

CHAPTER IV

CONCLUSION

The complexation between six phenolic diazacrown ethers and seven transition and heavy metal ions, establishing forty five values of stability constant, showed ML formation in most of the systems studied. Other complex formation types, however, could be also found, i.e. ML_2 formation for **L4** + Co^{2+} and **L6** + Cd^{2+} . Binuclear complexes M_2L were also formed in the system of Zn^{2+} with **L1**, **L3**, and **L4**. Besides ML formation, Pb^{2+} formed ML_2 complexes in all systems.

The general stability trend observed for mononuclear complex formation of smaller metal ions is that the more side arms extend, the more stable are those metal complexes. The complexation of Ni^{2+} does not follow the general trend however and the opposite trend is found in the case of Hg^{2+} where longer side arms yield less stable complexes. Moreover, the bulkiness of the ligand could affect the stoichiometry of the complex and usually diminish the affinity for metal ions, notably for larger ions like Hg^{2+} and Pb^{2+} .

The stability order for the first row transition metal complexes with a given ligand is: $Zn^{2+} < Ni^{2+} < Co^{2+}$. For IIB metal ions, the stability order following the polarizability order $Zn^{2+} < Cd^{2+} < Hg^{2+}$ is only observed in the complexation of the least steric ligand **L1**. For more steric ligands, the compensation between ligand reorganization, metal-ligand interactions and metal ionic radius-crown cavity sized-match yield higher stability for Cd^{2+} complexes. Interestingly, Pb^{2+} , despite being biggest ion studied, forms remarkably strong complexes with every ligand, resulting in an excellent selectivity for this ion by all ligands.

The ligand studied also shows great selectivity for Co^{2+} , especially **L2**, **L3** and **L4**. This could lead to new molecular hosts for Co^{2+} . The formation of binuclear complex found only in the system of Zn^{2+} does not give good selectivity for this ion nevertheless, as the stability constants are not very high. Every ligand thus has a potential to be used as a selective receptor for Pb^{2+} where selectivity of Pb^{2+} over Zn^{2+}

is in need. Many ligands, that selectively bind Cd^{2+} over Zn^{2+} , particularly **L2**, would be useful in the development of detection and sequestration methods for environmental and biological samples.

Suggestion for future work

1. Attachments of ligands onto solid supports, e.g. silica gel, are of interest to study the possibility of applying these ligands as ion selective membranes or columns, etc.
2. Determination of the stability constants of Cu^{2+} and Pb^{2+} complexes using other techniques, e.g. potentiometry or competitive spectrophotometry.
3. Due to many oxygen donor atoms and side arms in the molecules, complexation of lanthanide ions is of interest to explore whether these ligands could differentiate these ions among another.



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