Studies in conditional stability constants and confirmation of complex formation of Pr(III), Nd(III) & Gd(III) complexes with schiff's bases spectrophotometrically

AD Khambre

Department of Chemistry, Mahatma Phule Arts & Science College, Patur, Dist. Akola, Maharashtra, India

Abstract
Spectrophotometric Investigation of Pr(III), Nd(III) & Gd (III) complexes with Schiff's Bases ligands showed 1:1 & 1:2 complex formation between pH range of 2.00 to 5.00.The formation of complexes has been studied by Isobestic Point method & Job's variation method at 0.1M ionic strength and at 27 ºC spectrophotometrically. The conditional stability constants are determined for 1:1 complexes at about pH = 3.00.

Keywords: Metal Ions (Pr (III), Nd (III) & Gd (III)), Ligands (substituted Pyrazoles), 1, 4-diioxane (Solvent) etc.

1. Introduction
In view of analytical applications and antibiotic drugs, one of the drugs Dibromo Chalcones which acts as a ligand and is selected in the present investigation. The metal chelates of hydrazo-dimedone dynes are Studied by Atefetal [1] conditional stability constants of transition metal ions with some amino acid peptides have been studied by S.N. Dawale & Narwade [2]. Sunita and Gupta [3] have worked on spectrophotometric determination of cyanide in biological complex using a new reagent. Narwade *et al.* [4] have studied Fe(III) complexes with some substituted Chalcones Spectrophotometrically. Raghuwanshi *et al.* [5] have shown 1:1 & 1:2 complex formations of Cu(II), Ni(II) and Co(II) with some substituted chalcones & Isoxazolines Potentiometrically. Meshram *et al.* [6-8] have investigates metal ligand stability constants of transition metal ions complexes with some substituted Isoxazolines by Spectrophotometric & Potentiometric techniques. A caustical properties of peptides have been studied in 20% methanol-water mixture by sondawale. The study of the conditional stability constants of transition metal ion complexes with substituted Dibromo Chalcones been undertaken to study the complex formation & their confirmation. The present work been carried out by using Isobestic Point method & Job's method.

2. Experimental
Schiff's bases has been synthesized in the laboratory by standard method. The nitrate salts of Pr, Nd & Gd (BDH) & Potassium Nitrate (BDH) were used & their solutions were prepared in double distilled water (0.01M). The solutions of potassium nitrate was prepared (1M) & used for maintaining ionic strength constants. Absorption are measured by using UV-visible spectrophotometric model-106 (systronics).

3. Results & Discussion
Spectrophotometric Measurement
a) Isobestic Point Method
Vareille's method of isobestic point was used to study the confirmation of complex formation between Pr (III), Nd(III) & G(III) with Schiff's Bases. The absorption spectra were measured for solution containing metal ion (10 x 10^{-4}M) & ligand (50 x 10^{-4}M), identical in all respect except pH were obtained. The colour of solution was light yellow below pH 2.50 and light pink above pH 6.00. The pH of solution was measured by digital pH-meter. The data of absorption & wavelength in nm for all the pH solutions were used to construct the curves. The curves are plotted between wavelength in nm and optical density for Gd (III) L_3 systems. As wavelength Varies differences shows for different pH for Gd(III)L_3 Systems as given in Table 1

Table 1: System-Gd (III)-L2

Wavelength	Optical Density				
	pH =2.5	pH =3.5	pH =4.5	pH =5.5	pH =6.5
300	0.120	0.150	0.190	0.255	0.310
450	0.230	0.260	0.310	0.380	0.465
490	0.410	0.420	0.450	0.515	0.490
500	0.540	0.540	0.540	0.540	0.540
550	0.575	0.545	0.480	0.450	0.420
600	0.678	0.630	0.570	0.495	0.355
650	0.780	0.730	0.680	0.610	0.550

It is observed that number of curves are intersecting through isobestic point at 500 for Gd(III) L_2 respectively. For above systems the intersecting points shown by dark lines called as Isobestic point. It shows from above table that 1:1 and 1:2 complex formation occurs for given systems.

b) Job's Method
Job's variation method was used to know the nature of complexes. Thermo compositions of metal ions solution (1 x 10^{-3}M) & ligand (20 x 10^{-2}M) were prepared in ten series. Ionic strength was maintained constant (0.1M) by adding an appropriate amount 0f 1M KNO_3 solution in 10 ml volume (λmax) was determined using one of the compositions at

which there is maximum absorption. The absorption for all the compositions were recorded at a constant wave length (λmax). The data of absorption & % composition of metal ion and ligand solutions at constant pH can be used to construct the curves. It was observed that 1:1 complex formation occurs in the pH range of 2.5 to 5.00& 1:2 complex formation in the pH range of 4.5 to 5.5. Each solution is diluted up to 15 ml and recorded absorption at same (λ max). Conditional stability constants of metal ligand complexes were calculated for all the systems using following expression

$$K = \frac{X}{(a_1-x)(b_1-x)} = \frac{X}{(a_2-x)(b_2-x)}$$

K = Conditional stability constants of complex,
X = Concentration of complex
a_1& a_2 = Concentration of metal ions,
b_1& b_2 = Concentration of ligand.
Conditional stability constants of metal ligand complexes were calculated & presented in Table2

Table 2: Determination of conditional stability of metal ligand complexes

System	Concentration Complex mole^{-1}	Conditional Stability Constant K
Pr(III)L_1	0.1047 x 10^{-2}	3.7531 x 10^{-2}
Pr(III)L_2	0.1725 x 10^{-2}	0.7968 x 10^{-2}
Pr(III)L_3	0.1051 x 10^{-2}	3.8165 x 10^{-}
Nd(III)L_1	0.0047 x 10^{-2}	0.1053 x 10^{-2}
Nd(III)L_2	0.1225 x 10^{-2}	0.3270 x 10^{-2}
Gd(III)L_1	0.1745 x 10^{-2}	0.4750 x 10^{-2}
Gd(III)L_3	0.1380 x 10^{-2}	0.7516 x 10^{-2}

4. Conclusion

The conditional stability constants are found to be slightly greater than real stability constants. Therefore it is confirmed from both method that there is simultaneous formation of 1:1 and 1:2 complexes takes place.

5. References

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