

Chapter 5

Conclusions

The stoichiometry of complexes compounds have been studied by cyclic voltammetry. This method can be used in a manner similar to that of molar ratio except that the voltammetric technique is employed instead of the spectroscopic one. It was found that curcumin forms complex with Pb^{2+} in a 1:1 ratio at pH 5.

For the NMR determination, the ^1H NMR spectra of curcumin were recorded in CDCl_3 and d_6 -DMSO. It was found that curcumin existed predominantly as a keto-enol tautomer. For curcumin- Pb^{2+} , curcumin- Mg^{2+} and curcumin- Zn^{2+} systems in d_6 -DMSO the methine proton signals showed highfield shift. These data were compared with acetylacetone which showed upfield shift of this proton when coordinated to metal atom. Thus the upfield shift of this proton is an evidence for coordination of metal to curcumin. ^1H NMR spectra of curcumin- Co^{2+} , curcumin- Cu^{2+} and curcumin- Mn^{2+} system appeared as a broad spectrum, presumably due to the paramagnetic influence from the metal ions. For curcumin- Hg^{2+} system, from ^1H and ^{13}C NMR data suggesting that curcumin is in neutral enolic form with only monodentate coordination to the metal. In the ^{13}C NMR spectrum of curcumin- Mn^{2+} system, all carbon atoms showed upfield shift. It can be concluded that curcumin may interact with Mn^{2+} ion in the quinone form of one half of the curcumin molecule.

IR analysis inferred that both the hydroxyl groups, and the β -diketone moiety of curcumin are involved in metal–ligand complexation, either directly bonding to the metal or in intermolecular hydrogen bonding. So the IR data in combination of XRF results, which showed that the Pb and Cu are present in these products, lead to the conclusion that these precipitates should be curcumin complexes with the two metal ions.