A relevant survey of literature, especially the work done on Mn(II), Ni(II), and Co(II) complexes with azo dyes and some closely related ligands so far as complexing groups are concerned, has been given. This has a direct bearing on the investigations undertaken.

The scope and aim of the present investigation has also been dealt with. An interesting and important aspect of the present investigation is that the ligands chosen for the work possess three coordinating groups in the ligand molecule viz., azo, phenolic and carboxylic groups in ortho position with respect to each other, in such a way that the phenolic and the carboxylic groups lie on one side of the azo group. The present work has rendered it possible to study the relative tendencies of these three groups along with the dominating power of those groups which are involved in chelation.

Chapter II This deals with the various properties which have been used in studying the complex compounds. Physico-chemical methods used for the study of complexes in solution have been described and the methods which have been used in the present work discussed in detail.

The following methods have been employed in studying the composition and determining the stability of complexes.

**Composition**: (1) Job's method of continuous variation. (Absorbance and conductance as index properties).
(2) Mole-ratio method (Absorbance as index property).
(3) pH titration.

**Stability:**
(1) Mole-ratio method at constant ionic medium of 0.1 M NaClO₄ (Absorbance as index property).
(2) Bjerrum's method at constant ionic strength of 0.1 M NaClO₄.

Chapter - III As the azo dyes selected for the present work were not available commercially, their synthesis was taken up which has been described in this chapter.

Chapter - IV Experimental data and results have been compiled in this chapter. It has been spread over in two sections:

**Section - A** - deals with the study of ligands viz., their analysis, I.R. spectra, absorption including the verification of Lambert-Beer Law and the determination of pKᵈ value of dyes.

**Section - B** - The experimental data regarding the study of the composition and the stability of complexes have been compiled in this section. The method of Vosburgh and Cooper has been applied first to ascertain the nature of the complex formed in the system. The applicability of Lambert-Beer Law on the complexes has also been verified.

Lastly the isolation of solid metal complexes of the parent dye (unsubstituted dye) have been described. This has been done in order to get information about the structure of the complexes.

Chapter - V The results obtained have been discussed here and the following conclusions have been arrived at:
(1) I.R. spectra of dyes have been discussed in the light of structure proposed for them.

(2) The effect of the substituents on the wavelength of selective absorption of ligands (λ max.) has been discussed.

(3) The values of \(pK_a\) (COOH) of ligands have been correlated with the nature of the substituents present in the ligand molecule.

(4) The complexes formed by all the three metal ions i.e., Mn\(^{++}\), Ni\(^{++}\) and Co\(^{++}\) are found to have a 1:1 composition. This has been found by spectrophotometric method first and later confirmed by conductometric and pH metric methods.

(5) From the experimental observations and the I.R. study of solid metal complexes of unsubstituted dye, it has been inferred that the complex formation takes place between the phenolic and the carboxylic groups. The azo group does not take part in the reaction.

(6) The order of stability of the complexes with respect to metal ions has been found to be:

    Nickel > Cobalt > Manganese

(7) The stability has been correlated with the nature of the substituents present in the ligand. The order in this case is found to be:

    \(CH_3\) > H > OCH\(_3\) > Cl, which is the order of the basicity of the corresponding ligands.

(8) The stability constant (\(\log K\)) of the complexes have been correlated with \(pK_a\) (COOH) values of ligands and a linear relationship has been observed.

(9) The values of \(\log K(M)\) have been plotted against the values of \(\log K(M')\) and a linear relationship has been observed between them.

(10) The stability constant (\(\log K\)) has been correlated with the 2nd ionisation potential of the metal ions. It has been observed that the variation in metal chelate stability follows the order of ionisation potential of the metal ions.

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