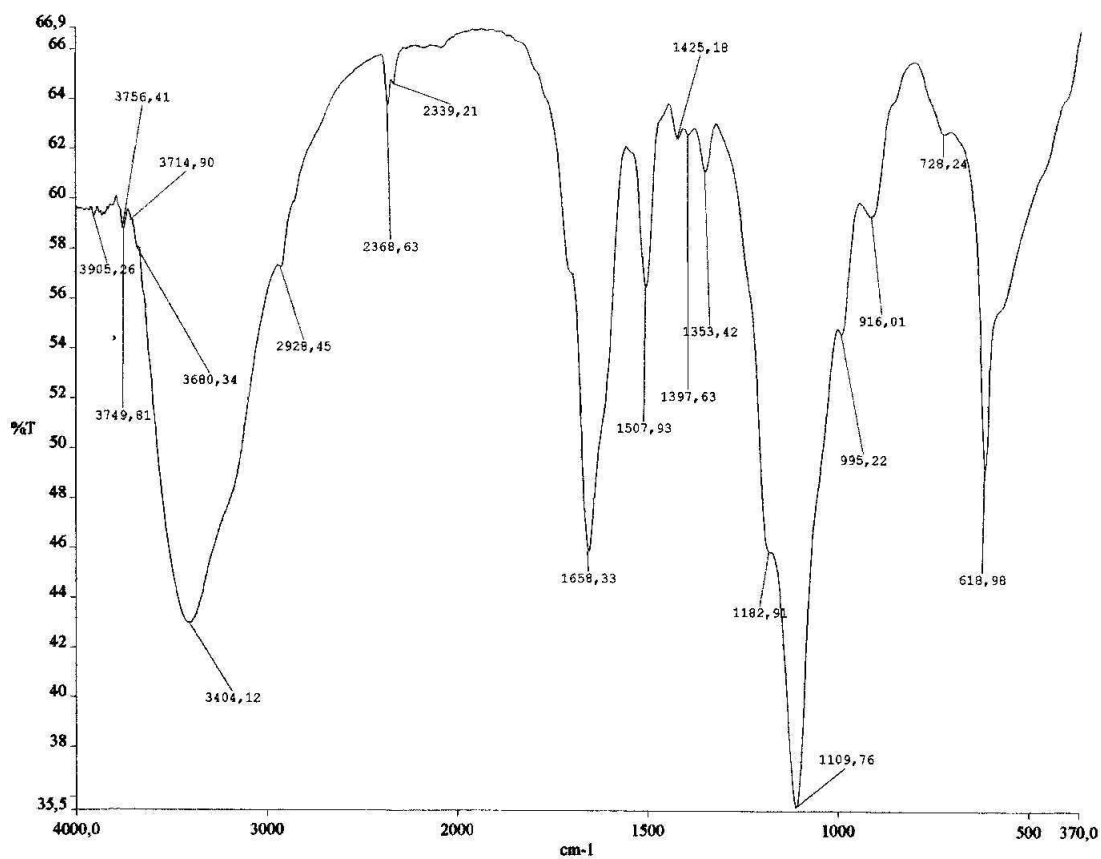


Figura A.49: IV do Complexo CuPCr ($4000 - 450 \text{ cm}^{-1}$)

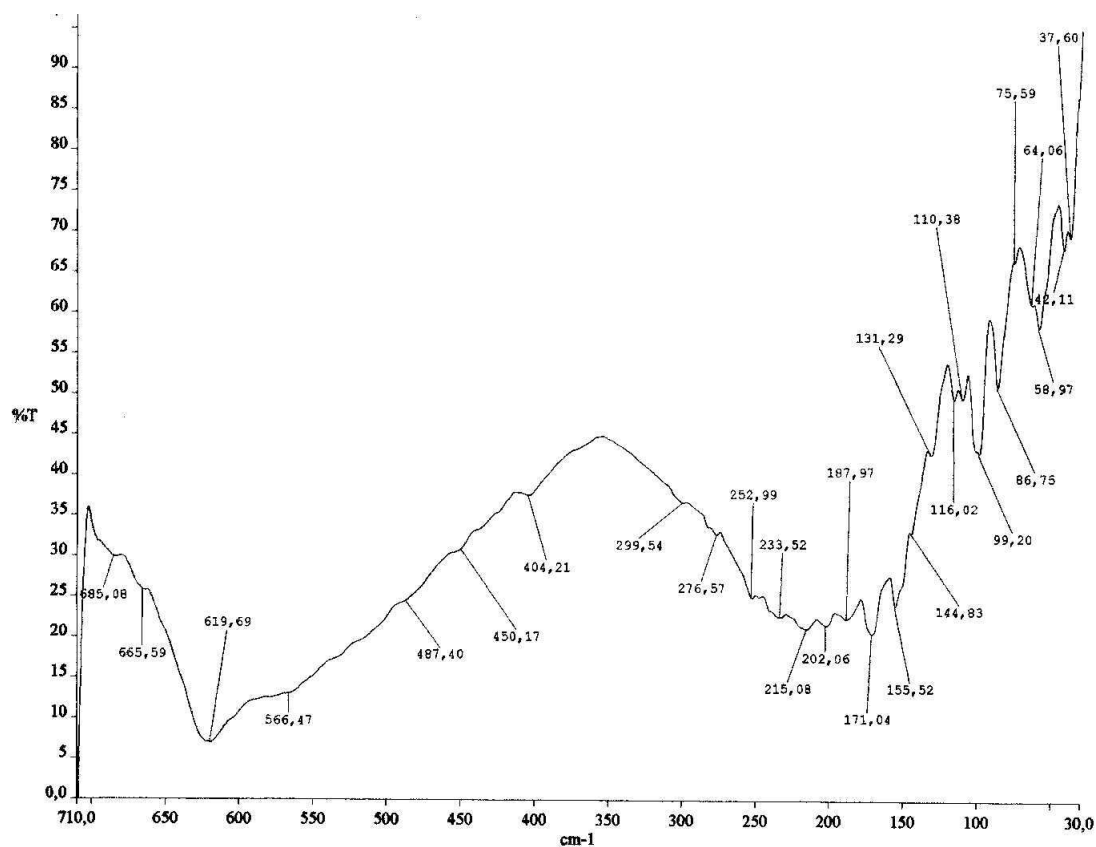


Figura A.50: IV do Complexo CuPCr (700 - 30 cm^{-1})

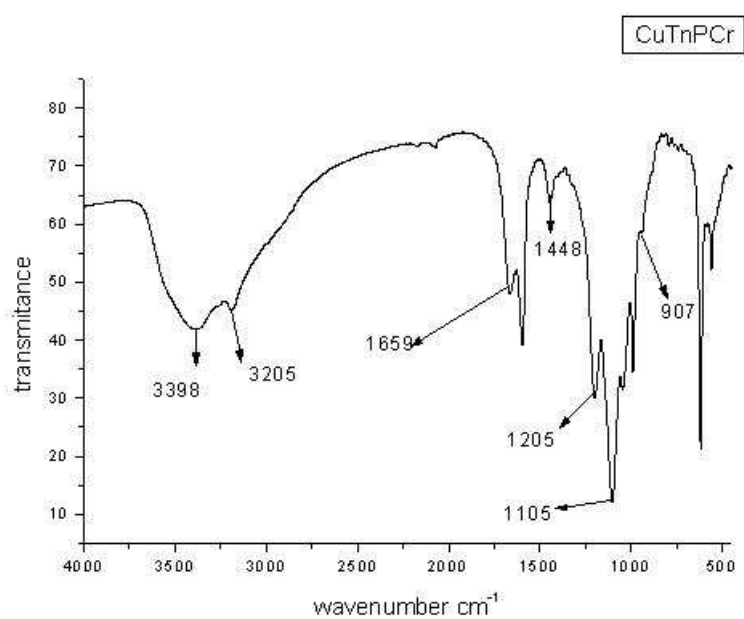


Figura A.51: IV do Complexo CuTnPCr (4000 - 450 cm^{-1})

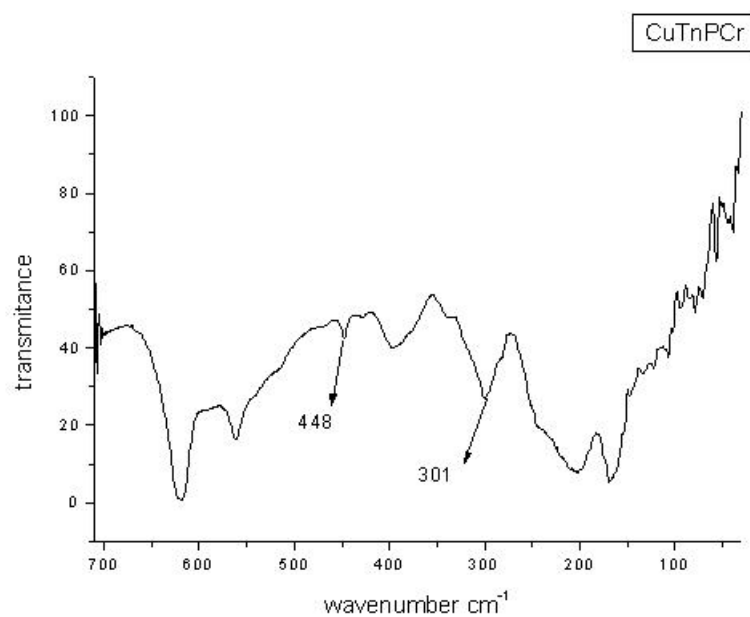


Figura A.52: IV do Complexo CuTnPCr (700 - 30 cm^{-1})

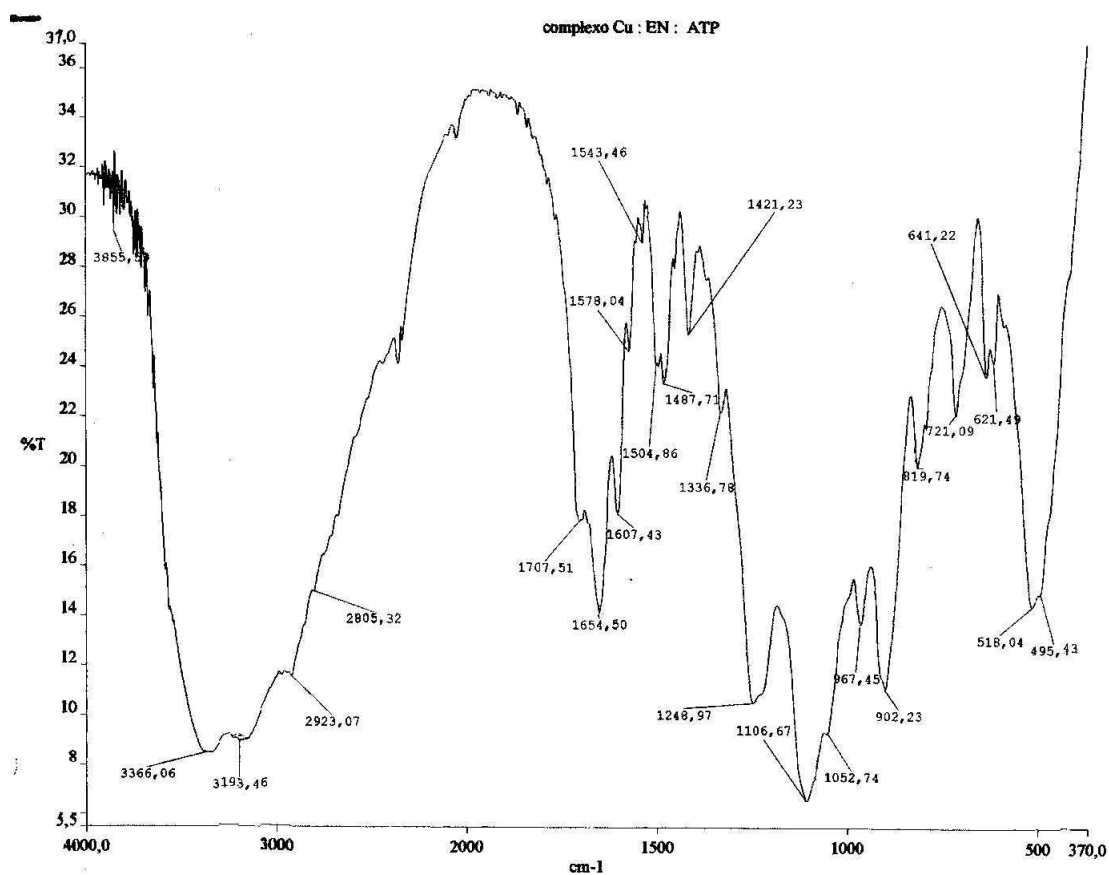


Figura A.53: IV do Complexo CuEnATP (4000 - 450 cm^{-1})

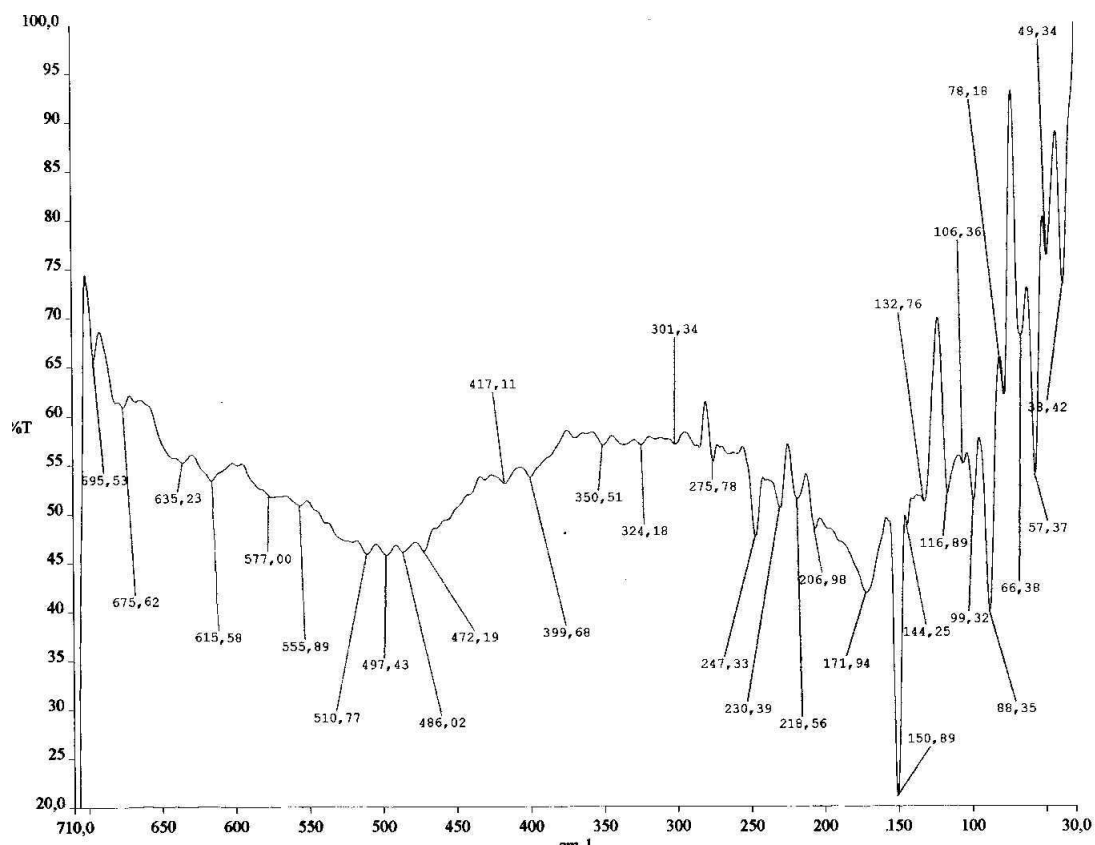


Figura A.54: IV do Complexo CuEnATP (700 - 30 cm^{-1})

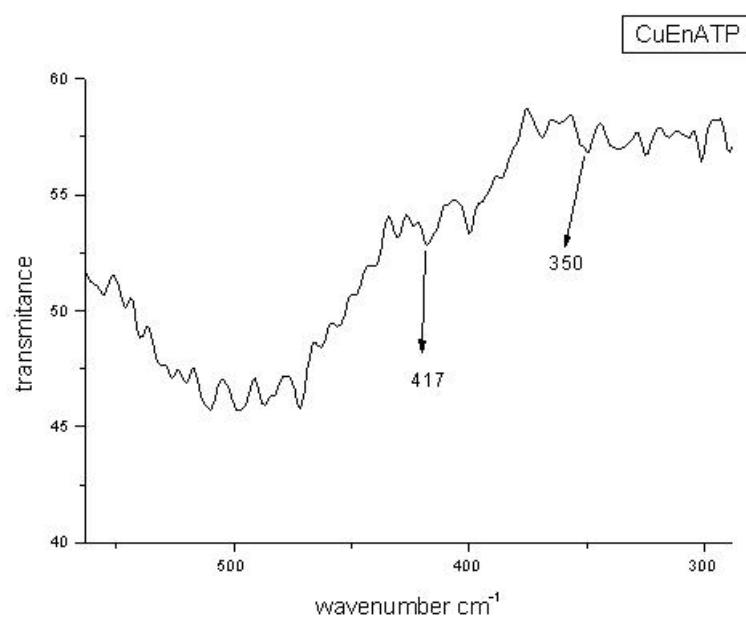


Figura A.55: Ampliação do IV do Complexo CuEnATP (700 - 30 cm^{-1})

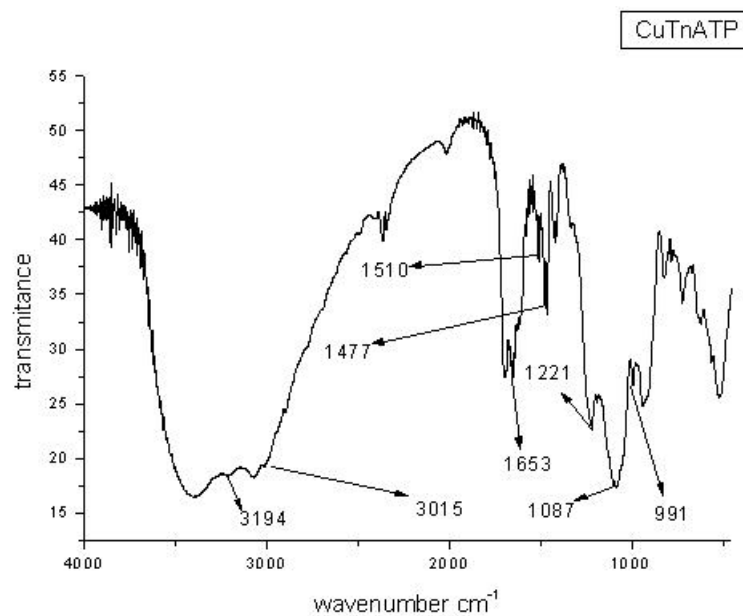


Figura A.56: IV do Complexo CuTnATP (4000 - 450 cm^{-1})

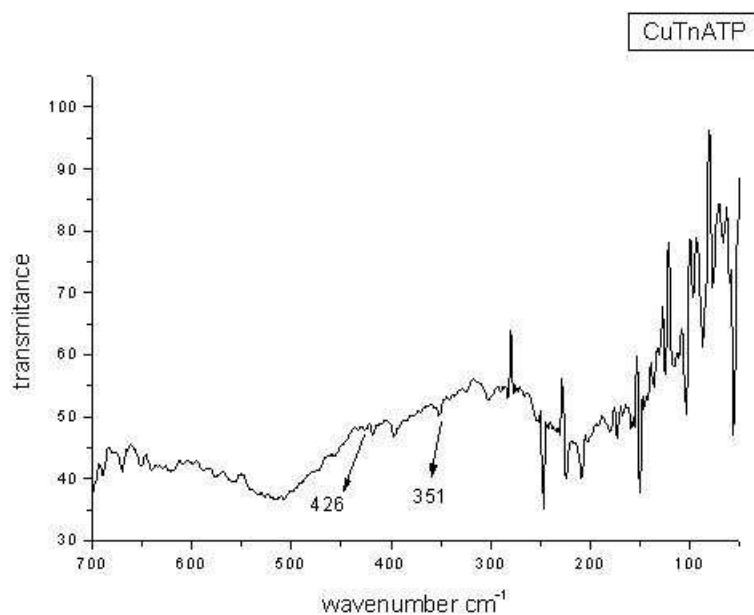


Figura A.57: IV do Complexo CuTnATP (700 - 30 cm^{-1})

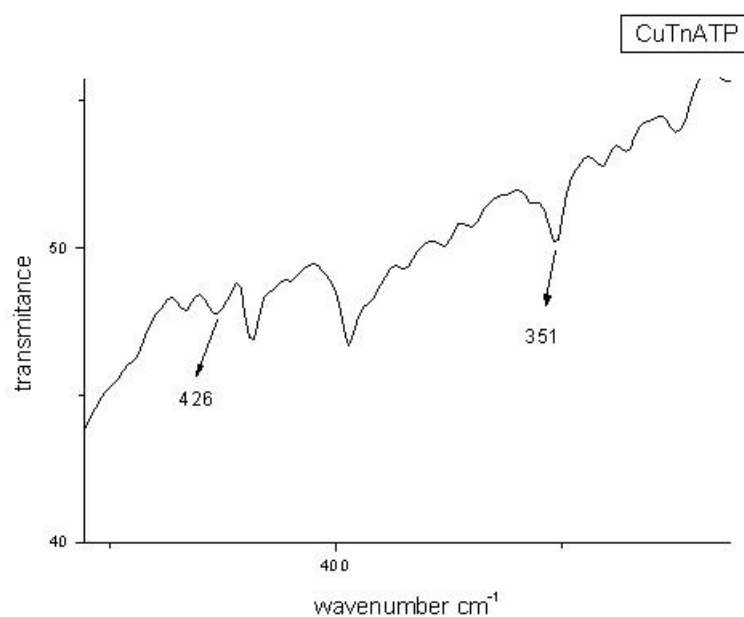


Figura A.58: Ampliação do IV do Complexo CuTnATP ($700 - 30 \text{ cm}^{-1}$)

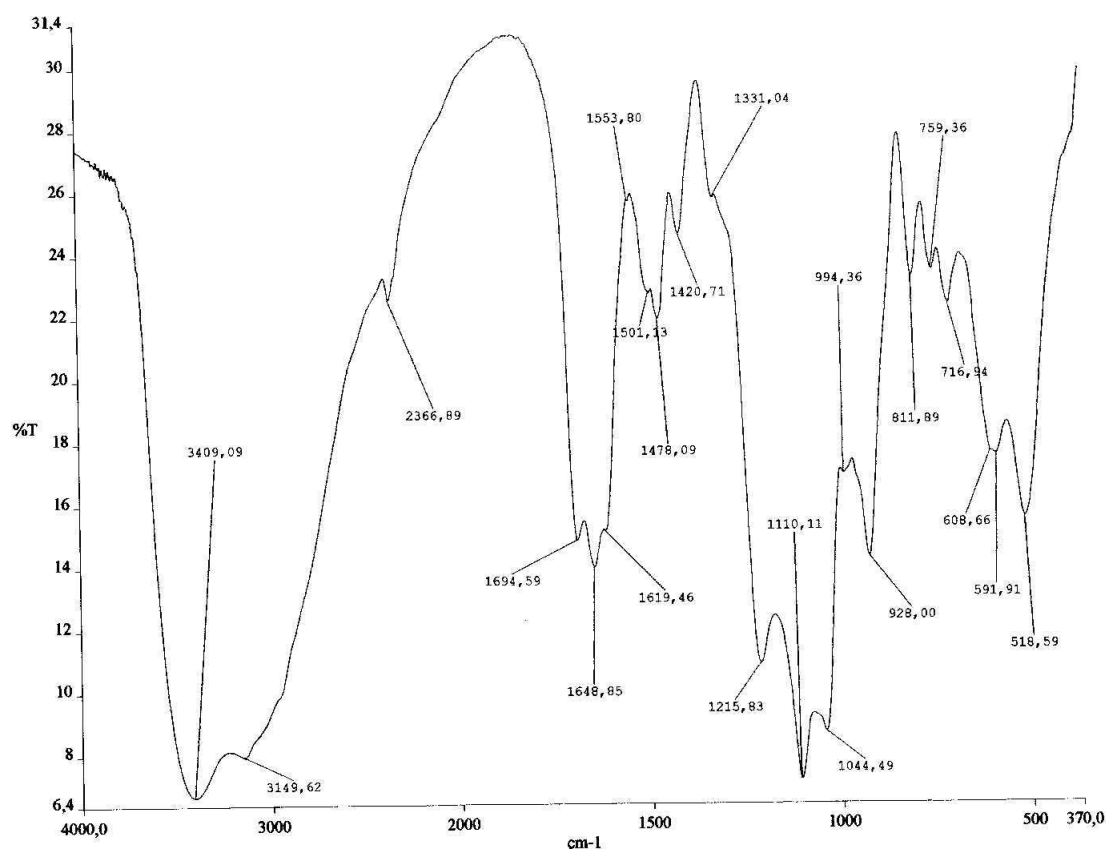


Figura A.59: IV do Complexo CuSpdATP ($4000 - 450 \text{ cm}^{-1}$)

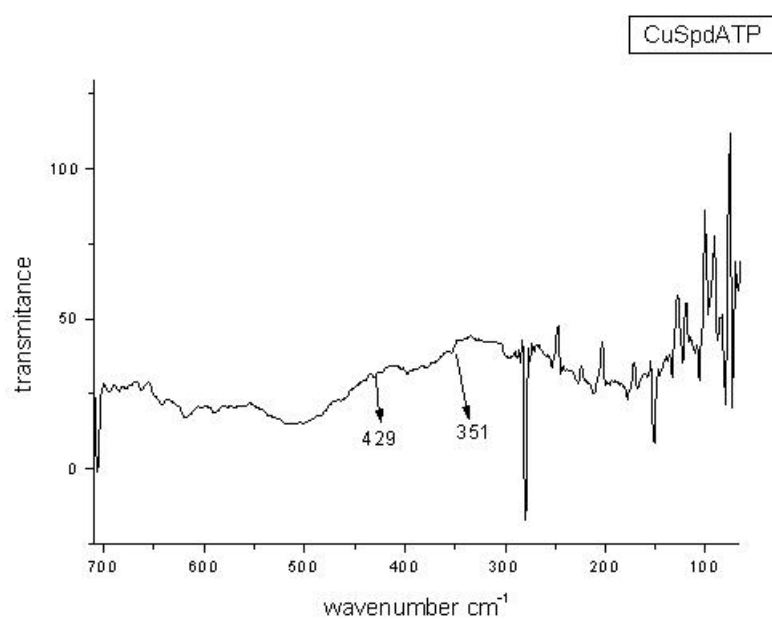


Figura A.60: IV do Complexo CuSpdATP (700 - 30 cm^{-1})

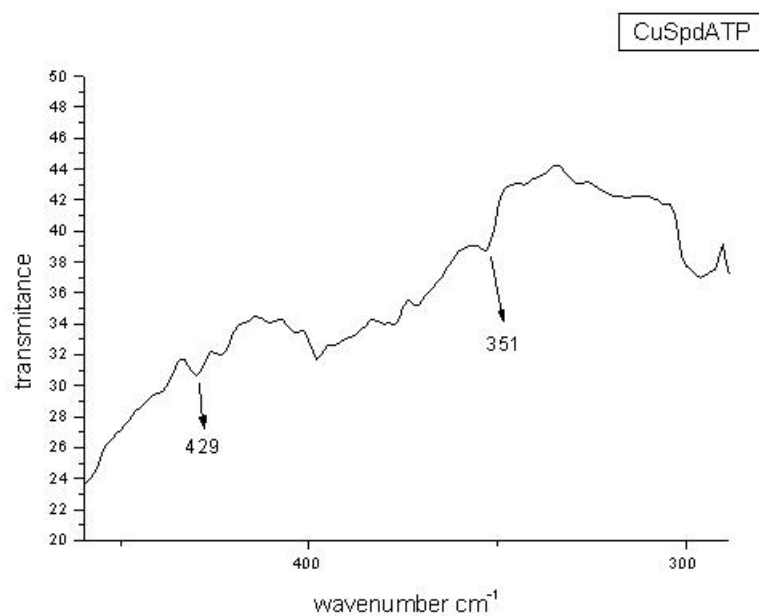


Figura A.61: Ampliação do IV do Complexo CuSpdATP (700 - 30 cm^{-1})

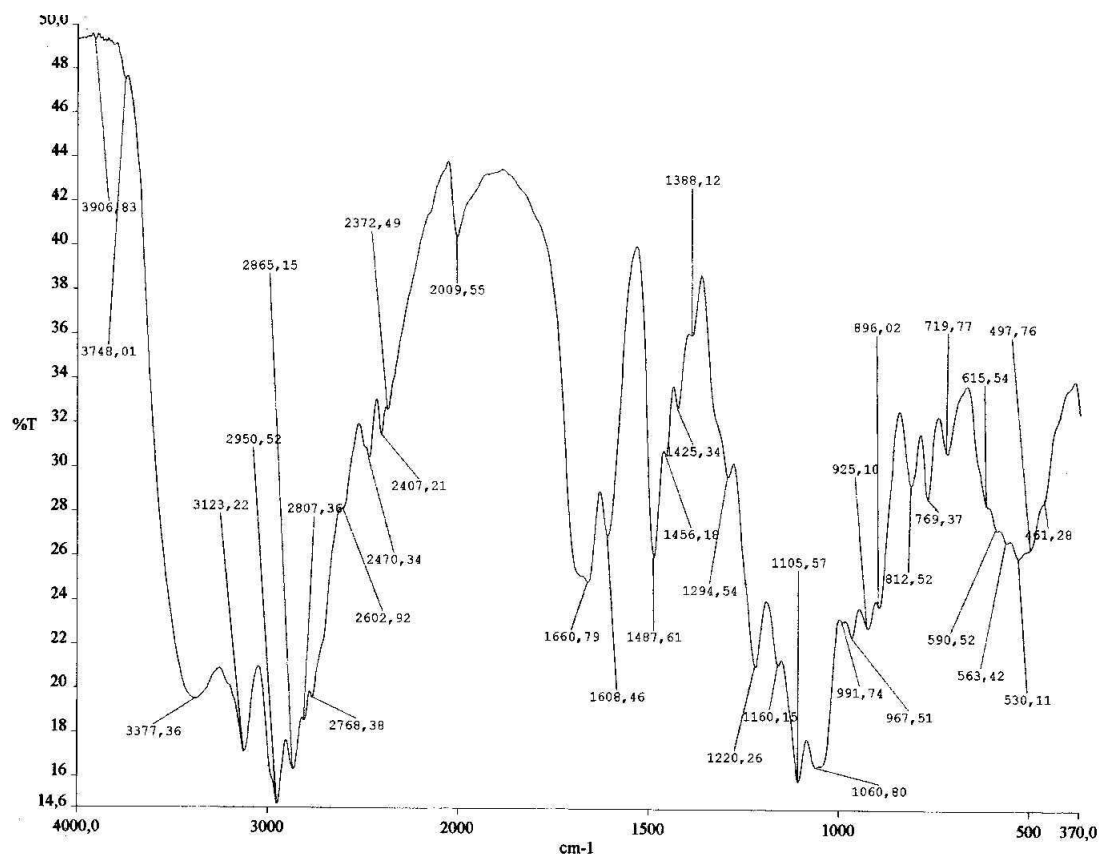


Figura A.62: IV do Complexo CuSpmATP (4000 - 450 cm^{-1})

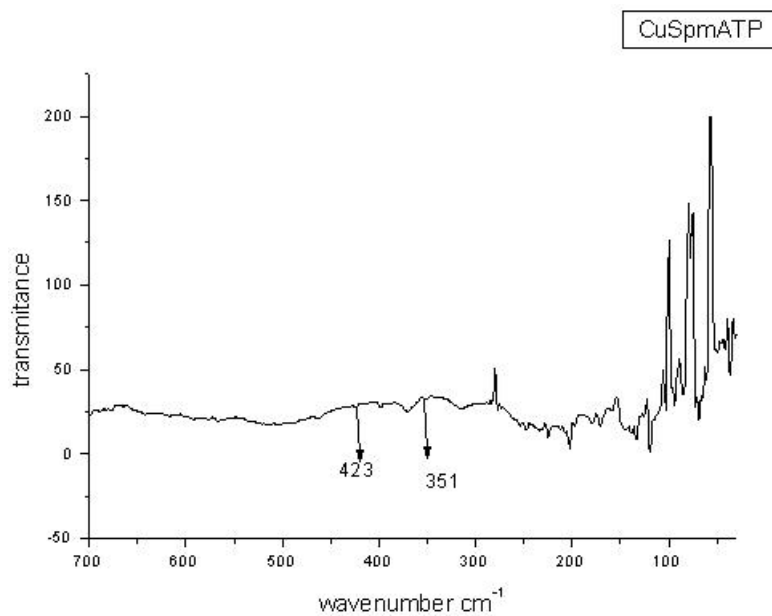


Figura A.63: IV do Complexo CuSpmATP (700 - 30 cm^{-1})

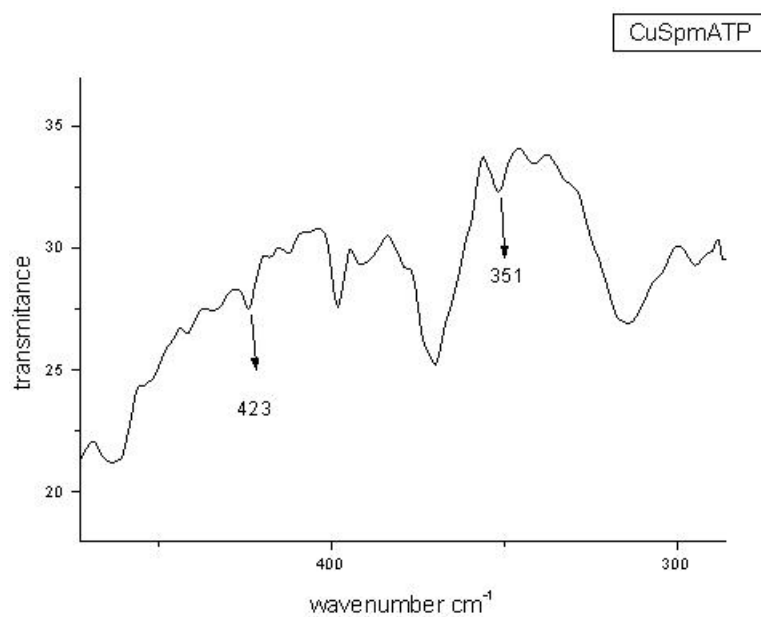


Figura A.64: Ampliação do IV do Complexo CuSpmATP (700 - 30 cm^{-1})

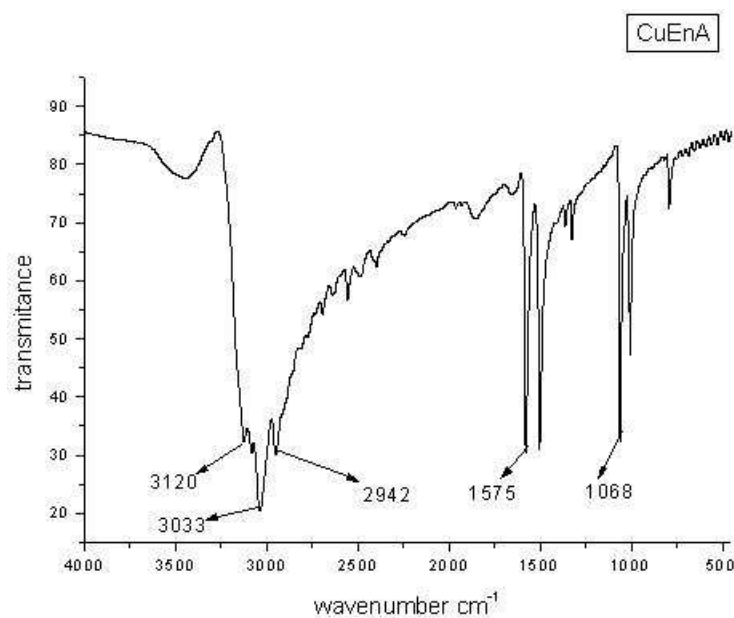


Figura A.65: IV do Complexo CuEn (4000 - 450 cm^{-1})

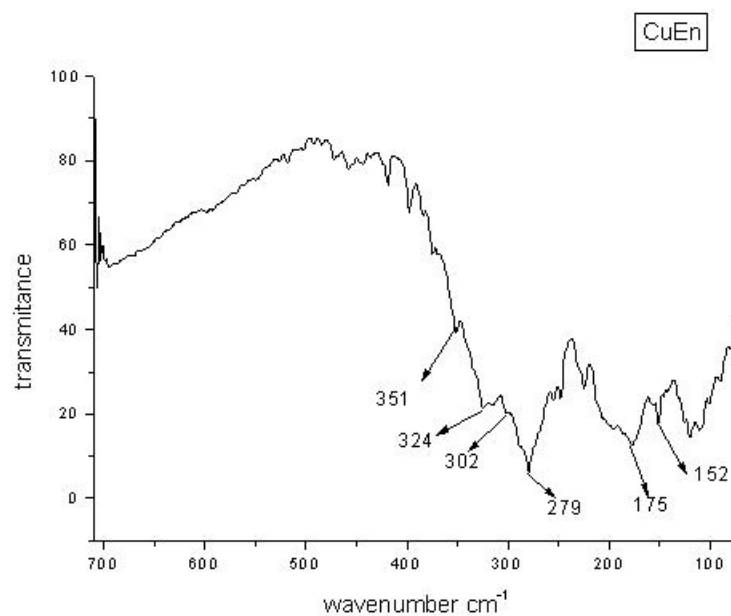


Figura A.66: IV do Complexo CuEn (700 - 30 cm^{-1})

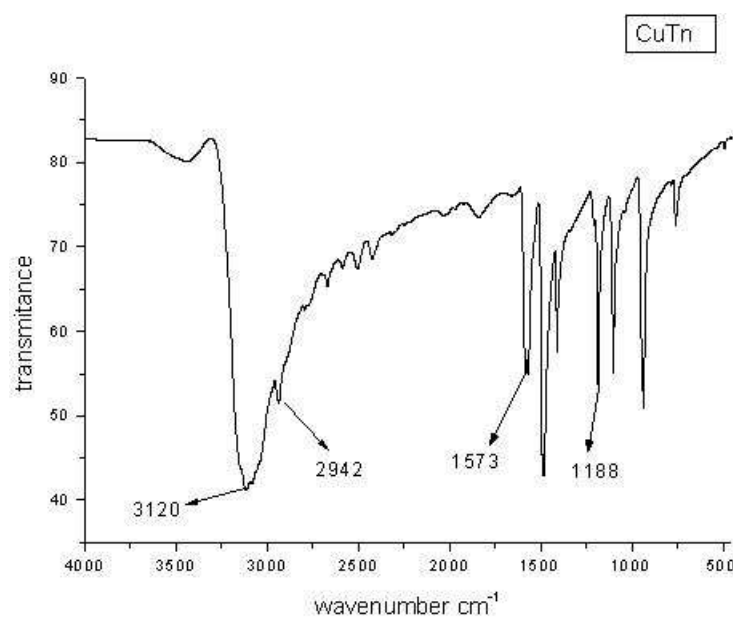


Figura A.67: IV do Complexo CuTn (4000 - 450 cm^{-1})

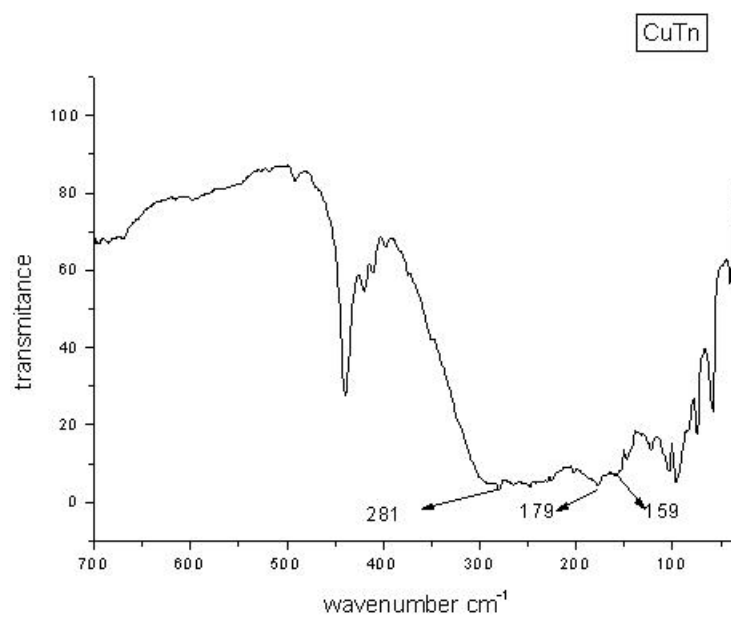


Figura A.68: IV do Complexo CuTn ($700 - 30 \text{ cm}^{-1}$)

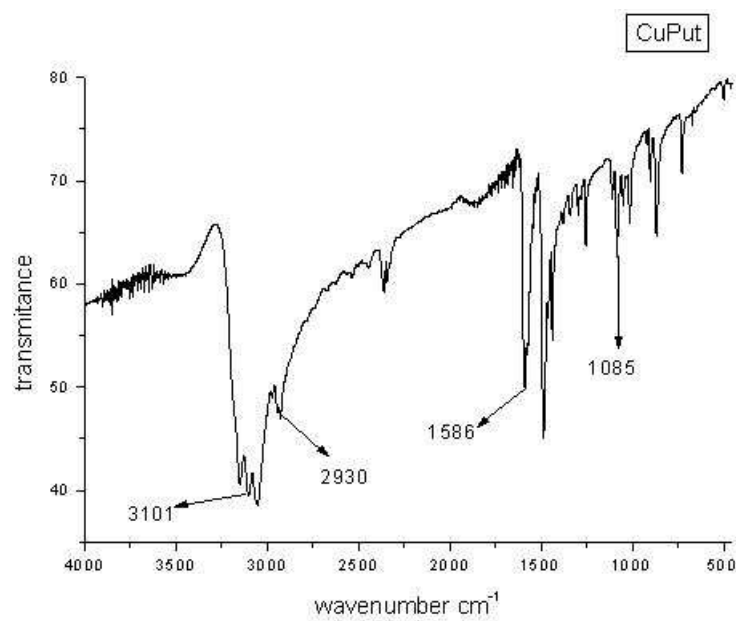


Figura A.69: IV do Complexo CuPut ($4000 - 450 \text{ cm}^{-1}$)

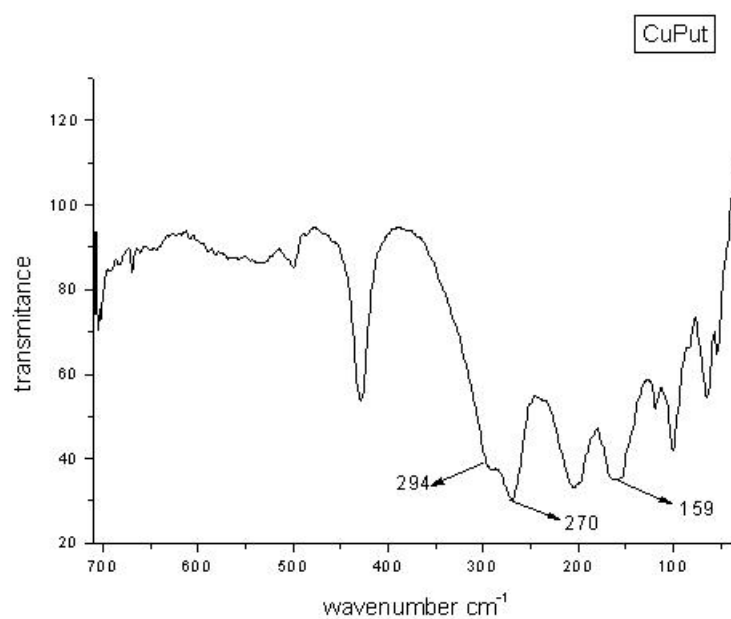


Figura A.70: IV do Complexo CuPut (700 - 30 cm^{-1})

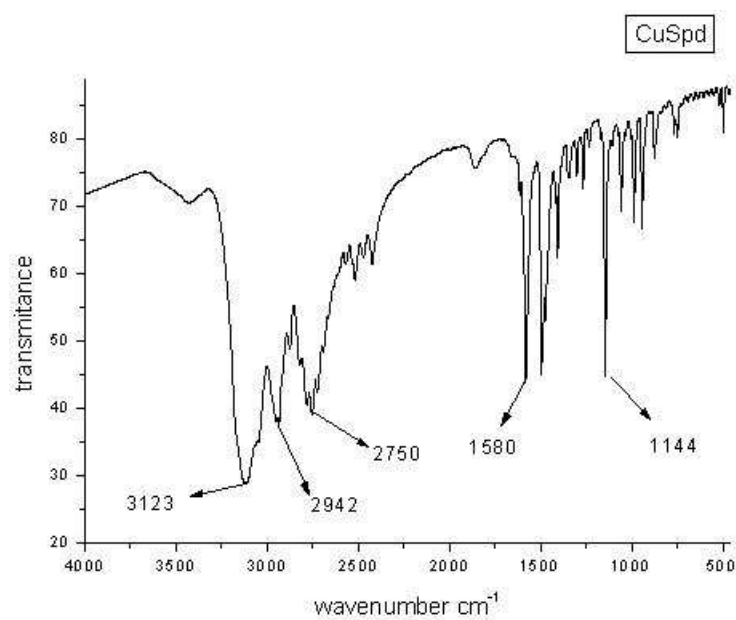


Figura A.71: IV do Complexo CuSpd (4000 - 450 cm^{-1})

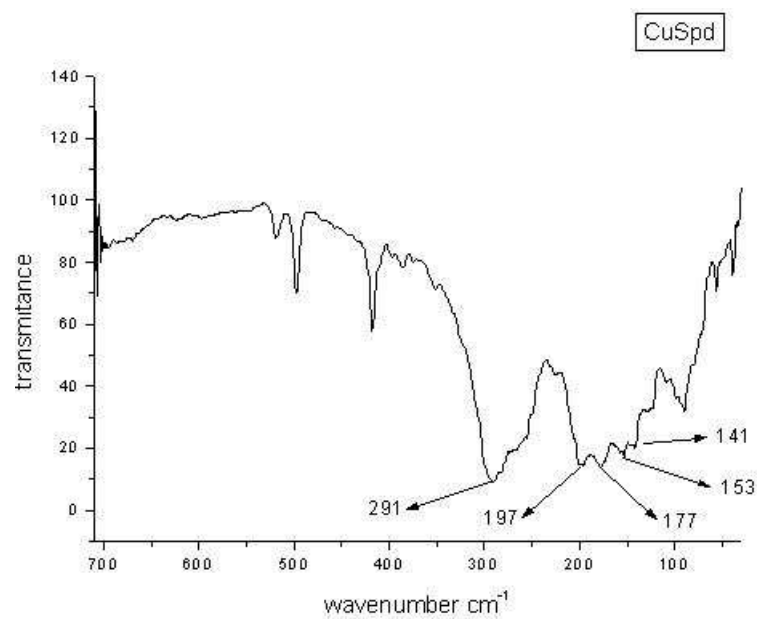


Figura A.72: IV do Complexo CuSpd ($700 - 30 \text{ cm}^{-1}$)

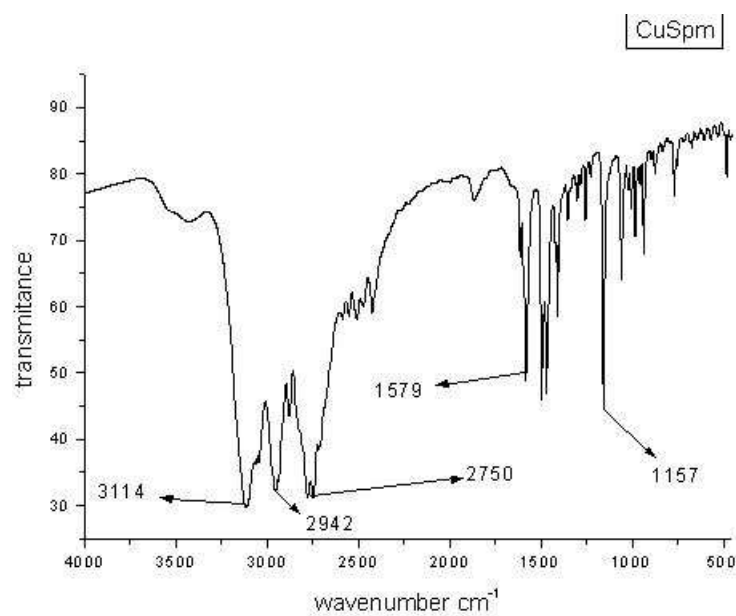


Figura A.73: IV do Complexo CuSpm ($4000 - 450 \text{ cm}^{-1}$)

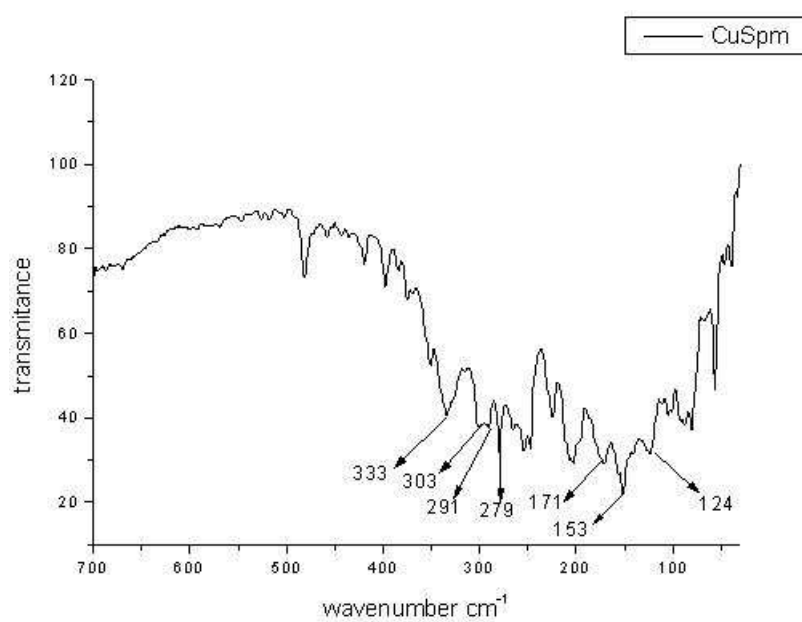


Figura A.74: IV do Complexo CuSpm (700 - 30 cm^{-1})

A.3.3

Complexos de Cobalto (II)

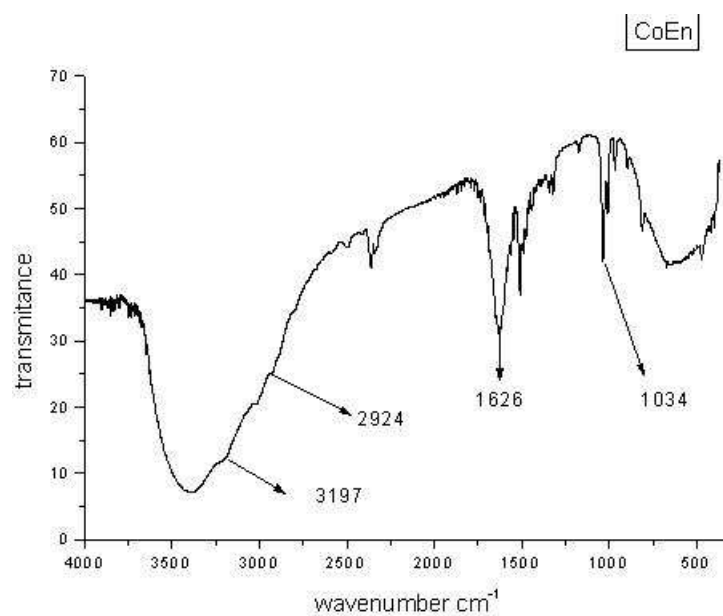


Figura A.75: IV do Complexo CoEn ($4000 - 450 \text{ cm}^{-1}$)

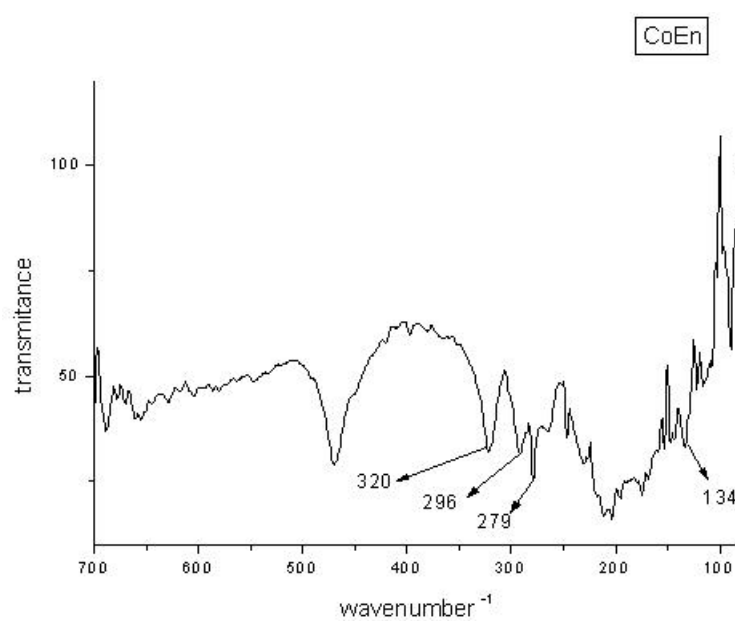


Figura A.76: IV do Complexo CoEn ($700 - 30 \text{ cm}^{-1}$)

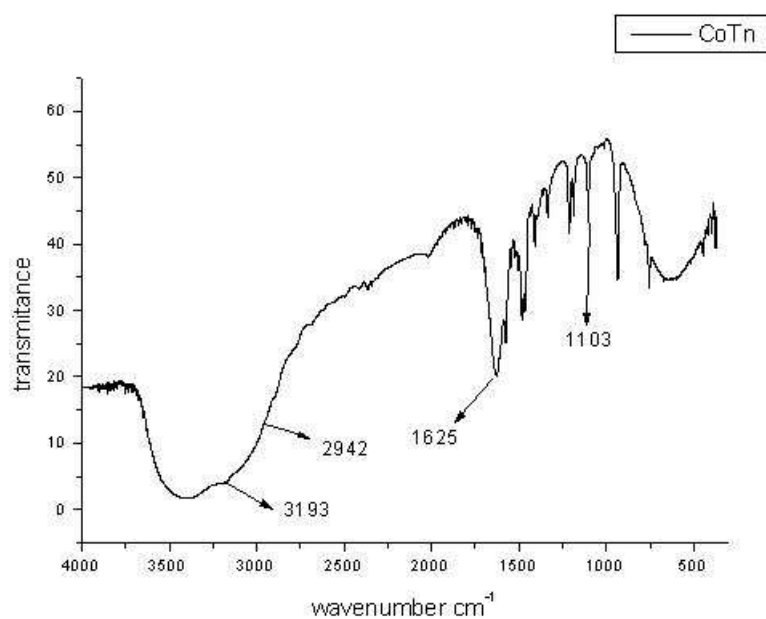


Figura A.77: IV do Complexo CoTn (4000 - 450 cm^{-1})

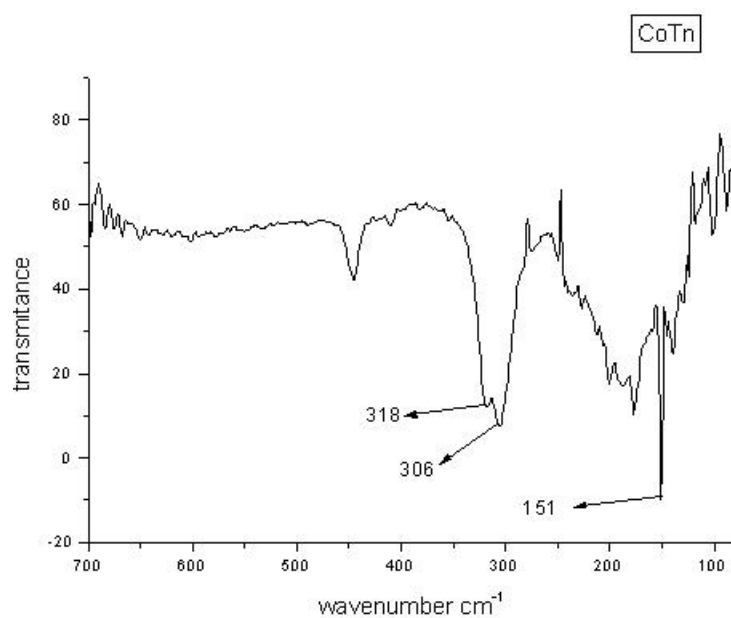


Figura A.78: IV do Complexo CoTn (700 - 30 cm^{-1})

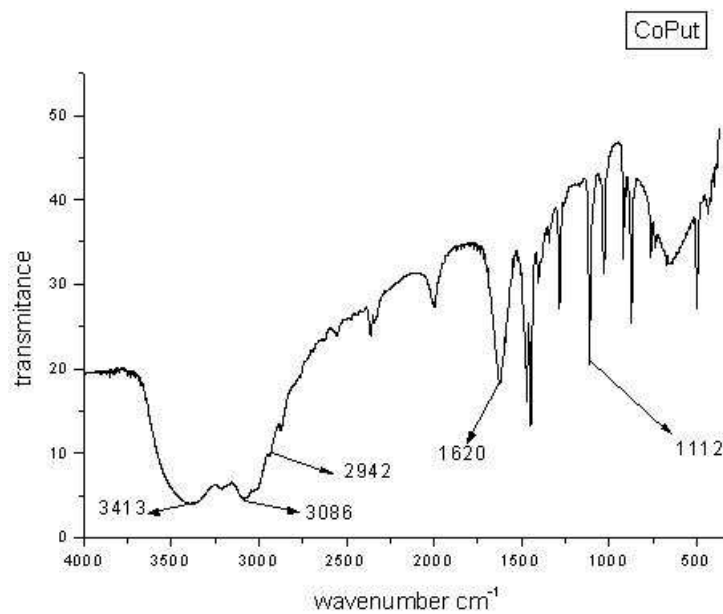


Figura A.79: IV do Complexo CoPut (4000 - 450 cm^{-1})

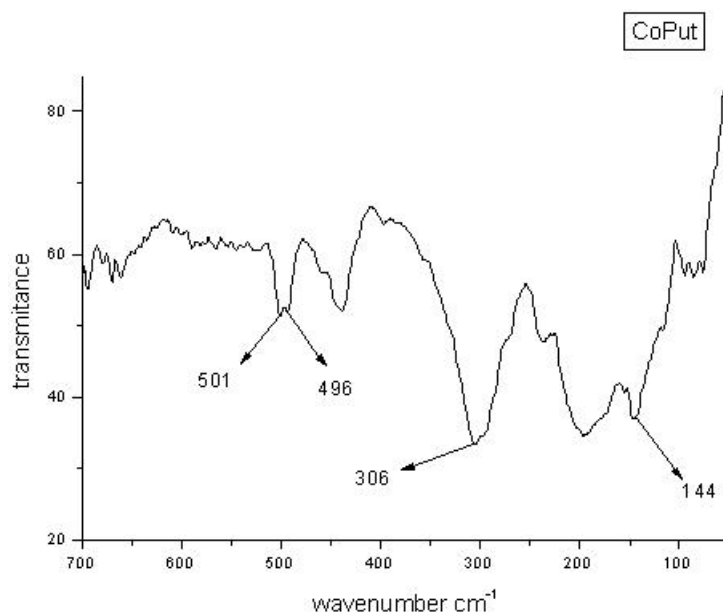


Figura A.80: IV do Complexo CoPut (700 - 30 cm^{-1})

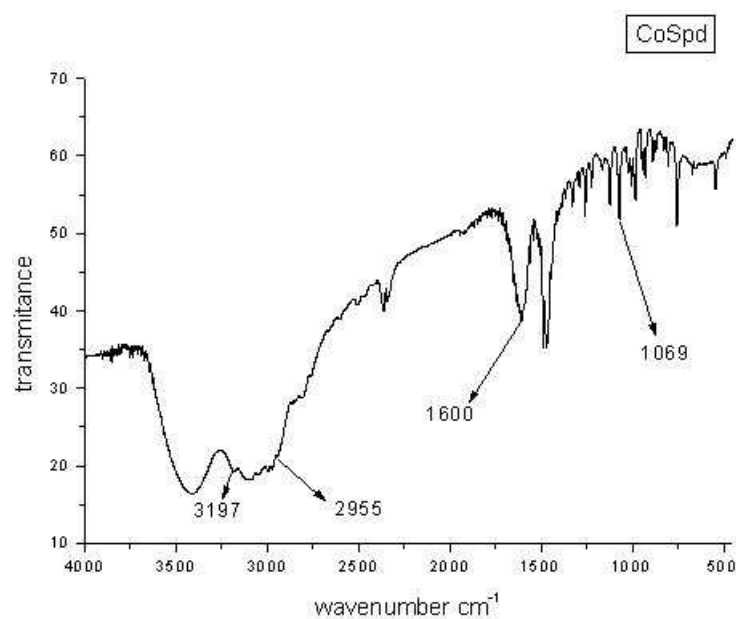


Figura A.81: IV do Complexo CoSpd ($4000 - 450 \text{ cm}^{-1}$)

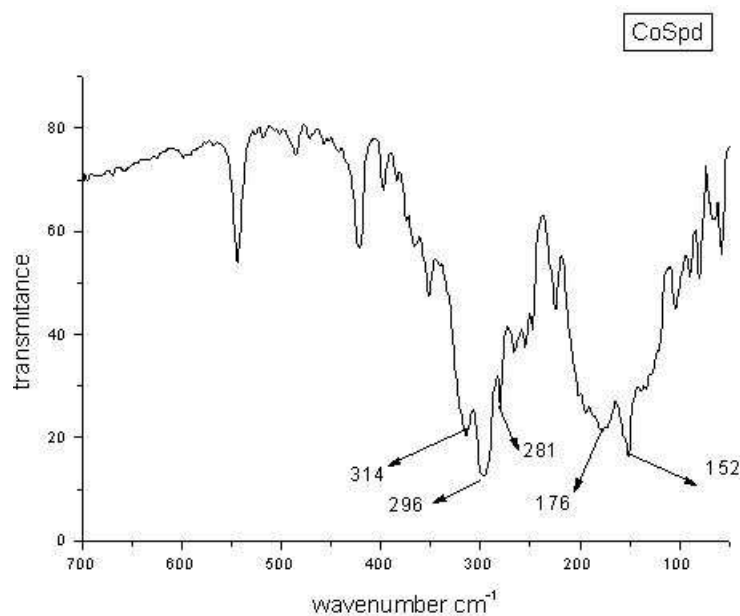


Figura A.82: IV do Complexo CoSpd ($700 - 30 \text{ cm}^{-1}$)

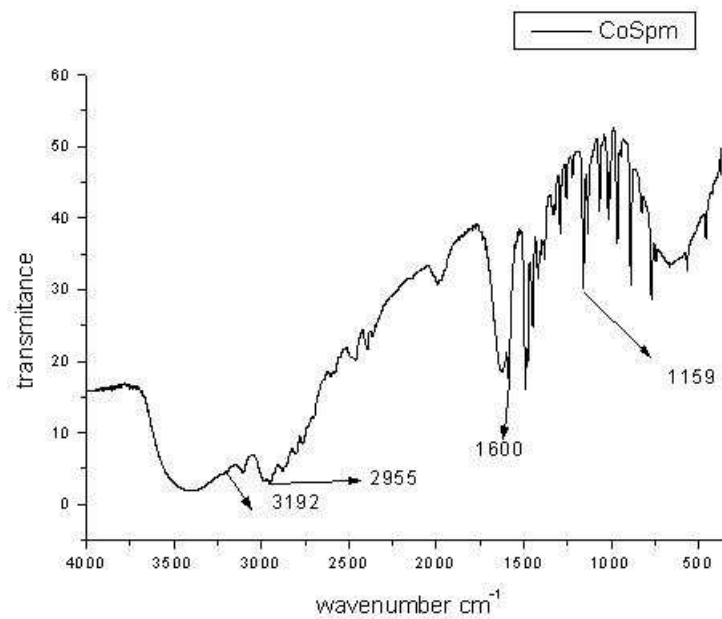


Figura A.83: IV do Complexo CoSpm (4000 - 450 cm^{-1})

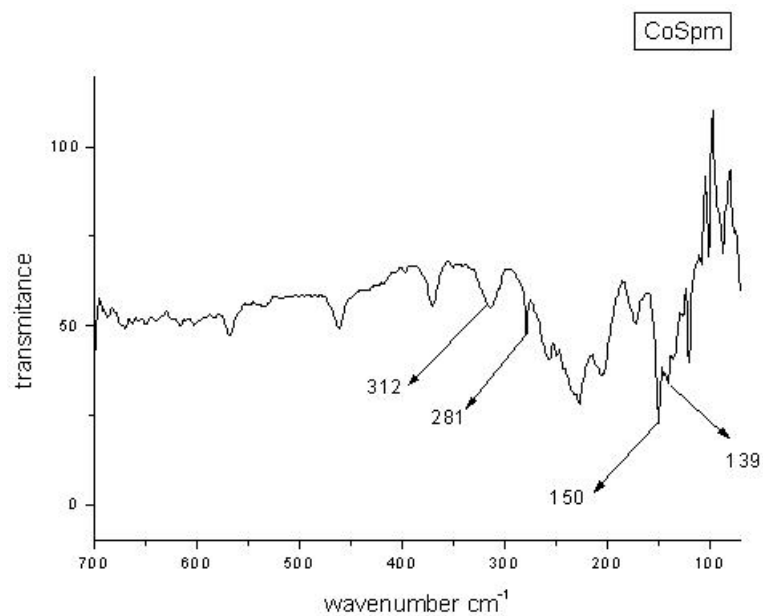
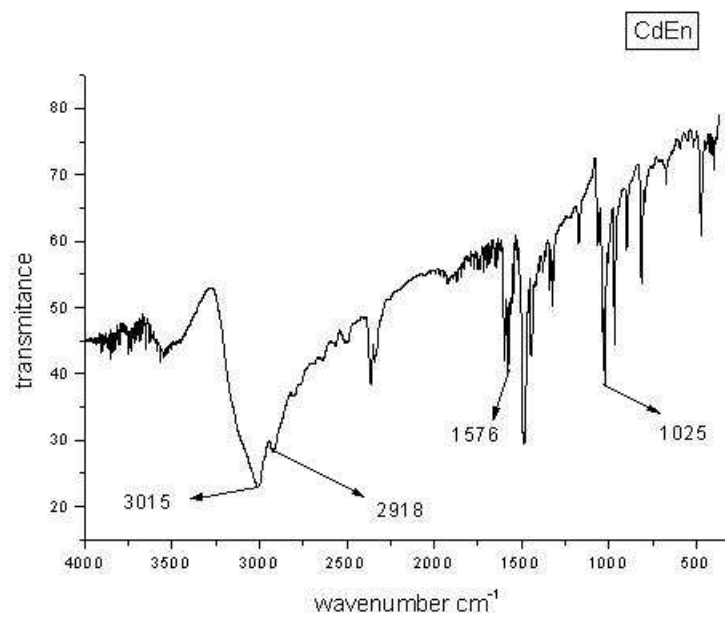
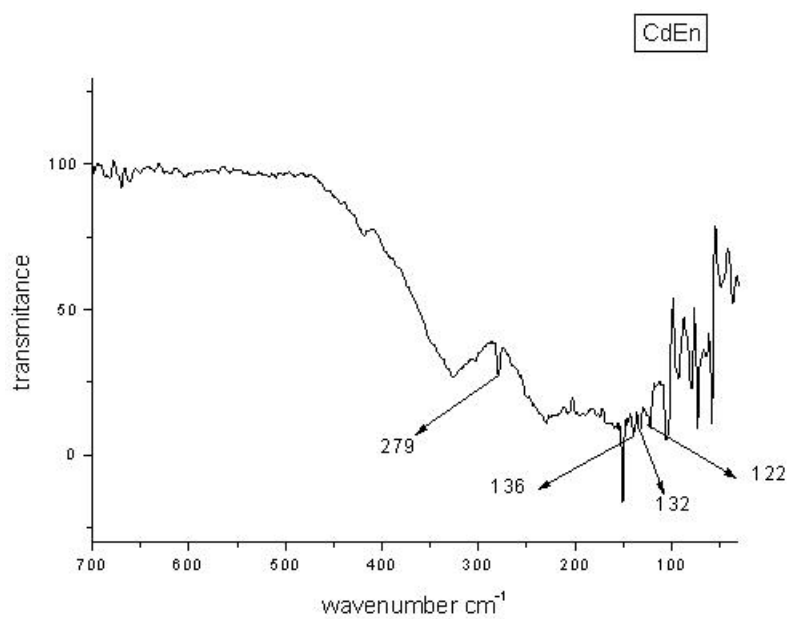


Figura A.84: IV do Complexo CoSpm (700 - 30 cm^{-1})

A.3.4

Complexos de cádmio (II)

Figura A.85: IV do Complexo CdEn ($4000 - 450 \text{ cm}^{-1}$)Figura A.86: IV do Complexo CdEn ($700 - 30 \text{ cm}^{-1}$)

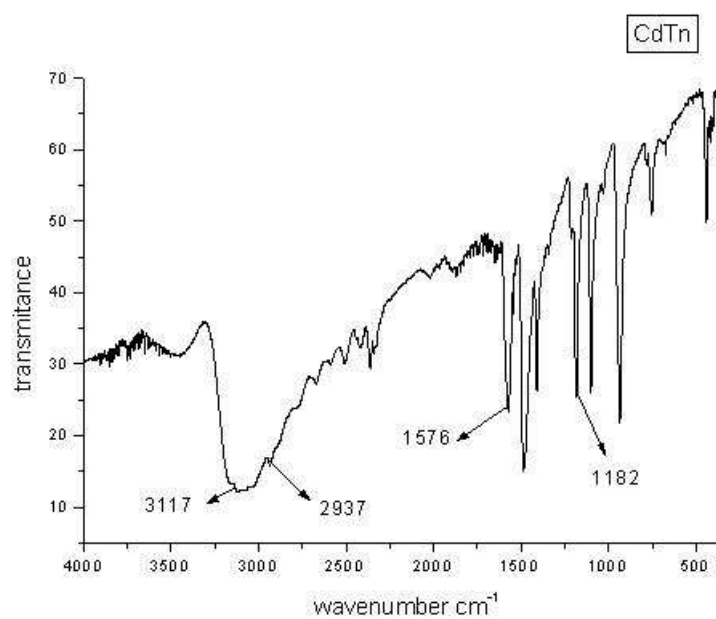


Figura A.87: IV do Complexo CdTn (4000 - 450 cm^{-1})

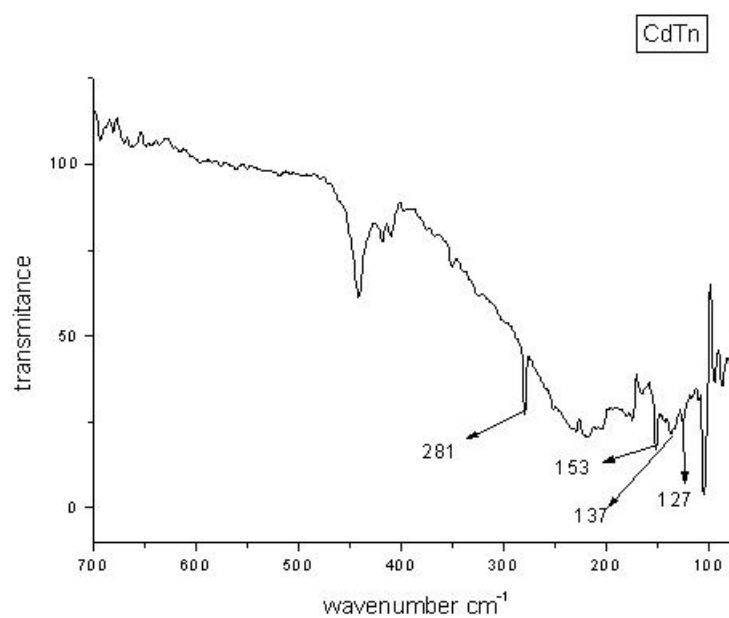


Figura A.88: IV do Complexo CdTn (700 - 30 cm^{-1})

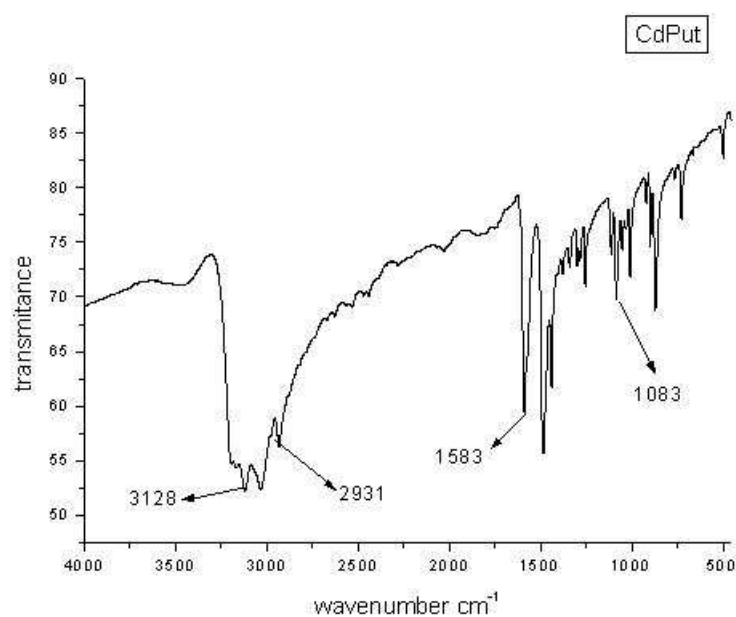


Figura A.89: IV do Complexo CdPut (4000 - 450 cm^{-1})

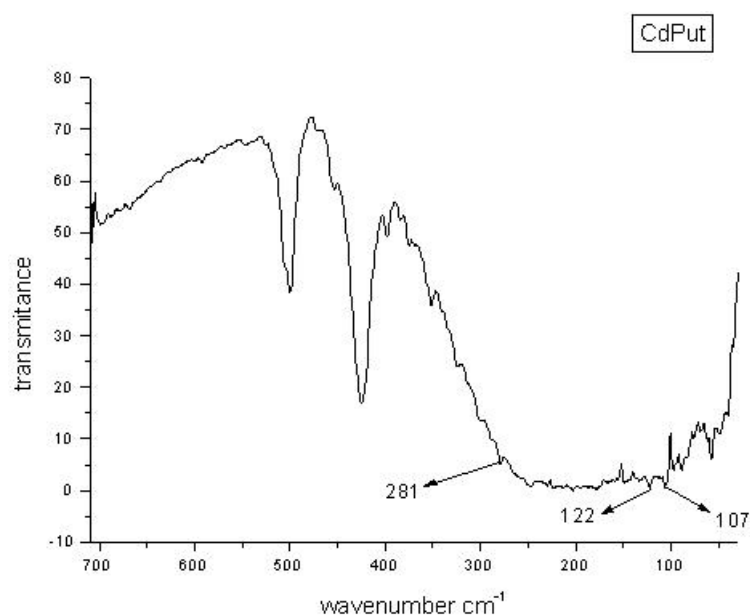


Figura A.90: IV do Complexo CdPut (700 - 30 cm^{-1})

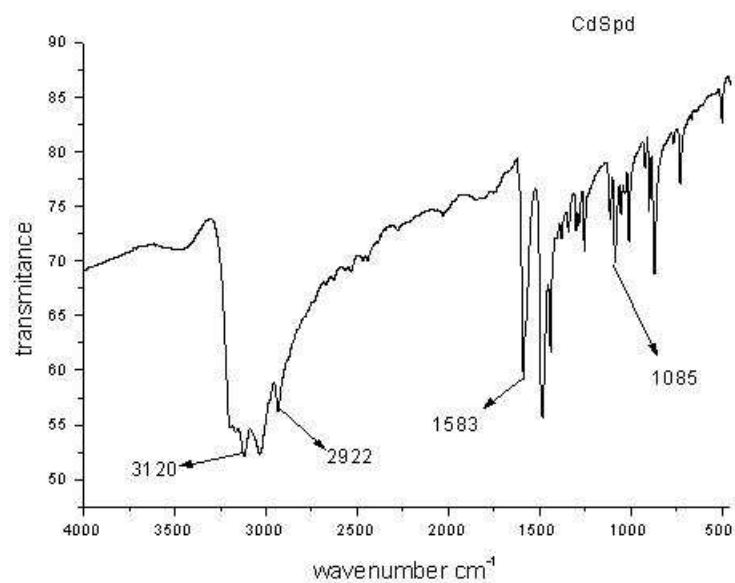


Figura A.91: IV do Complexo CdSpd (4000 - 450 cm^{-1})

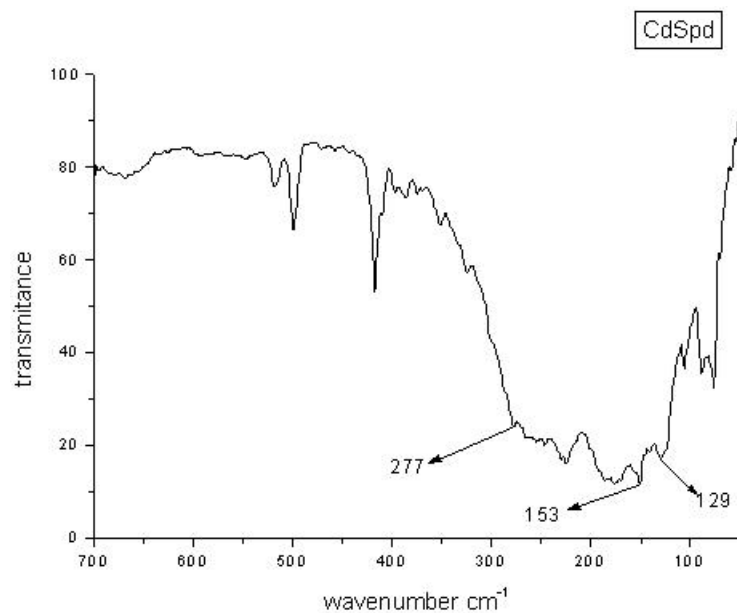


Figura A.92: IV do Complexo CdSpd (700 - 30 cm^{-1})

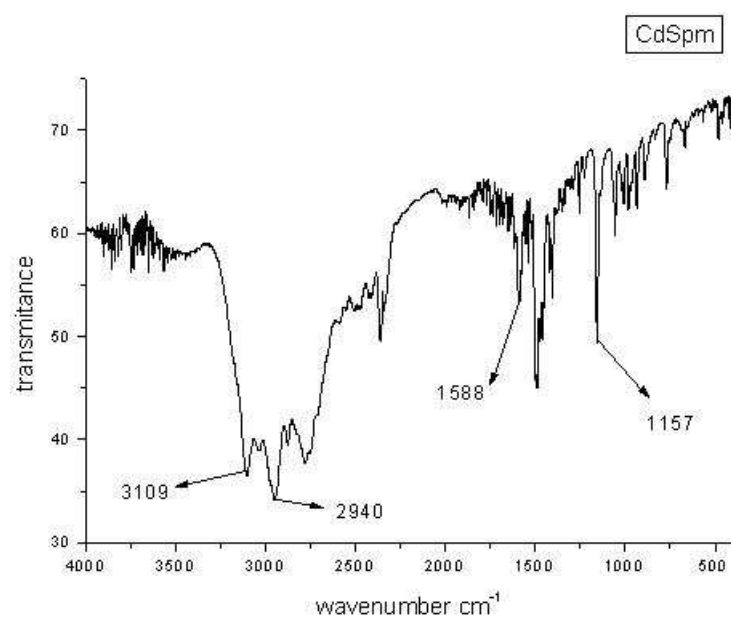


Figura A.93: IV do Complexo CdSpm (4000 - 450 cm^{-1})

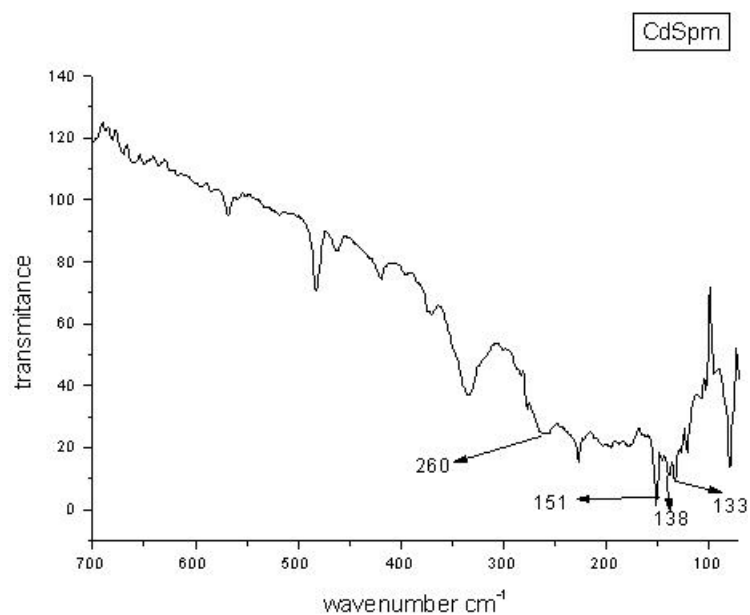


Figura A.94: IV do Complexo CdSpm (700 - 30 cm^{-1})

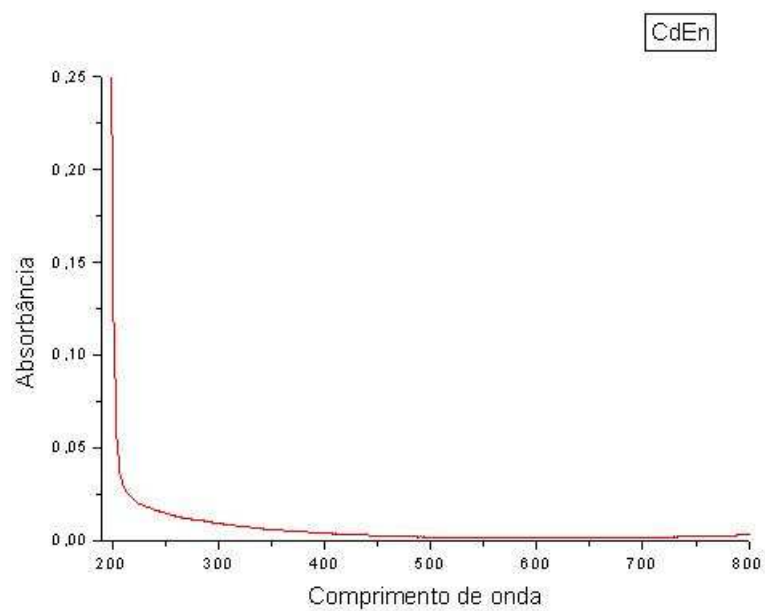
A.4**UV-Visível****A.4.1****Ligantes**

Figura A.95: UV do ligante En

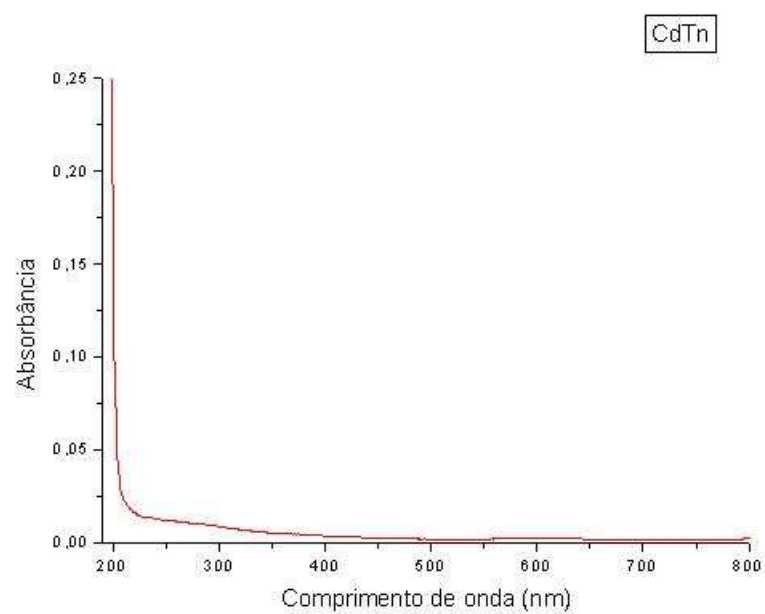


Figura A.96: UV do ligante Tn

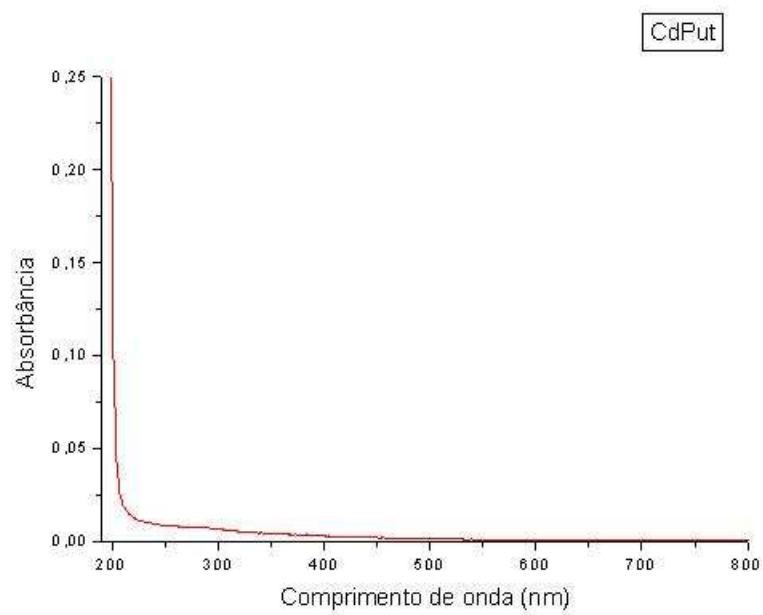


Figura A.97: UV do ligante Put

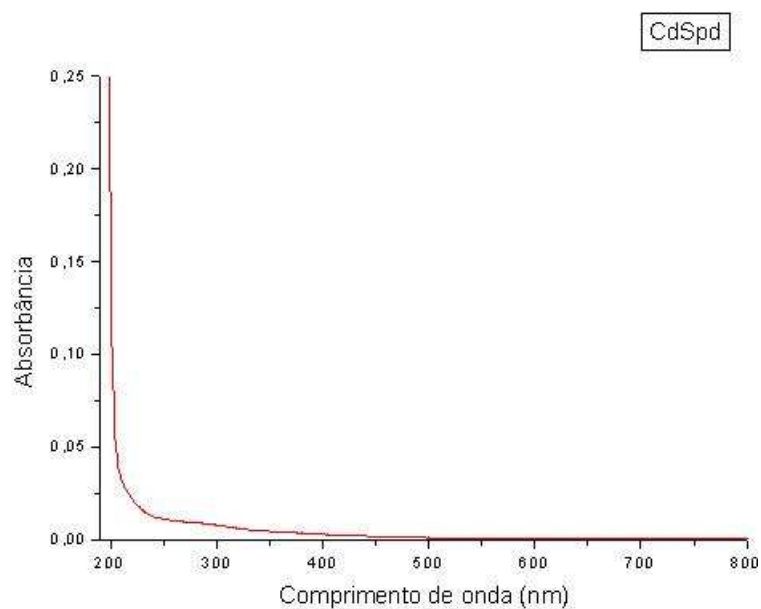


Figura A.98: UV do ligante Spd

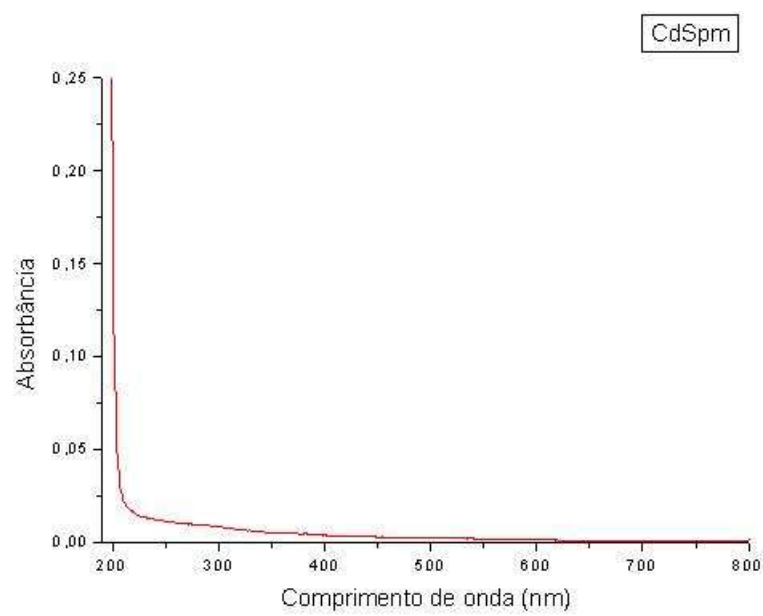


Figura A.99: UV do ligante Spm

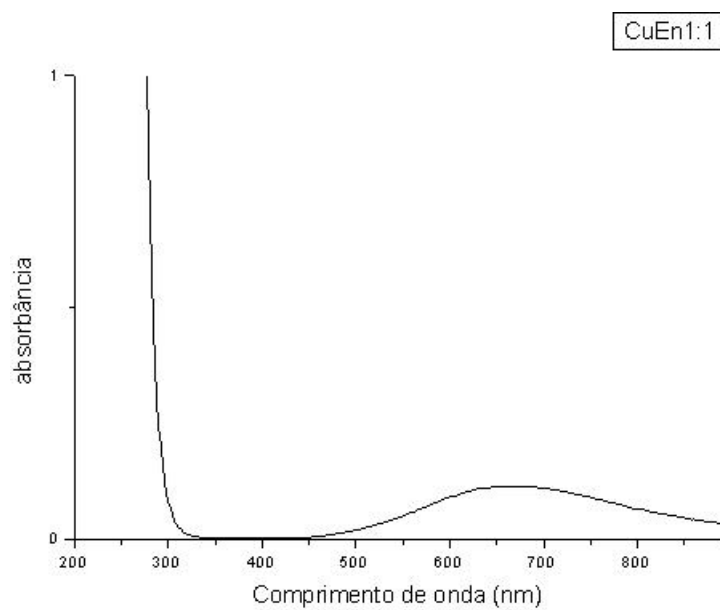
A.4.2**Complexos de cobre (II)**

Figura A.100: UV-Visível do complexo CuEn1:1

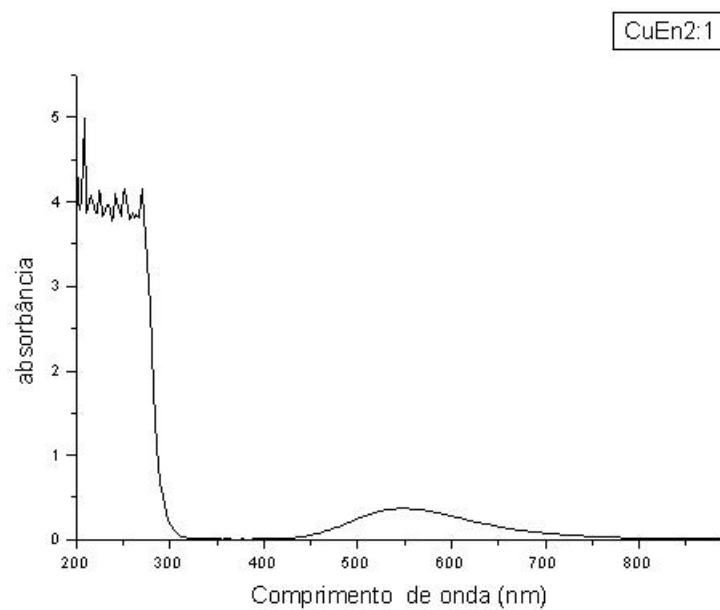


Figura A.101: UV-Visível do complexo CuEn2:1

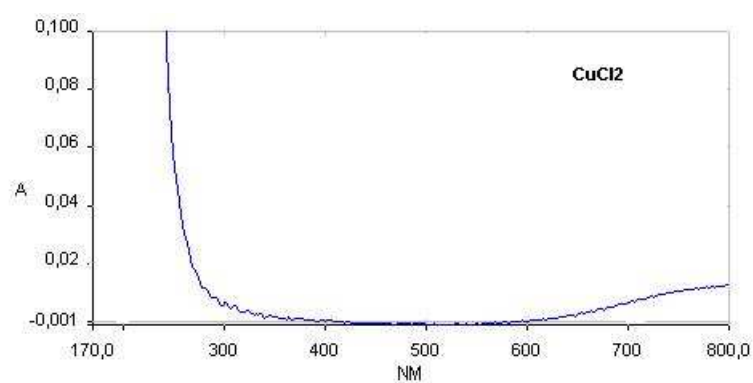


Figura A.102: UV-Visível do sal CuCl_2

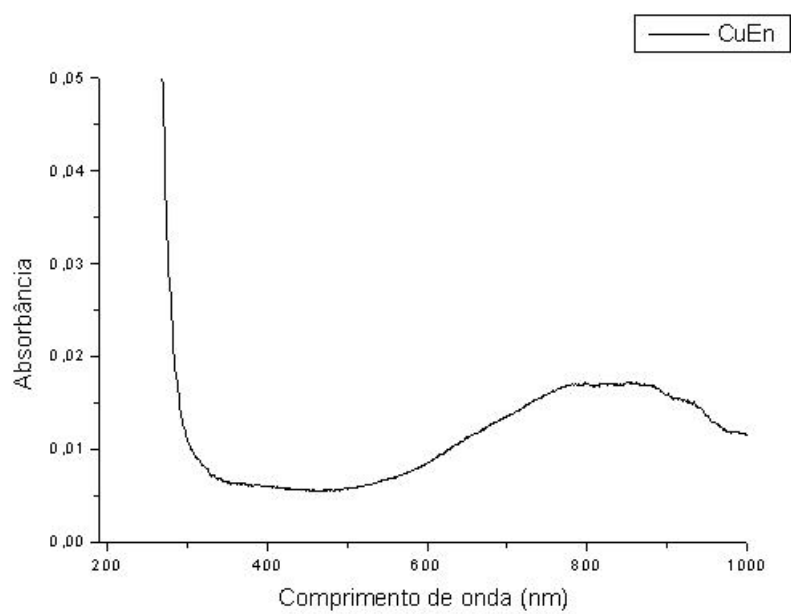


Figura A.103: UV-Visível do complexo CuEn

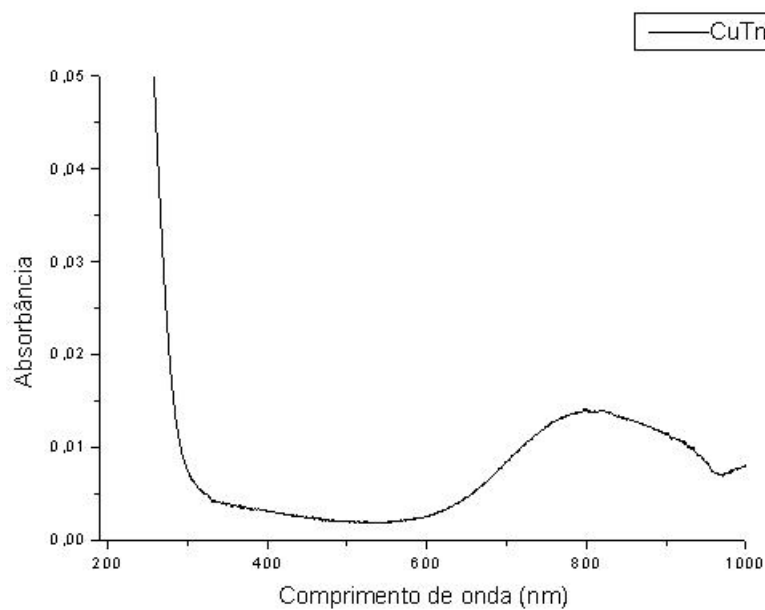


Figura A.104: UV-Visível do complexo CuTn

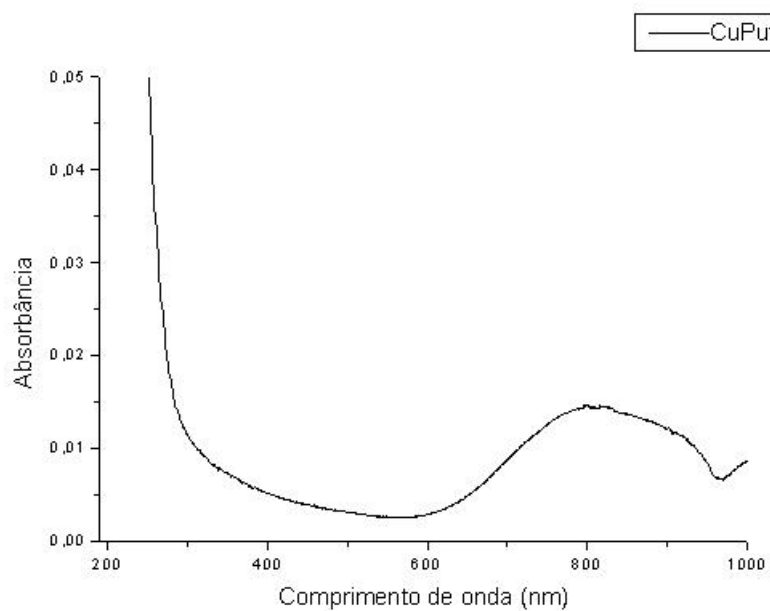


Figura A.105: UV-Visível do complexo CuPut

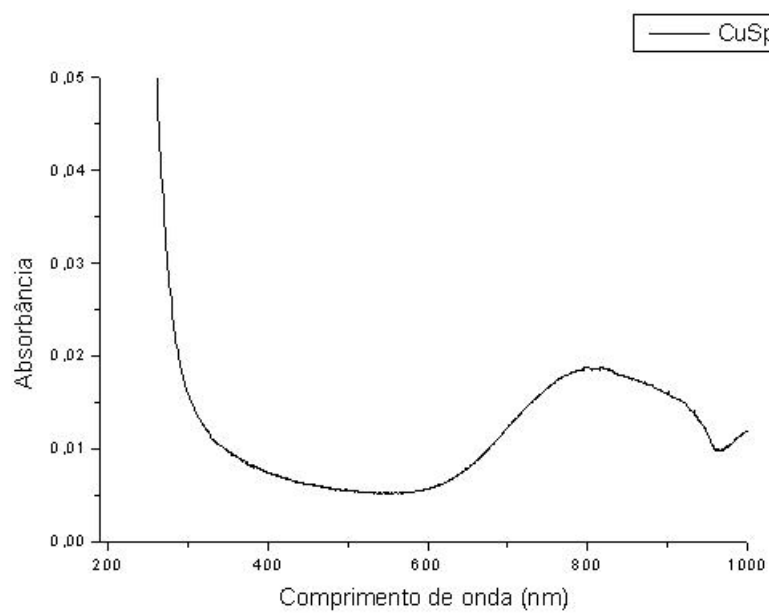


Figura A.106: UV-Visível do complexo CuSpd

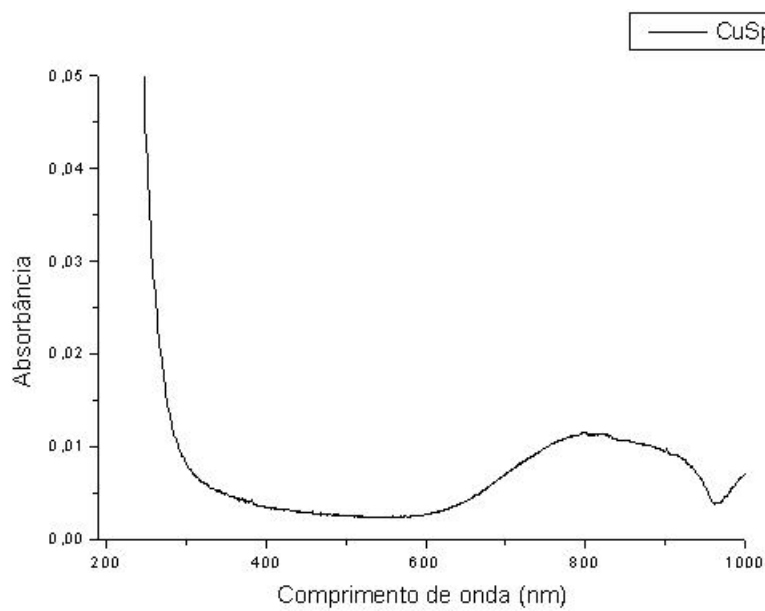


Figura A.107: UV-Visível do complexo CuSpm

A.4.3

Complexos de cobalto (II)

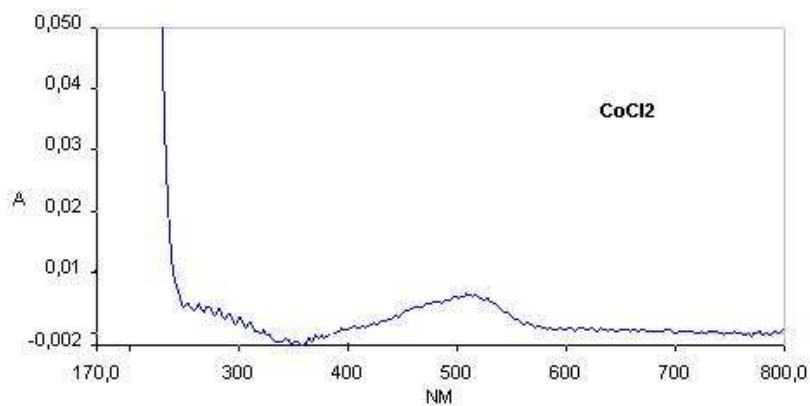


Figura A.108: UV do sal CoCl_2

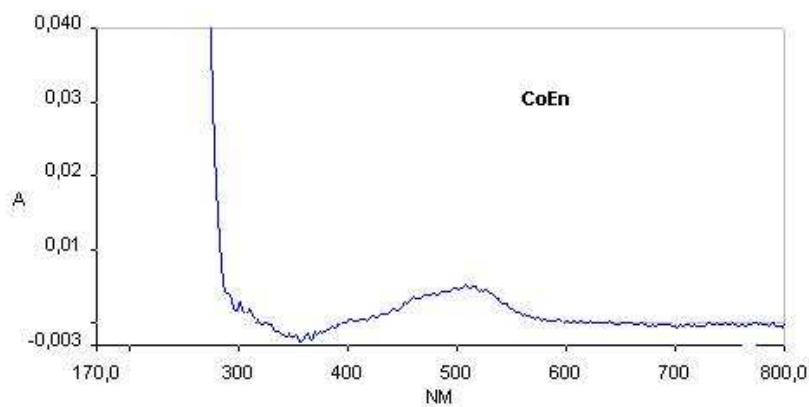


Figura A.109: UV-Visível do complexo CoEn

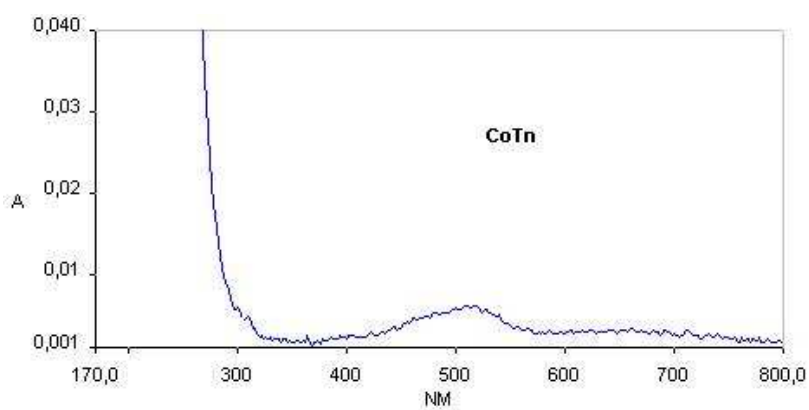


Figura A.110: UV-Visível do complexo CoTn

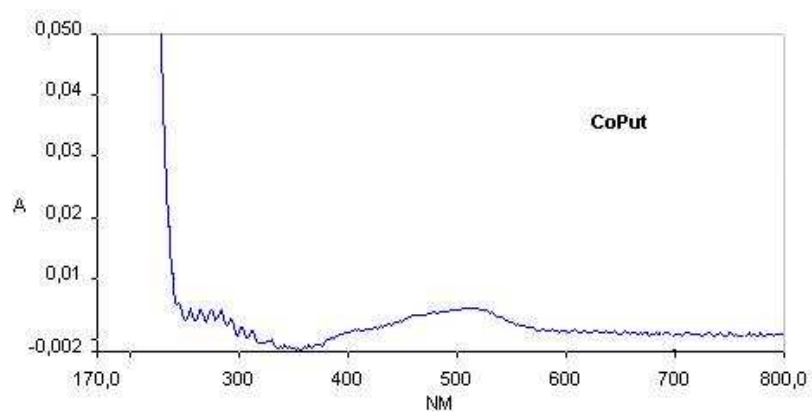


Figura A.111: UV-Visível do complexo CoPut

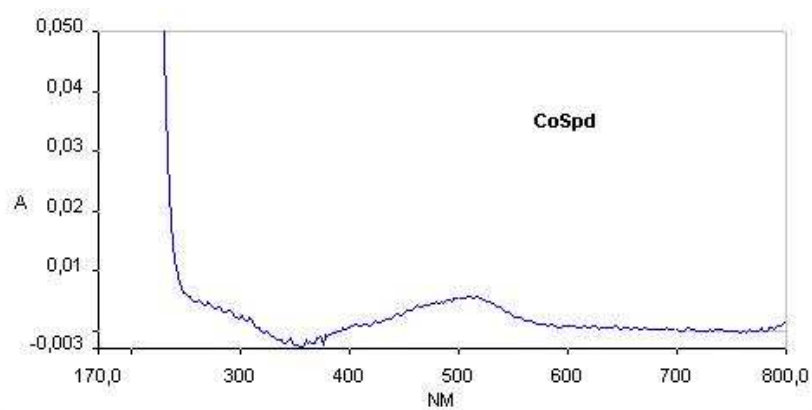


Figura A.112: UV-Visível do complexo CoSpd

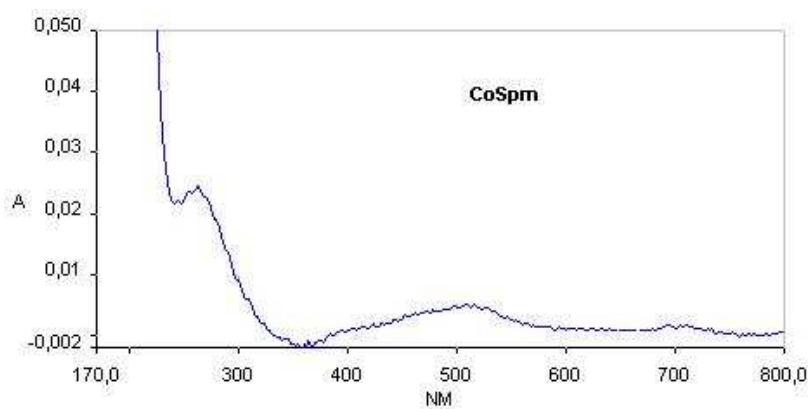


Figura A.113: UV-Visível do complexo CoSpm

A.4.4

Complexos de cádmio (II)

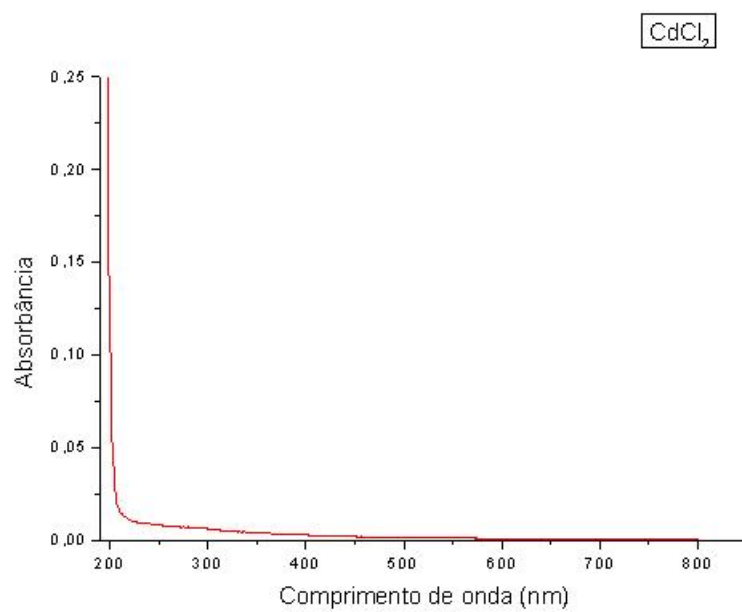


Figura A.114: UV do sal CdCl_2

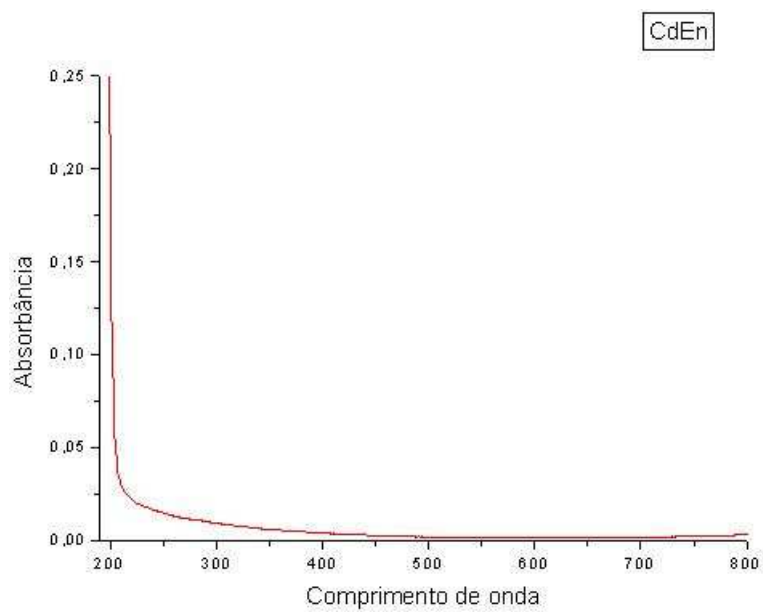


Figura A.115: UV do Complexo CdEn

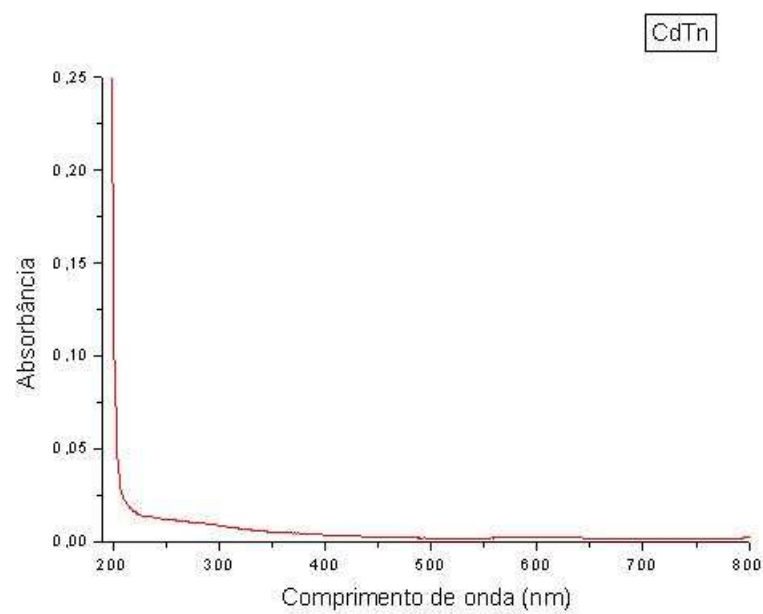


Figura A.116: UV do Complexo CdTn

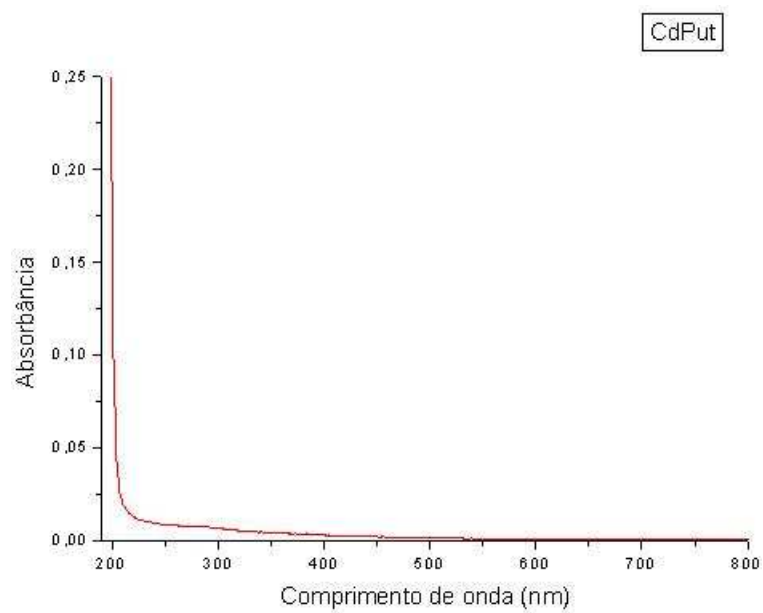


Figura A.117: UV do Complexo CdPut

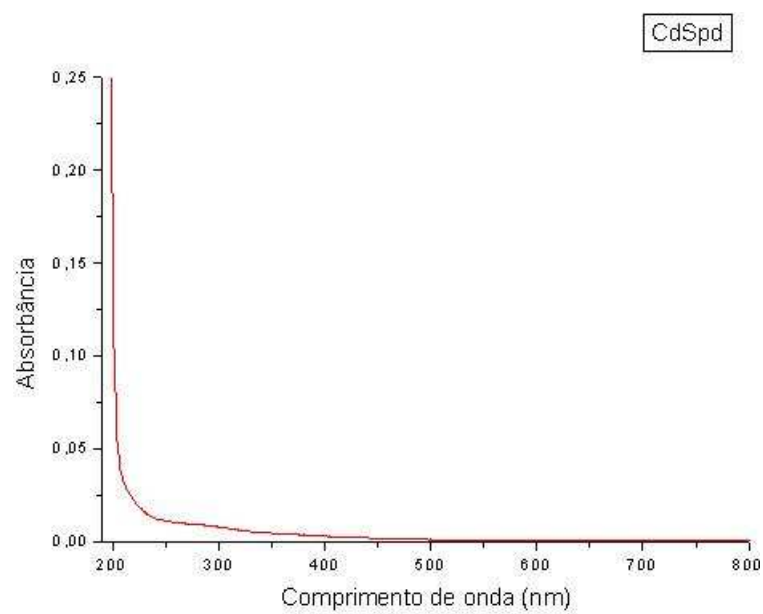


Figura A.118: UV do Complexo CdSpd

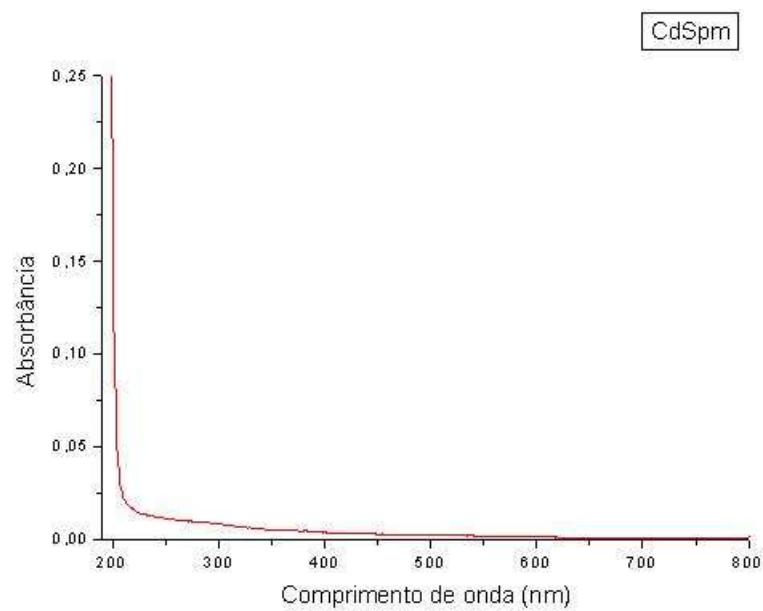
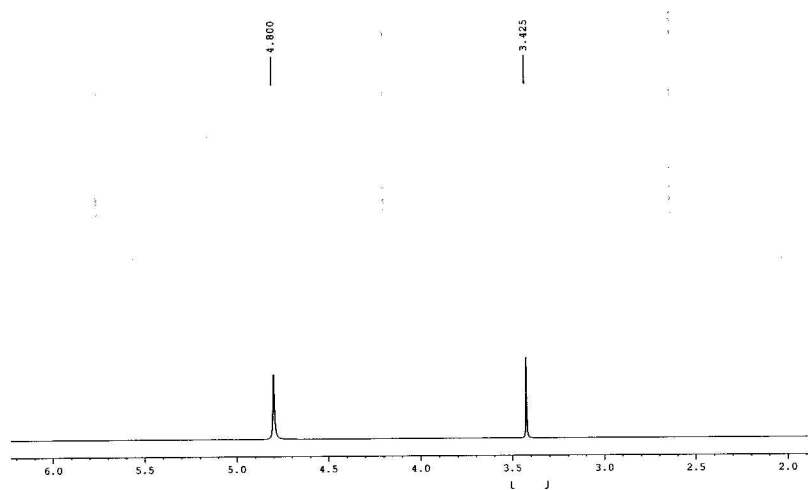
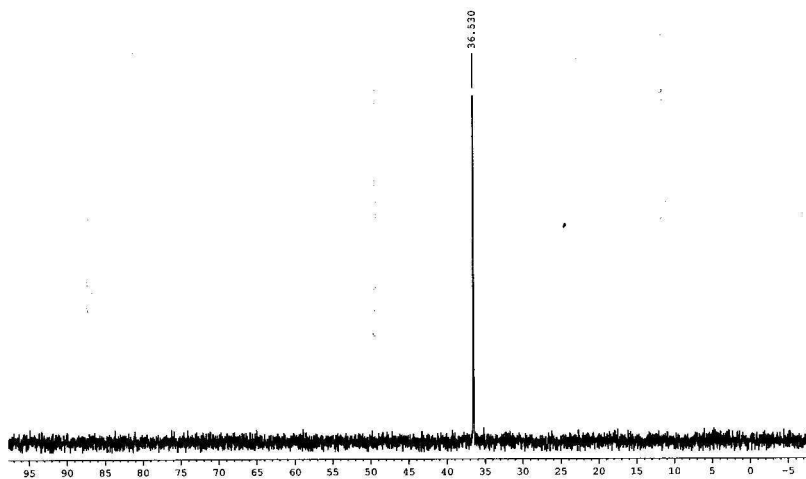


Figura A.119: UV do Complexo CdSpm

A.5**RMN de 1H e ^{13}C** **A.5.1****Ligantes**Figura A.120: RMN de 1H da EnFigura A.121: RMN de ^{13}C da En

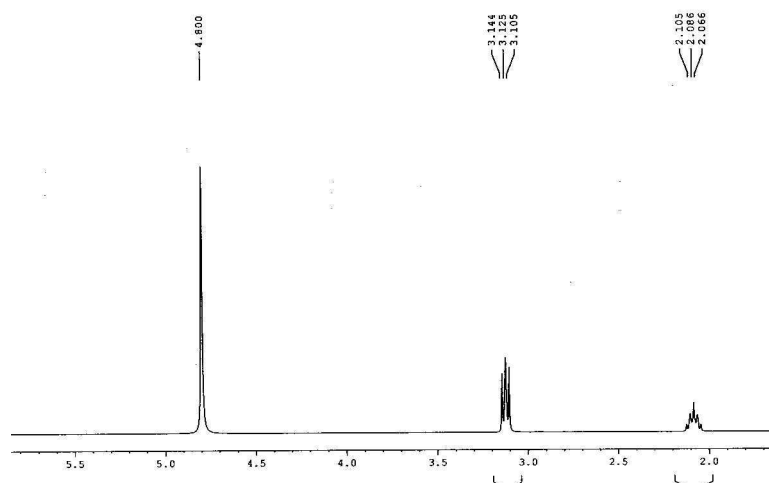


Figura A.122: RMN de ¹H da Tn

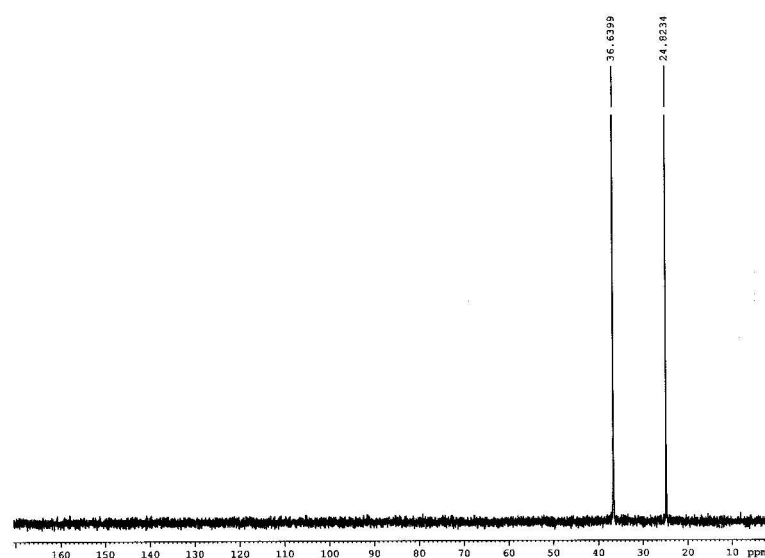


Figura A.123: RMN de ¹³C da Tn

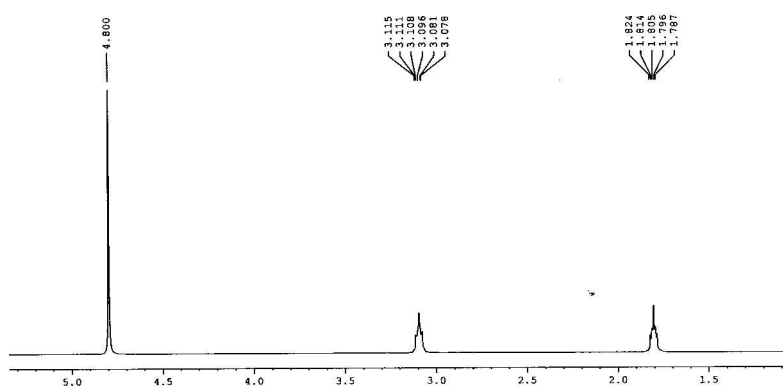


Figura A.124: RMN de ¹H da Put

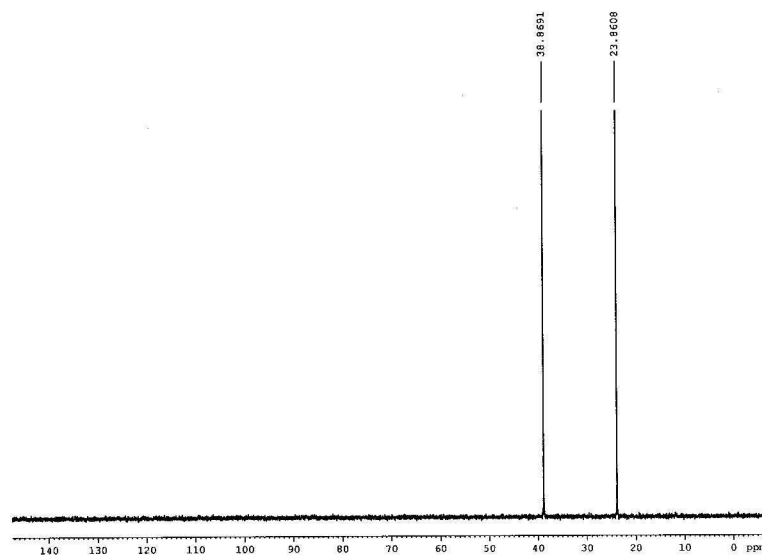


Figura A.125: RMN de ^{13}C da Put

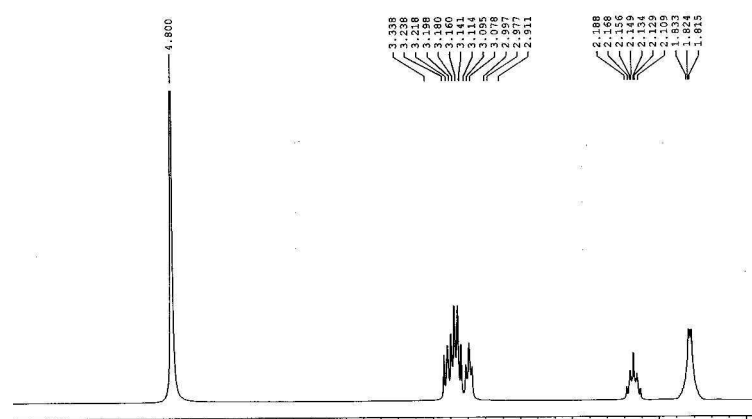


Figura A.126: RMN de ^1H da Spd

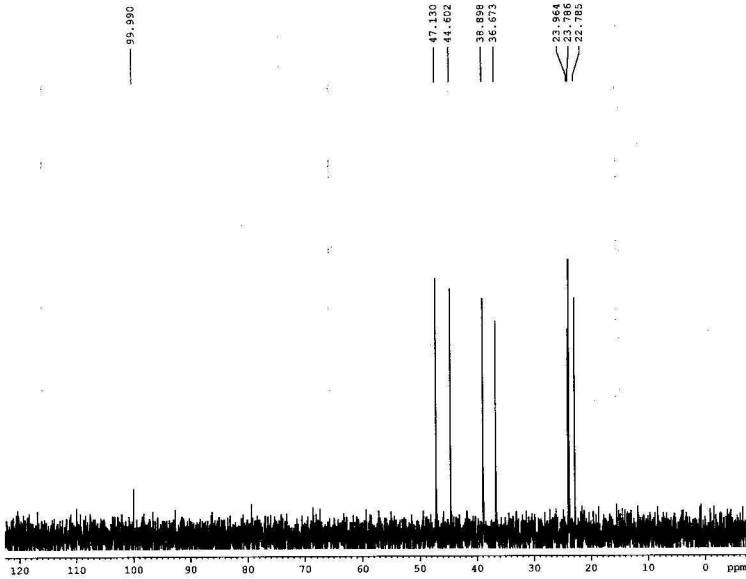


Figura A.127: RMN de ^{13}C da Spd

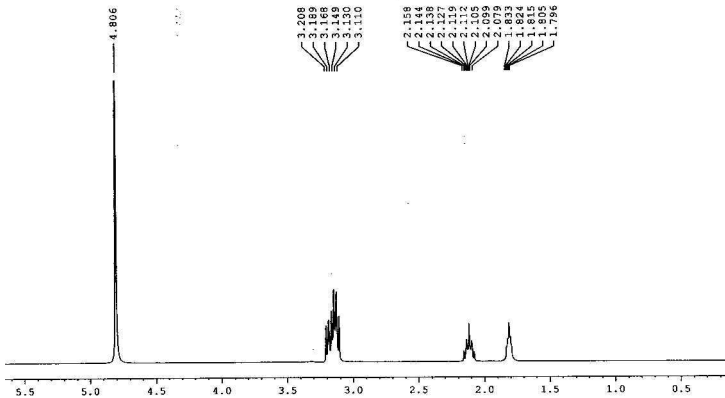


Figura A.128: RMN de ^1H da Spm

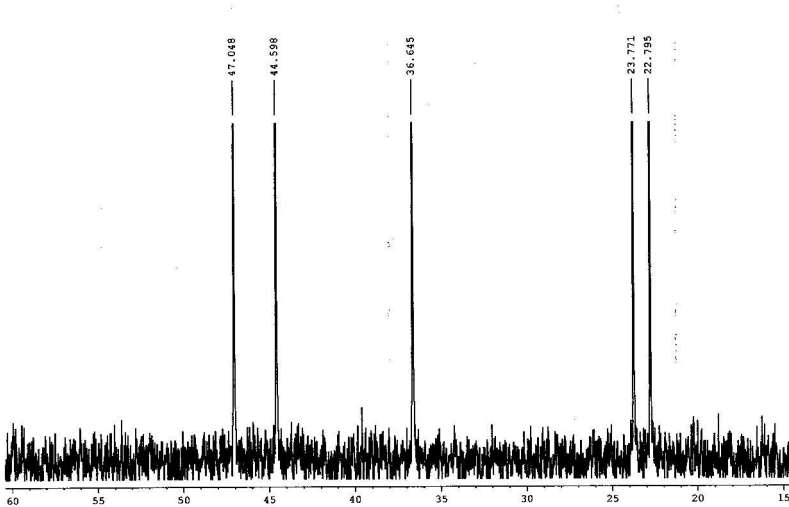


Figura A.129: RMN de ^{13}C da Spm

A.5.2

Complexos de cádmio

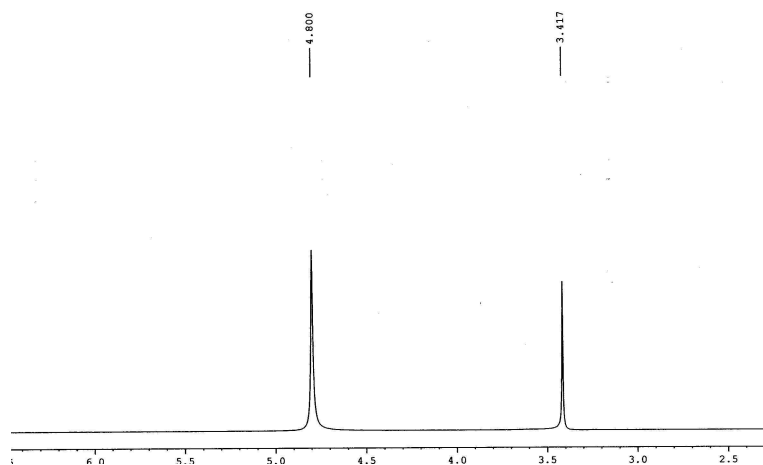


Figura A.130: RMN de ^1H do CdEn

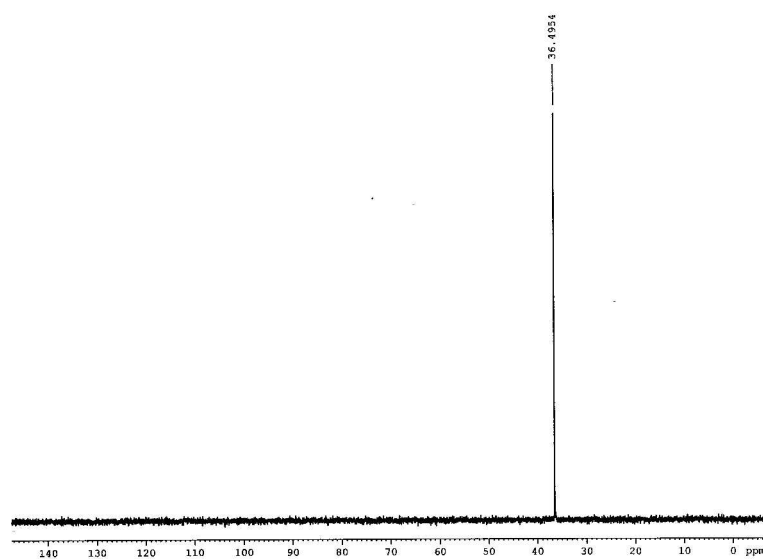


Figura A.131: RMN de ^{13}C do CdEn

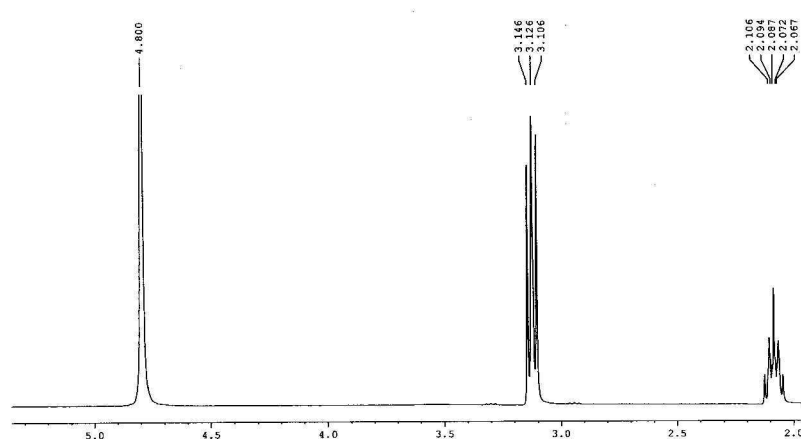


Figura A.132: RMN de ^1H do CdTn

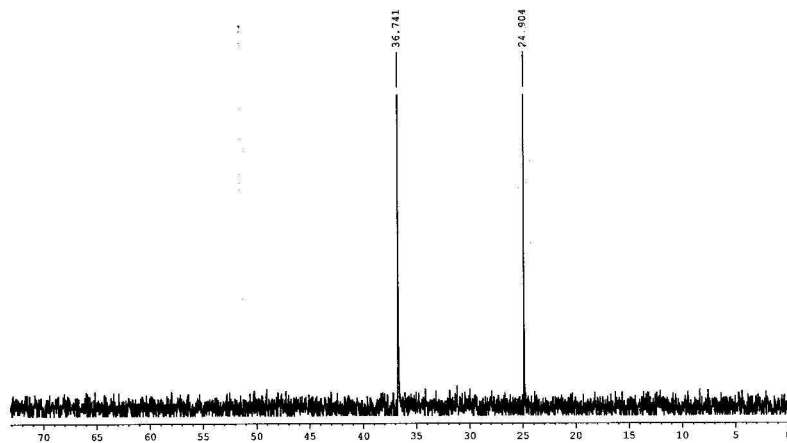


Figura A.133: RMN de ^{13}C do CdTn

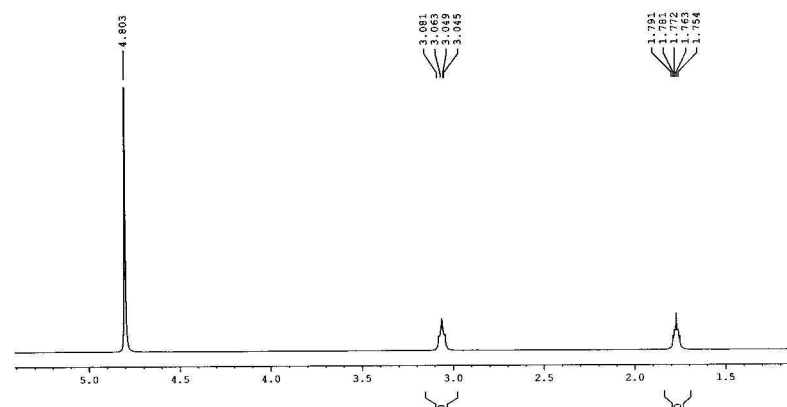


Figura A.134: RMN de ^1H do CdPut

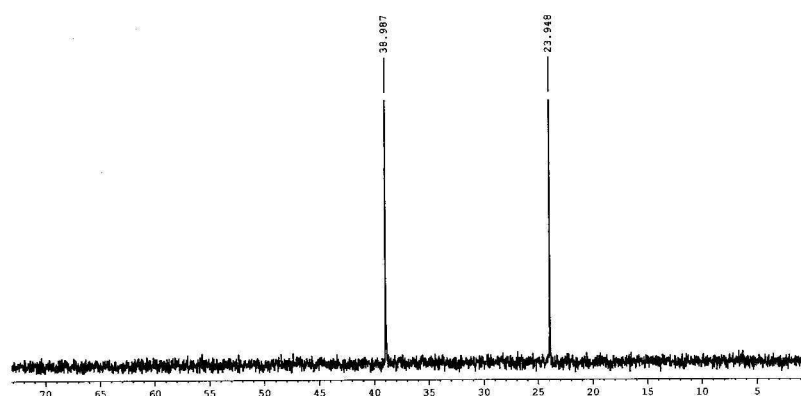


Figura A.135: RMN de ^{13}C do CdPut

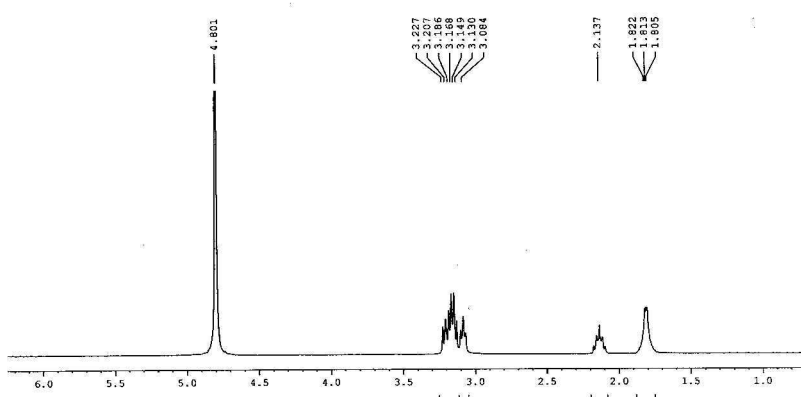


Figura A.136: RMN de ^1H do CdSpd

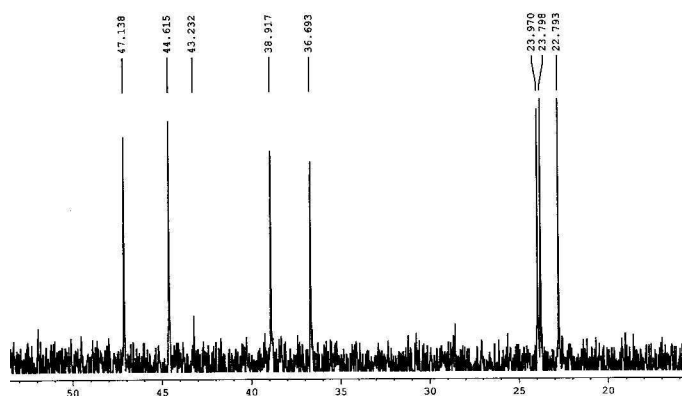


Figura A.137: RMN de ^{13}C do CdSpd

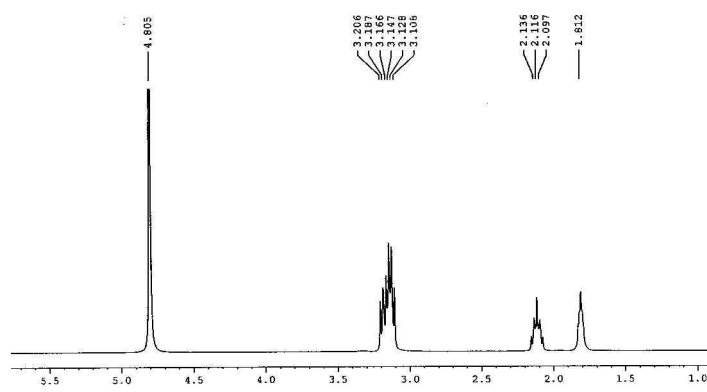


Figura A.138: RMN de ^1H do CdSpm

A.6

RMN de ^{113}Cd

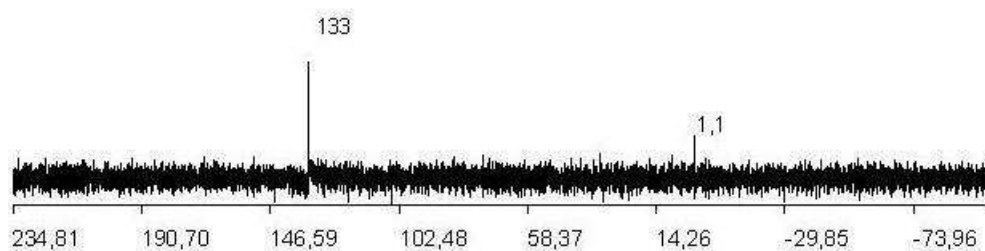


Figura A.139: RMN do Sal CdCl_2

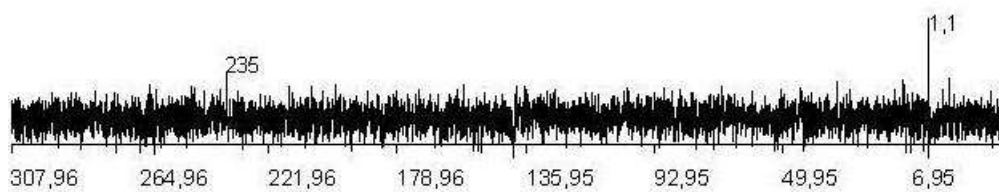


Figura A.140: RMN do Complexo CdEn

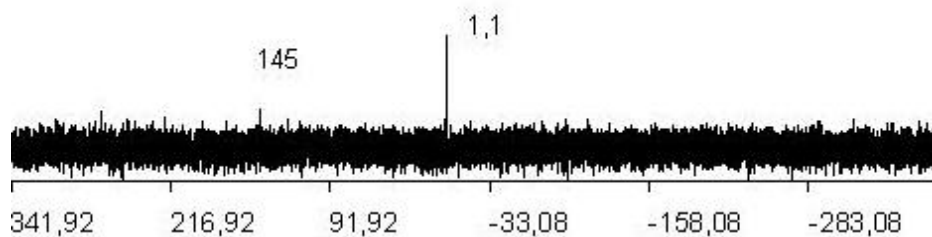


Figura A.141: RMN do Complexo CdTn

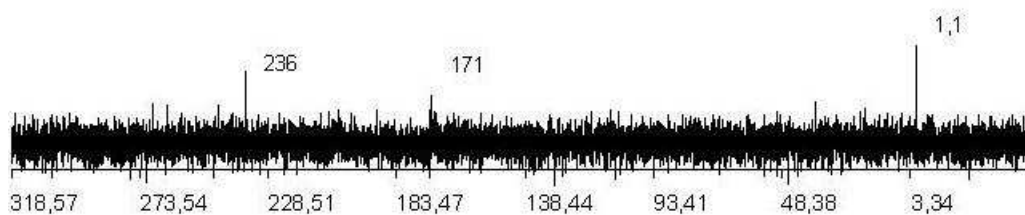


Figura A.142: RMN do Complexo CdSpd

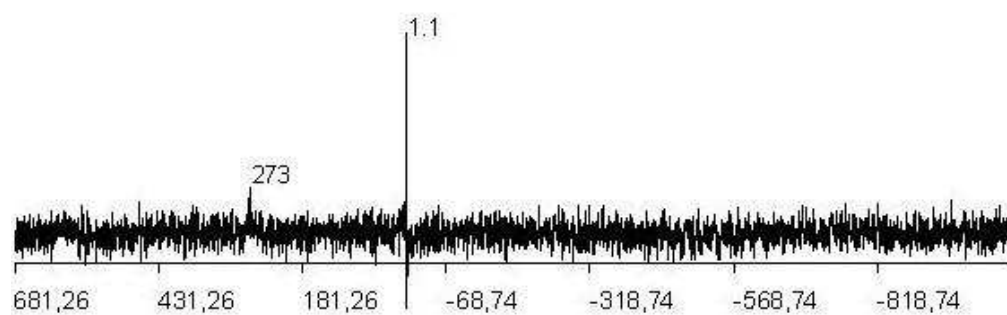


Figura A.143: RMN do Complexo CdSpm