Title: **Synthesis of binuclear iron complex which may serve as possible starting material for the formation of a dinitrogen complex**

Author: Mwangi, Joseph Kigathi

Abstract: The aim of this study was to synthesize a binuclear iron complex which may serve as possible starting material for the formation of a dinitrogen complex at ordinary conditions of temperature and pressure. Dinitrogen complexes are important as they are seen as possible substitutes for the Haber process in the synthesis of ammonia gas as some dinitrogen complex undergo a proton induced reduction to ammonia. The following complexes were synthesized; FeH2(dppe)2, FeH(SOCl)(dppe)2 and the binuclear iron complex (dppe)2 HFeSOFeH(dppe)2. The complex FeH2(dppe)2 was obtained by reacting anhydrous iron (II) chloride and l,2 bis{diphenylphosphino)ethane -in equal molar amounts using acetone as a solvent. Sodium tetrahydroborate was used to reduce the chlorides in the complex formed. The complex FeH(SOCI)(dppe)2 was obtained by reacting FeH2(dppe)2 complex with thionyl chloride in equal molar amounts while the complex (dppe)2HFeSOFeH(dppe)2 was obtained by reacting equal molar amounts of complexes FeH(dppe)2 and FeH(SOClj(dppe)2 using acetone as a solvent. All preparative work was done in a dry and oxygen-free nitrogen atmosphere as the complexes were thought to be susceptible to destruction by oxygen. The results so far obtained confirms that the binuclear iron complex were synthesized, which contain a sulphur bridge unlike most of the synthesized complexes which contain phosphine Iigands, The conclusion made is supported by elemental analysis data that were used to deduce the formula of the complexes, IR spectroscopy and l3 C and I H NMR spectroscopy for all synthesizes complexes as recorded and used to determine the structural information of the complexes. Recommendation for further research are proposed and which include; attempt to crystallize the synthesized binuclear complex and carry out its X -Ray structural determination, and investigate the reaction between the complex FeH(SOCI)(dppe)2 with the known molybdenum hydrides complexes which may forms an even better binuclear complex of iron and molybdenum joined by a sulphur ligand.