Abstract of the Thesis entitled

"Structural, Magnetic, Catalytic And Spectroscopic Properties Of Metal Complexes Of Varying Nuclearity"

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This thesis includes the contents of seven published articles: *Cryst. Growth. Des.* **2016**, *16*, 3777–3790; *Polyhedron* **2015**, *87*, 98−108, **2014**, *77*, 39−46, and **2014**, *73*, 67−71; *Inorg. Chim. Acta* **2017**, *455*, 70−80, **2015**, *435*, 38−45, and **2014** *410*, 65−75.

This thesis is comprised of eight chapters. Brief reviews of the relevant topics and objective and scope of the thesis are discussed in **Chapter 1**.

Eight single / double compartmental Schiff base ligands have been used. Each ligand is a 2:1 aldehyde:diamine condensation product: 3-methoxysalicylaldehyde–ethylenediamine (H_2L^1), 3-ethoxysalicylaldehyde–ethylenediamine (H_2L^2), 3-methoxysalicylaldehyde–*o*-phenylenediamine (H_2L^3), 3-methoxysalicylaldehyde– *trans*-1,2-diaminocyclohexane (H_2L^4), 2-hydroxyacetophenone–2,2-dimethyl-1,3-diaminopropane (H_2L^5), salicylaldehyde–2,2-dimethyl–1,3-diaminopropane (H_2L^6), 3-ethoxysalicylaldehyde–2,2-dimethyl-1,3-diaminopropane (H_2L^7), and salicylaldehyde–1,3-diaminopropane (H_2L^8). All the thirty five (**35**) compounds that are reported in this thesis in **Chapters 2–8** have been synthesized and characterized by single crystal X-ray structure determination. In addition to structural studies, other studies/aspects include: Catechol oxidase activity (**Chapters 4** and **5**); ESI-MS (**Chapters 4, 5,** and **7**), magnetic properties (**Chapter 8**), lone pair functionality (**Chapter 7**), electrochemistry (**Chapter 4**), and diffuse reflectance spectra (**Chapters 3** and **6**).

Chapter 2 deals with ten $Cu^{II}Sn^{IV}$ / $Cu^{II}Sn^{II}$ salts / cocrystals / salt cocrystals of composition $[CuL^1]_2\cdot[SnMe_2Cl_4]^{2-}\cdot(H_2ED)^{2+}$ (**1**), $[CuL^1]_2\cdot[SnEt_2Cl_4]^{2-}\cdot(H_2ED)^{2+}\cdot0.5H_2O$ (**2**), $[CuL^1]_2\cdot[Sn(n\text{-}Bu)_2Cl_4]^{2-}\cdot(H_2ED)^{2+}$ (**3**), $[CuL^1]_2\cdot[SnPh_2Cl_4]^{2-}\cdot(H_2ED)^{2+}$ (**4**), $[CuL^1]_2\cdot[SnPh_2Cl_4]^{2-}\cdot(H_2ED)^{2+}\cdot2MeOH$ (**5**), $[CuL^2]_2\cdot[SnMe_2Cl_2(H_2O)_2]\cdot0.2H_2O$ (**6**), $[CuL^2]\cdot[Sn(n\text{-}Bu)_2Cl_2(H_2O)]$ (**7**), $[CuL^2]_2\cdot[SnPh_2Cl_4]^{2-}\cdot(H_2ED)^{2+}$ (**8**), $[CuL^1SnCl]^+\cdot[SnCl_3]^-$ (**9**), and $[CuL^2SnCl]^+\cdot[SnCl_3]^-$ (**10**) (ED = 1,2-ethylenediamine).

Chapter 3 deals with $[\{Cu^{II}L^1\}(Me_2NH_2)](ClO_4)$ (**11**); $[\{Cu^{II}L^3\}(Me_2NH_2)](ClO_4)$ (**12**); $[\{Cu^{II}L^4\}(Me_2NH_2)](ClO_4)$ (**13**); $[\{Cu^{II}L^1\}_2(enH_2)](ClO_4)_2$ (**14**); $[\{Cu^{II}L^3\}_2(opdaH_2)](ClO_4)_2\cdot2H_2O$ (**15**) (enH_2/ $opdaH_2$ = diprotonated ethylenediamine / *o*-phenylenediamine); $[\{Cu^{II}L^4\}(MeOH_2)](ClO_4)$ (**16**).

Chapter 4 deals with $[Mn^{III}L^2(OAc)(H_2O)]\cdot DMF$ (**17**), $[Mn^{III}L^2(Cl)(H_2O)]\cdot 2H_2O$ (**18**), $[Mn^{III}L^2(N_3)(H_2O)]$ (**19**), $[Mn^{III}L^2(NCS)(H_2O)]$ (**20**), and $[Mn^{III}L^2(NCSe)(H_2O)]\cdot MeCN$ (**21**).

Chapter 5 deals with $[Co^{III}L^2(N_3)_2\supset(H_3O^+)]\cdot 2MeOH$ (**22**) and $[Co^{III}L^2(NCS)(H_2O)]\cdot DMF\cdot H_2O$ (**23**).

Chapter 6 deals with of two mononuclear compounds of composition $[Cu^{II}L^5]\cdot MeOH$ (**24**) and $[Ni^{II}L^5]$ and six heteronuclear complexes of composition $[Cu^{II}(acetone)L^5(U^{VI}O_2)(NO_3)_2]\cdot 1.5CH_3COCH_3$ (**25**), $[Cu^{II}(H_2O)L^7(U^{VI}O_2)(NO_3)_2]\cdot MeCN$ (**26**), $[Ni^{II}L^5(U^{VI}O_2)(NO_3)_2]\cdot CH_3COCH_3$ (**27**), $[\{Cu^{II}L^5Ag^{I}(NO_3)\}_2]$ (**28**), $[\{Cu^{II}L^6Ag^{I}(NO_3)\}_2]$ (**29**), and $[(Cu^{II}L^6)_2Cd^{II}(ClO_4)_2]$ (**30**).

Chapter 7 deals with of two trinuclear compounds, $[(Cu^{II}L^8)_2Pb^{II}(ClO_4)_2]$ (**31**) and $[(Cu^{II}L^6)_2Pb^{II}(NO_3)_2]$ (**32**), one dimer of trinuclear compound, $[\{(Cu^{II}L^6)_2Pb^{II}\}_2(\mu$-adipate)$](ClO_4)_2\cdot 2H_2O$ (**33**), and one trinuclear based 1-D coordination polymer, $[(Cu^{II}L^6)_2Pb^{II}(\mu_{1,5}$-dicyanamide$)_2]_n$ (**34**).

Chapter 8 deals with one-dimensional coordination polymer of copper(II) of composition $[Cu^{II}_6(N,N\text{-diEten})_2(\mu_{1,1}\text{-}N_3)_8(\mu_{1,1,1}\text{-}N_3)_2(\mu_{1,3}\text{-}N_3)_2]_n$ (**35**), where N,N-diEten is N,N-diethylethylenediamine.

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