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Oxine (8-quinolinol) and its many derivatives are well-known as chelating agents. They have also been known as fungicides and bactericides. 8-Quinolinol is extensively used as a reagent in qualitative and quantitative analysis. 7-Nitro-8-quinolinol-5-sulphonic acid (abbreviated as NQSA), a more soluble derivative of oxine, was first prepared by Holland in 1940. It is a yellow crystalline solid without definite melting point and crystallizes with one mole of water. It is fairly soluble in water, but insoluble in non-polar solvents. The introduction of an electrophilic group like -NO₂ in seventh position to 8-quinolinol-5-sulphonic acid, makes NQSA and its chelates more soluble and facilitates the study of stability constants in aqueous and mixed-solvents.

Chapter II deals with the reagent NQSA. It was prepared in two stages (i) sulphonation of 8-quinolinol by 20 % fuming sulphuric acid below 10°C, (ii) followed by nitration with NaN₂ and HCl. NQSA formed was recrystallized and its purity was checked by determining its molecular weight by titrating potentiometrically against standard alkali. The concentrated solution is reddish brown but the dilute solution is yellow in colour.

pKₐ was determined potentiometrically by titrating 4.6 mM and 5.0 mM NQSA at 0.1 and 0.2 ionic strengths (maintained constant by the use of different concentrations of KCl as the
background electrolyte). From the data so obtained, the function 
log B/a-B was calculated at certain pH values (of second neutralization only), where 'a' is the amount of acid (NQSA) and B is the sum of the base added and molarity of free H\(^+\) ion. The above function is plotted against pH, and pK\(_{D2}\) (mixed or Brønsted constant) was obtained as the intercept. The value of pK\(_{D2}\) for 0.1 and 0.2 ionic strength were found to be 5.42 and 5.25 respectively.

The effect of dielectric constant on the second dissociation constant was studied by employing different ethanol-water, acetone-water and dioxan-water mixtures. pH measurements in mixed solvents were corrected following van Uitert and Haas. The value of correction term log U_H (to convert pH-meter reading in mixed solvents to stoichiometric hydrogen ion concentration as would exist if water is the solvent) was determined for different percentages (v/v) of ethanol-water, acetone-water and dioxan-water mixtures against standard alkali. Using these values of log U_H, pH-meter readings of titration of NQSA (at 0.1 M KCl) against alkali in each % of ethanol, acetone and dioxan, were corrected and employed to determine pK\(_{D2}\) as shown before. It was found that ethanol has not remarkable effect on pK\(_{D2}\); while in the case of acetone and dioxan, pK\(_{D2}\) first decreased and then increased.

Chapter III describes the stability constants of different chelates of the ligand NQSA with divalent cations like Mn, Cd,
Fe, Zn, and Co. They were determined potentiometrically for aqueous and dioxan-water systems. Following the Irving-Rossotti method, \( \tilde{n} \) and pH were determined by titrating (A) HCl, (B) HCl + NQSA and (C) HCl + NQSA + metal ion, against standard alkali keeping ionic strength nearly constant (employing 0.2 M KCl as background electrolyte) for all titrations. From the formation curve of each metal-chelate, approximate values of step stability constants (\( K_n \)) were determined following Bjerrum. If the ratio of stepwise stability constants, \( K_n/K_{n+1} \) is less than \( 10^2 \), successive extrapolation procedure or sweeping procedure following Iossotti-Iossotti can be adopted to determine the accurate values of \( R_n \), the overall stability constant of the nth step of complex formation. The stability constants of some divalent metal ions were determined in water as well as in dioxan-water system. An important factor influencing the stability constants of metal chelates are the dielectric constant of the medium and the solvating property of the solvent. An attempt was made to investigate the effect of variation in dielectric constant on the stability of some divalent metal complexes. It was seen that with the increase in the organic content of the solvent, the stability constant increases. In the present case, the complexes containing both O-metal and N-metal link, the observed increase in the stability may be due to O-metal link which is strongly affected. The N-metal link has little influence on the stability of complex.
Chapter IV narrates the stability constant of silver complex potentiometrically using a silver electrode. $\bar{n}$ and $pL$ were determined following Frumecus method of corresponding solutions. The silver forms 1:1 complex. The stability constant $\log \beta_1$ was calculated for water and water-dioxan systems. It was found to be increasing with the decrease in dielectric constant. The average diameter ($r$) of the silver complex was found to be $2.24 \, \text{Å}$ and $16.34 \, \text{Å}$ in the dielectric constant ranges of 70 to 50 and 45 to 30 respectively.

Chapter V describes the study of complexes spectrophotometrically. KQSA gave brown colour with V(V), V(IV) and Co(II). The complexes of these metals, have no specific wavelength of maximum absorbance. The wavelengths selected were such that the maximum absorbance with the complex and the minimum absorbance with ligand or metal ions, is obtained. The wavelength used for V(V) complex was $510 \, \text{nm}$, and for V(IV) complex and Co(II) complexes, it was $520 \, \text{nm}$. The V(V) complex was studied at 0 and 1 pH; V(IV) complex at 1 and 2 pH and Co(II) complex at 2 pH. The formation of 1:3 complex in the case of V(V) complex was found by Job's and mole-ratio methods. 1:2 and 1:3 complexes were found by these methods for V(IV) complex and Co(II) complex respectively at the pH mentioned above. Slope ratio method was found to be unsuccessful. The values of stability constants were calculated for all these complexes from mole-ratio method.
Chapter VI deals with the study of magnetic susceptibilities and IR spectra of the solid complexes. The solid complexes were prepared by mixing EQSA and metal ion solutions in equimolar proportions. These complexes were used to determine magnetic susceptibility and IR spectra. The molecular magnetic susceptibility was calculated. The complexes with Ni, Cu, Co, Mn and Fe metal ions were found to be paramagnetic and those with Ag, Zn, Cd and Pb ions were found to be diamagnetic. IR spectra gives evidences of complex formation through N and O-atom of the ligand.

The above indicates chief lines of the work carried out in the thesis. The details regarding experimental work, discussion etc., are described in the individual chapter.