

MASTER'S THESIS

Synthesis, characterization and properties of luminescent rigid-rod organometallic acetylide materials

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**Synthesis, Characterization and
Properties of Luminescent Rigid-Rod
Organometallic Acetylide Materials**

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A thesis submitted in partial fulfillment of the requirements
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Abstract

Reaction of *trans*-[PtCl₂(PBU₃)₂] with the terminal alkyne ligands **I** and **II** in diisopropylamine in the presence of catalytic amount of CuI afforded mono-platinum(II) diacetylide complexes **1** and **2**. Reaction of [Co₂(CO)₈] with **I** and **II** in *n*-hexane at 0°C yielded two new cobalt complexes **3** and **4**. Treatment of [(Et₃NH)(μ-CO)(μ-S^tBu)Fe₂(CO)₆] with **I** and **II** in refluxing THF gave the diiron complexes **5** and **6** in moderate yield. Triruthenium and triosmium carbonyl clusters ([M₃(CO)₁₀(NCMe)₂], M = Ru, Os) react with **I** and **II** in CH₂Cl₂ at room temperature to produce the alkyne-coordinated triruthenium and triosmium cluster complexes **7–10**. Reactions of the diterminal alkyne ligands **III–XII** and **XV** with triphenylphosphinegold(I) chloride [(Ph₃P)AuCl], anthracenyldiphenylphosphinegold(I) chloride [AnPh₂PAuCl], trimethylphosphinegold(I) chloride [(Me₃P)AuCl], methylmercury(II) chloride [MeHgCl] and phenylmercury(II) chloride [PhHgCl] in a basic medium at room temperature afforded the dimeric complexes **11–20**, **21–30**, **31**, **32–40** and **41–44** in high yields, respectively. Treatment of selected diyne ligands with *trans*-[Pt(PEt₃)₂(Ph)(Cl)] and *trans*-[PtCl₂(PBUⁿ)₂] in diisopropylamine in the presence of CuI, at room temperature over 15 hours yielded the dimeric metal acetylide complexes **45–49** and polymeric materials **50–54**. All these compounds have been characterized by various spectroscopic (infrared, ¹H NMR, ³¹P NMR and mass spectrometry) methods. Moreover, these new compounds were subjected to electronic absorption (UV/Vis) and emission (photoluminescence) spectroscopy in order to investigate their electronic properties. The structures of selected complexes have been determined by X-ray crystallography. The first example of solid state structure of dimercury(II) diacetylide complex was reported. Some selected electroactive metal acetylide complexes were investigated in CH₂Cl₂ using cyclic voltammetry in order to study their electrochemical behaviour. The new platinum(II) acetylide polymeric

materials were found to be thermally stable and photoconducting. The monoacetylide ligands **I** and **II** and diacetylide ligands **III–XV** were shown below:

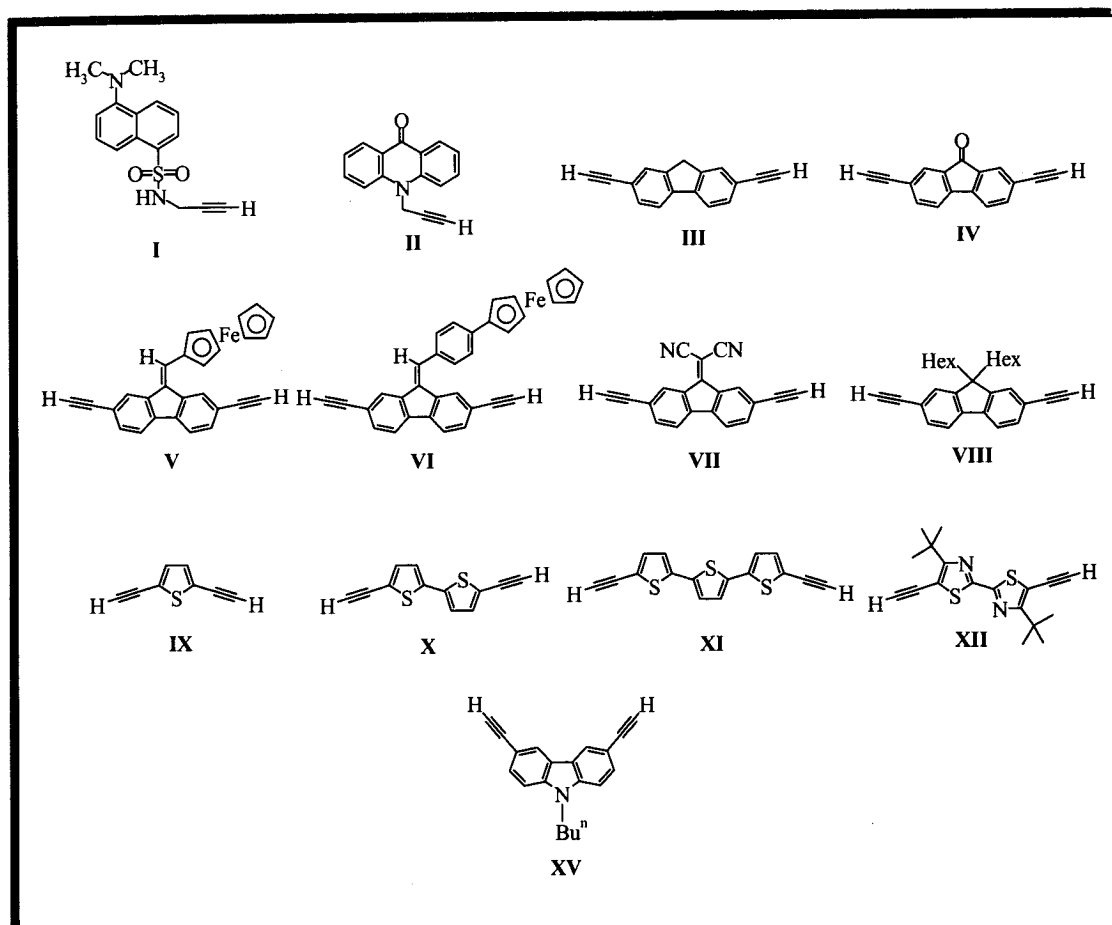


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