

ABSTRACT

Hemilabile ligands are the class of chelating ligands, which possess two different types of donating groups, out of two coordinating sites; one exerts only a weak coordination to the metal ion depending upon the environment. These types of ligands are much sought after for their versatile applications in the fields of medicine, catalysis, and supramolecular chemistry. The donating properties of this class of ligands can be electronically tuned by varying the substitutionally on the centre donating sites. Generally, these ligands possess the combinations such as phosphine-phosphite, phosphine-amine, phosphine-phosphine oxide in their structures. Metal complexes of hemilabile ligands are useful for catalysis. The weak metal-ligand bonds present in these complexes can be selectively cleaved, when a strong substitution approaches towards the coordination sphere. Such complexes have been used in a range of catalytic reactions due to the hemilabile ligand being able to furnish open coordination sites and stabilize reactive transition metal centers during the course of a reaction. This reversible protection of one or more coordination sites is the most important property of hemilabile ligands. In this project proposal we plan to synthesize the new P-N ligands from variously substituted 2,6-diphenyl piperidin-4-ones. The synthesized ligands will be characterized by spectral, electrochemical impedance spectroscopy, potentiodynamic polarization and thermal studies. New Ga (III) complexes were synthesized using methyl, dimethyl and ethyl substituted 2,6-diphenylpiperidin-4-ones. The synthesized complexes were characterized with spectral, thermal and antibacterial studies.

The corrosion resistance of methyl, dimethyl and ethyl substituted 2,6 diphenyl piperidin-4-one was studied in 1.0 M sulphuric acid and 1.0 M nitric

acid medium using electrochemical impedance spectroscopy and potentiodynamic polarization techniques. The corrosion inhibition of the compounds are compared, the thermodynamic parameters, adsorption isotherm and effect of temperature on the adsorption of the inhibitor was also studied. The corrosion inhibition of the methyl, dimethyl and ethyl substituted 2,6-di(p-tolyl)piperidin-4-one and 2,6-di(p-methoxy)piperidin-4-one were studied using same methods. There are four different mode of adosorption of inhibitor molecule on the substrate is possible, (i) structure of the molecule, (ii) the nature of the metal surface, (iii) the chemical composition of the corroding environment and (iv) the electrochemical potential between the metal and solution interface. The concept of assessing the efficiency of an inhibitor of corrosion with the help of computational chemistry is to search for compounds with desired properties using chemical intuition and experience into a mathematically quantified and computerized form. The experimental results of corrosion analysis were compared with the quantum chemical analysis.

The antibacterial effect of the piperidin-4-ones and Gallium (III) complex of piperidin-4-ones were analyzed using zone inhibition method. The results shows that the dimethyl substituted piperidin-4-ones shows very high zone inhibition on comparison with the methyl and ethyl substituted ligands in all three series. Gallium (III) complexes showed better zone inhibition in all ligands. Out of all the Gallium (III) complexes 3,5-dimethyl2,6-(p-methoxy)piperidin-4-one shows highest antibacterial effect.