CHAPTER- 4

Section. 4.1: Synthesis and Structural establishmentof Diacetylmonoxime-3-amino-4-hydroxy benzoylhydrazone (DMAHBH)

4.1.1: Synthesis of DMAHBH

It was prepared by refluxing a mixture of Diacetylmonoxime(1.0111g, 0.01 mole) and 3-amino-4-hydroxy benzhydrazide (1.6717 g) in ethyl alcohol (15 ml) for 5 hours. The reaction mixture was cooled and the product was separated out. The yellow colored product was collected. The Yield of the reagent was 79% and the M.P. was recorded- 220^0 C.

4.1.2: Establishment of structure of diacetylmonoxime-3-amino-4-hdroxybenzoyl hydrazone (DMAHBH)

Structure of Diacetylmonoxime-3-amino-4-hydroxybenzoylhydrazone (DMAHBH) was establishedby Proton NMR, FTIR and Mass Spectra.

Infrared spectra

The Infra Red spectrum of DMAHBH ligand was given in **Chapter-5,Figure-5.1.1**The Absorption bands observed in the spectrum of the above ligand were assigned and tabulated in **Table 5.1.1**

Proton NMR

The prepared DMAHBH reagent was taken for the recording of Proton NMR using dimethylsulphoxide (DMSO-d_6) solvent. The spectrum of the reagent was given in the Results and Discussion chapter (Chapter-5)**Figure 5.1.2.**The NMR Signals observed are tabulated in **Table 5.1.2**

Mass spectra

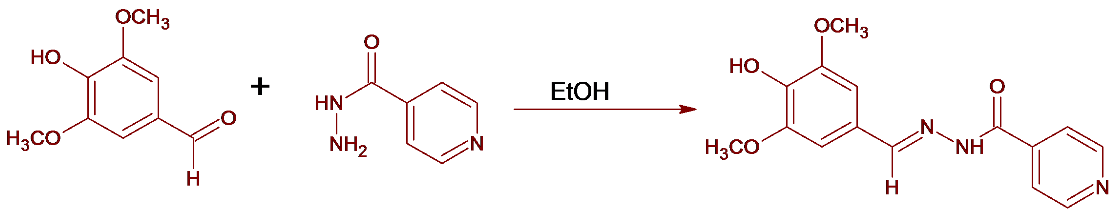
Mass spectrum of DMAHBH was recorded and was given in the **Figure 5.1.3 of Chapter-5.**

Thus infrared, PMR and mass spectral data of DMAHBH were utilized for the development of structure and the structure**(Figure 5.1.7)** confirmed is assigned toDiacetylmonoximeamino-4-hydroxybenzoylhydrazone(DMAHBH)**Chapter -5**

Section 4.2: Synthesis and structural establishment of 3,5-dimethoxy-4-hydroxy benzaldehydeisonicotinoylhydrazone (DMHBIH)

4.2.1: Synthesis of DMHBIH

It was prepared by refluxing a mixture of 3,5-dimethoxy-4-hydroxybenzaldehyde (1.8218 g, 0.01 mole) and isonicotinoyl hydrazine (1.3714 g, 0.01 mole) in ethyl alcohol (15 ml) for 5 hours . The reaction mixture was cooled and the product was separated out. The light greenishcolored product was collected. The Yield of the reagent was 76% and the m.p. was recorded- 221^0 C.



4.2.2: Establishment of structure of 3,5-dimethoxy-4-hydroxybenzaldehyde isonicotinoyl hydrazone (DMHBIH)

3,5-Dimethoxy-4-hydroxybenzaldehydeisonicotinoyl hydrazone (DMHBIH) was characterized with the help of infrared, PMR and mass spectral data.

Infrared spectra

The FTIR spectrum of DMHBIH was given in**Figure5.1.4** of Chapter- 5The spectral bands of the reagent were observed at different wave numbers and are tabulated in**Table 5.1.3**

Nuclear Magnetic Resonance spectra

Nuclear Magnetic Resonance spectrum of DMHBIH was recorded using deuterated DMSO as a solvent. PMR spectrum of DMHBIH was given in **Figure 5.1.5.**The spectrum of DMHBIH and the zone of signals were tabulatedin **Table. 5.1.4**

Mass spectra

Mass spectrum of DMHBIH was recorded according to the general procedure and was given in the **Figure 5.1.6.**

A systematic study of the spectral data obtained revealed the structure for 3, 5-dimethoxy-4-hydroxybenzaldehydeisonicotinoylhydrazone (DMHBIH) and the structure was presented in **Chapter-5 (Figure. 5.1.8).**

Section 4.3: Spectrophotometric determination of Cadmium (II) using DMAHBH

Diacetylmonoxime-3-amino-4-hydroxybenzoylhydrazone (DMAHBH)is made to complexwith Cadmium (II) in Phosphate buffer medium (pH-8) and Triton X-100(5%)to form yellow colored complex.All the parameters (Chapter-3), spectra and spectral data are studied at 378 nm in p^H 8 buffer solution with Triton X-100 (5%) for the development of Cd (II)-DMAHBH System. The above conditions obtained from the following studies.

4.3.1 Determination of Wavelength (λ max)

The λ max of Cd (II) complex and reagent solution was carried outagainst reagent blank by adopting the general procedure in 3.5.1 of Chapter-3. The absorption spectra of Cadmium (II) complex and the reagent is given in **Figure 5.2.1(Chapter-5).**

4.3.2: Effect of p^H

The maximum absorbance of Cd (II) –DMAHBH complex was performed by employing the procedure described in **3.5.2.**The spectra depicting the effect of p^H is presented in Chapter -5, **Figure 5.2.2**

4.3.3:Reagent Effect

The effect of reagent DMAHBH on the complex was studied by employing the procedure given in Chapter-3 (3.5.3) . The data obtained are incorporated in **Table 5.2.1**

4.3.4: Effect of time

The absorbance ofCadmium (II)–DMAHBH complex was studied every 20 min. The results of time effect were tabulated and given in **Table 5.2.2 (Chapter-5)**

4.3.5: **Micelles effect**

The impact of anionic, cationic and neutral surfactants(SDBS,CTAB and Triton X-100) was studied. The minimum amount of surfactant (Triton X-100) required was studied as per procedure given in chapter-3.Experimental results are tabulated in **Table 5.2.3.**

4.3.6: Order of addition of Solutions

The study was taken up by varying theaddition order of buffer, metal, surfactant and reagent solutionsaccording to the general procedure in **Chapter-3.**

4.3.7: Quantification of Cd(II)-DMAHBH complex (Beer's Law)

Quantification of above system was studied by adopting the procedure given in(Chapter -3).The results obtained was taken for construction of calibration curve. **(Figure.5.2.3).** The quantitative data was obtained from the calibration plot and results were presented in the **chapter-5.**

4.3.8: Effect of Cations and Anions on the absorbance

The systematic study was taken up by employing the procedure given in **Chapter -3 (3.5.7)**. The interventionof ions was studied with 1.588 μg/ml of Cadmium (II). The experimental results are incorporated in **Chapter-5 Table 5.2.4**

4.3.9: Applications

The developed Cd (II) - DMAHBH system was applied for the determination of Cd in soil and tobacco samples using standard procedures. The results are presented in **Table.5.2.5 and 5.2.6** of Chapter -5.

4.3.10: Composition and stability constant of the Cd(II) DMAHBH complex

Metal - Ligand ratio and stability constant were obtained from experimental resultsof Job's and Molar Ratio methods by adopting general procedure given in **chapter-3.** The data obtained from the two methods are usedfor plotting Job's and Molar ratio curves **(Figure.5.2.4 and 5.2.5)**

Section 4.4: **Estimation of Cd(II) by derivative Spectrophotometry**

First and Second order derivative spectrophotometric methods were also employed for determination of Cd(II) in samples at microgram levels

4.4.1: Derivative spectrophotometric determination of Cadmium (II)-DMAHBH System

The first and second order derivative spectrum of Cadmium (II) – DMAHBH complex was taken in Phosphate buffer solution (pH 4.0) and maximum amplitude was shown at 430 nm and 460 nm. (**Figure:5.2.6, 5.2.7, 5.2.8 &5.2.9**). Hence the further investigations were taken up at the above wavelengths in presence of Triton- X100 solution.

4.4.2: Verification of Beer's Law (First and Second Order)

From the zero order spectrum the derivative amplitudes were measured at different concentrations of metal ions and plotted **(Figure: 5.2.10 and 5.2.11)** graphs between amount of Cadmium and amplitude at 430 and 460 nm.

4.4.3: Foreign Ion Effect

Anions and cations interference was studied as per experimental procedure given in **Chapter-3 of 3.5.4** and the results are presented in **Chapter -5 (Table 5.2.7)**

4.4.4: Applications

Estimation of Cd(II) in soil and cigarette samples

The developed derivative procedure was employed for the determination of Cadmium Ion and the values are presented in **Table 5.2.8 and 5.2.9**

Section 4.5: Direct spectrophotometric determination of Lead (II) usingDMAHBH

Diacetylmonoxime-3-amino-4-hydroxybenzoylhydrazone (DMAHBH) when made to react with lead(II) formedyellow colored complex in acidic Phosphate buffer solution (pH 4.0) in presence of Triton X-100. The zero, first and second order spectrophotometric studies were carried out by employing the procedure given in Chapter-3 of general experimental procedures.

4.5.1: Determination of Wavelength (λ_{max})

The spectrum of reagent and Lead (II)-DMAHBH complex were taken by using spectrophotometer and the spectrum was given in **Figure 5.3.1** of Chapter-5.

4.5.2: p^{H}Effect

The Lead (II)- DMAHBH complex absorbance was recorded in solutions of different p^H (3.0-9.0). The experimental data were utilized to plot a graph between pH and absorbanceandthe plot was presented in **Chapter -5 &Figure 5.3.2**

4.5.3: Reagent Effect

Effect of reagent was studied by employing the procedure given in 3.5.3 of Chapter-3 and the results are presented in **Table 5.3.1** of **Chapter-5**

4.5.4: Effect of Time on Complex stability

At different time pointsto observe the complex stability a method was adopted and the procedure employed was given in Chapter-3. The results are presented in **Chapter-5. Table 5.3.3**

4.5.5: Micelles Effect

The studies were performed with various surfactants likeanionic, cationic and neutral (SDBS, CTAB and Triton X-100) on absorbance of Lead(II)- DMAHBH complex . The experimental results were discussed in **chapter-5. Table 5.3.2**

4.5.6: Order of addition of Solutions

The addition order of different solutions was varied and the effect was studied and the results were given in **Chapter-5.**

4.5.7: Quantification of Lead (II)-DMAHBH complex (Beer's Law)

Beer's law verification for the system was carried out by employing the procedure given in **3.5.6 of Chapter-3.** The experimental data were utilized to plot (**Figure 5.3.4**) a graph in between absorbance and amount of Lead (II). The experimental results were discussed in **Chapter-5**

4.5.8: Effect of Cations & Anions

The Effect of Anions & Cations was studied by employing the procedure given in **3.5.7 of Chapter-3**and the results are presented in **Table 5.3.4. (Chapter 5).**

4.5.9: Applications
Estimation of Lead(II) in Bulked food,soil and biological sample

The developed system was utilized for the estimation of Lead(II) in Bulked food, Soil and Biologicalsamples.

The Bulked food Soil and Biological samples were prepared by standard procedure[96]. The amount of Lead(II) was calculated from the experimental results of Beer's Law and the values are tabulated in **Table 5.3.5 and 5.3.6**

4.5.10:Composition and stability constant of the Lead(II)-DMAHBH complex

The above studies were performed by employing the procedure given in **3.5.9** of **Chapter-3**and the ratio of the complex and stability constant was obtained from the data of Job's and Mole Ratio plots**(Figure.5.3.4&Figure.5.3.5)**in **Chapter-5.**

Section.4.6: Derivative Method

First and second order derivative methods were developed from zero order method for the determination of Lead (II).

4.6.1: Derivative spectrophotometric determination of Pb(II) – DMAHBH system

The first and second order derivative spectrum of Lead(II) – DMAHBH complex was taken in Phosphate buffer solution (pH 4.0) and maximum amplitude was shown at 448 nm and 468 nm.(**Figure:5.3.6,5.3.7, 5.3.8 &5.3.9**). Hence thefurther investigations were taken upat the above wavelengths in presence of Triton X100 solution.

4.6.2: Verification of Beer's Law (First and Second Order)

From the zero order spectrum the derivative amplitudes were measured at different concentrations of metal ions and graphs were plotted **(Figure.5.3.10 &5.3.11)**between amount of Lead and amplitude at 448 and 468 nm.

4.6.3: Foreign ions Effect.

In derivative method various anions and cations interference was also studied by following procedure given Chapter-3. The results are presented in **Chapter-5, Table 5.3.7.**

4.6.4: Applications

Estimation of Pb (II) in Bulked food, soil and Biological sample

The derivative method developed (First and Second Order) was utilized for the determination of Lead. The experimental results are tabulated (**Table 5.3.8 and 5.3.9)in Chapter-5.**

Section.4.7:Spectrophotometric estimation of V(V) using DMAHBH

The reagent Diacetylmonoxime-3-amino-4-hydroxybenzoylhydrazone (DMAHBH)is allowed to react with Vanadium (V) to form yellow colored complex at pH 9.0 in presence of micellar medium like Triton X-100. The optical density of the complex was also recorded. The zero order spectrophotometric study was carried out by adapting systematic procedures given in **Chapter-3** of general procedures.

4.7.1: Determination of Wavelength (λ_{max})

The spectrum of reagent and Vanadium (V)-DMAHBH complex were taken by using general procedure given in **Chapter-3** and the spectrum was given in **Figure 5.4.1** of Chapter-5.

4.7.2:pH Effect

To arrive at the optimum pH required for achieving the maximum and constant absorbance, a plot was made between Hydrogen ion Concentration and absorbance of the complex and given in **Figure. 5.4.2 of Chapter-5** by employingstandard procedure given in Chapter-3.

4.7.3:ReagentEffect

The study was taken up by employing the general procedure given in Chapter-3 and the amount of reagent necessary was presented in **Table 5.4.1**

4.7.4: **Time Effect**

The stability of complex was ascertained at different points of time and the results were tabulated in **Table 5.4.2.**

4.7.5: Micelles Effect

Micelles effect was studied by adopting the general procedure in Chapter-3 and the values are incorporated in Table 5.4.3

4.7.6: Order of addition of Solutions

Impact of changing the addition order of solutionswas also studied.

4.7.7: Quantification ofV(V)-DMAHBH complex

V (V)-DMAHBH Complex was quantified by employing the procedure given in **Chapter-3** and a plot **(Figure.5.4.3)** was made.

4.7.8: Effect of Cations & Anions

This experiment was intended for the determination of impact of different associated ions. The effect of foreign ions was studied with 0.408µg/ml of Vanadium(V) and the values are incorporated in **Table 5.4.4**

4.7.9: Applications

The developed method was practically utilized for the quantification of Vanadium(V) in water, plant and alloy samples. The results were presented in Chapter-5 of results and discussion.**Table 5.4.5 and 5.4.6**

4.7.10: **Composition and stability constant of the V(V) - DMAHBH complex**

The ratio of complex and stability constant was studied by employing the general procedure given in Chapter-3.5.9 of Chapter-3 and the Figures depicting it were given in Chapter-5 (**Figure 5.4.4 and 5.4.5)**

Section 4.8: Derivative Method

First and Second order derivative methods were developed from zero order and is utilized in the quantification of V (V)-DMAHBH Complex.

4.8.1: Derivative spectrophotometric determination of V (V)-DMAHBH system.

The first and second order derivative spectrum of Vanadium (V)-DMAHBH complex was recorded at 426 nm and 443 nm and presented in **Figure. 5.4.6**and**Figure.5.4.7, Figure 5.4.8 and Figure 5.4.9** respectively.

The impact of interference ions have been studied in zero, first and second order determination of vanadium and the results are tabulated in **Chapter -5, Table.5.4.7**

4.8.2: Verification of Beer's Law (First and Second Order)

From the zero order spectrum the derivative amplitudes were measured at different concentrations of Vanadium and plotted **(Figure: 5.4.10 and 5.4.11)** graphs between amount of Vanadium and amplitude at 426 and 443 nm.

4.8.3: Study of various foreign ions

In derivative method (first & second order) foreign ions intervention were also studied and the experimental results were tabulated in Chapter-5. **Table 5.4.7**

4.8.4: Applications

The Vanadium(V) in water, alloys and plant sample solution was estimated by the recommended derivative procedure and the values are presented in **Table 5.4.8 and 5.4.9**

Section 4.9: Direct spectrophotometric determination of Copper (II) using DMAHBH

Diacetylmonoxime-3-amino-4-hydroxybenzoylhydrazone (DMAHBH) is made to react with Copper (II) in basic buffer and the complex was estimated by standard spectrophotometric methods reported in Chapter-3.

4.9.1: Determination of Wavelength (λ_{max})

The absorbance spectra of Cu (II) was taken up at different concentrations by employing the common procedure and the spectra was depicted in **Figure 5.5.1**

4.9.2: pH Effect

Effect of Hydrogen ions on the stability ofCu (II)-DMAHBHcomplex was recorded and the change in absorbance was presented in spectra **Figure 5.5.2**

4.9.3 Reagent effect

The study was employed to reveal the impact of reagent, according to the general procedure given in Chapter-3 and the data was incorporated in**Table 5.5.1**

4.9.4: Time Effect

By varying the time in specified intervals the effect has been studiedby utilizing the procedures reported in Chapter-3 and the results were tabulated in**Table 5.5.2**

4.9.5: Order of addition of Solutions

Stability of the complex was also studied by varying the addition order of Buffer, surfactant, Metal etc.

4.9.6 Quantification of Cu (II)-DMAHBH complex

The complex was quantified according to the general procedures given in Chapter-3 and the results obtained were presented in Chapter 5**Figure 5.5.3**

4.9.7 Effect of Cations and Anions on absorbance

Impact of ions was studied by adopting general procedure from Chapter-3 and interference results were incorporated in**Table 5.5.3**

4.9.8 Applications

The developed Copper (II)- DMAHBH system was applied for quantifying Cu in food samples using standard procedures. The results are incorporated in**Table 5.5.4**

4.9.9 Composition and Stability Constant of Cu (II)-DMAHBH complex:

By adopting the general procedure from Chapter-3 the ration of metal to ligand and stability of complex was studied andthe data obtained was plotted as **Figure 5.5.4 and 5.5.5**

Section 4.10 Derivative Method

First and Second order derivative spectrophotometric methods developed from zero order was employed for the determination of Cu (II) in samples.

4.10.1 Derivative spectrophotometric determination of Cu (II) –DMAHBH system

The first and second order derivative spectrum of Cu (II)-DMAHBH Complex was recorded and presented in**Figure5.5.6 , 5.5.7, 5.5.8 and 5.5.9.**

4.10.2 Verification of Beer's Law (First and Second order)

From the zero order spectrum the derivative amplitudes were measured at different concentrations of Vanadium and plotted **(Figure.5.5.10 and 5.5.11)** graphs between amount of Vanadium and amplitude at 466 and 479 nm.

4.10.3 Foreign Ions Effect:

In derivative method (first & second order) foreign ions impact was also studied and the experimental results were tabulated in Chapter-5. **Table 5.5.5**

4.10.4 Applications:

Estimation of Cu (II) in food samples:

The developed method was applied for the estimation of Cu (II) in food samples like Cow milk etc and the results are compared with standard methods. Results are presented in**Table 5.5.6**

Section 4.11 Direct spectrophotometric determination of Cadmium(II) using DMHBIH

The reagent 3, 5-Dimethoxy-4-hydroxybenzaldehydeisonicotinoylhydrazone (DMHBIH) is reacted with Cadmium(II) to give yellow colored complex at pH 4.0. in presence of micellar medium like CTAB. The zero order spectrophotometric study was carried out by adapting systematic procedures (see general procedure in Chapter-3).

4.11.1: Determination of Wavelength (λ_{max})

The absorption spectra **(Figure: 5.6.1)** of Cadmium(II)– DMHBIHcomplex was recorded following the general procedure.

4.11.2: pH Effect

To study the hydrogen ion concentration effect a plot was drawn and the absorbance wasmeasured **Figure: 5.6.2.**

4.11.3: Reagent Effect

The intervention ofreagent was studied and the values are presented in **Table 5.6.1**by employing the procedure given in **Chapter-3.**

4.11.4: Time Effect

Stability of Cadmium –DMAHBH complex was ascertained at different points of time and the results were presented in **Table 5.6.2 of Chapter-5.**

4.11.5: Micelles Effect

Surface active agents effect was studied by following the general procedure given in Chapter-3 and the results were incorporated in **Table 5.6.3** Chapter-5.

4.11.6: Order of addition of Solutions

Absorbance of the complex was studied by varying the order of solutions.

4.11.7: Quantification of Cd(II)-DMHBIH complex

The investigation was performed to verify the Beer's law and the experimental results were calculated from the plot and presented in Chapter-5 of results and discussion.

4.11.8: Effect of Cations & Anions

This experiment was also intended for the determination of intervention capability of ions. The intervention of foreign ions was studied with 0.562µg/ml of Cadmium(II) and the values are incorporated in **Table 5.6.4.**

4.11.9: Applications

The present developed method was used for the estimation of Cadmium(II) in radish flesh and cabbage andsynthetic bearing metal alloysamples and the results were shown in Chapter-5.Synthetic bearing metal alloy, radish flesh and cabbagesamples are prepared by standard procedures and analyzed for the determination of Cadmium(II) and the values are presented in **Table 5.6.5 and 5.6.6 and 5.6.7**

4.11.10: Composition and stability constant of the Cd(II)-DMHBIH complex

By adopting the general procedure from Chapter-3 the ratio of metal to ligand and stability of complex was studied andthe data obtained was plotted as **Figure 5.6.4 and 5.6.5**

Section 4.12: Derivative Method

From the zero order method first and second order derivative spectrums were derived. The absorbance of first and second derivative was taken up at 436nm and 455nm as shown in **Figure no: 5.6.6 , 5.6.7, 5.6.8 & 5.6.9**

4.12.1: Verification of Beer's Law (First and Second order Method)

From the zero order spectrum the derivative amplitudes were measured at different concentrations of Cadmium and plotted **(Figure:5.6.10 and 5.6.11)** graphs between amount of Cadmium and amplitude at 436 and 455 nm.

4.12.2: Foreign Ion Effect

Derivative method was also utilized in calculating the intervention effect of various foreign ions and the experimental results were discussed in Chapter-5 and tabulated**(Table 5.6.8).**

4.12.3: Applications

The estimation was carried out as explained in zero order spectrophotometric determination of metal ion.

The amount of Cadmium present in these samples was computed from a pre-determined calibration plot. The results are presented in **Table 5.6.9, 5.6.10 and 5.6.11** respectively.

Section 4.13: Direct spectrophotometric estimation of Lead (II) using DMHBIH

The reagent 3,5-Dimethoxy-4-hydroxybenzaldehydeisonicotinoylhydrazone (DMHBIH) reacts with Lead(II) to give yellowish brown colored water soluble species in acidic buffer (pH 4.0) medium. The optical density of the complex was stable for more than three hours in presence of Triton X-100. This qualitative observation was studied systematically and developed a direct spectrophotometric method for the determination of Lead (II) in aqueous medium.

4.13.1: Determination of Wavelength (λ_{max})

The absorption of Lead– DMHBIHcomplex was recorded and plotted and in **Figure5.7.1**following the general procedure.

4.13.2: pH Effect

The effect of pH was studied by gradually reducing the hydrogen ions and a plot was made andgiven in **Figure. 5.7.2**

4.13.3: Reagent Effect

The amount of reagent necessary for full color development was established and the values are presented in **Table 5.7.1.**

4.13.4: Time Effect

Time related stability of Complex was ascertained and the results were presented in **Table 5.7.3.**

4.13.5: Micelles Effect

Impact of various micelles have been studied and the values are presented in **Table 5.7.2**

4:13.6: Order of addition of Solutions

The impact of varying the addition order of solutions was studied as for all the Metal-reagent Systems.

4.13.7: Quantification of Pb (II)-DMHBIH Complex

Lead (II)-DMHBIH complex was quantified by adopting the procedure given in 3.5.6 of Chapter -3 and a plot was recorded. The plot was given in Results and Discussion Chapter-5.**Figure 5.7.3**

4.13.8: Effect of Cations & Anions:

The effect of intervening ions was studied to determine the limit of tolerance. The interference of foreign ions was studied with 5.18µg/ml of Lead(II). The values are incorporated in **Table 5.7.4**

4.13.9: Applications:

The present developed method was applied for the estimation of Lead(II) in synthetic alloy samples.

Estimation of Pb(II) in synthetic alloysamples

Synthetic alloy samples are prepared by standard procedures[100] and analyzed for the determination of Lead(II). The values are presented in **Table 5.7.5**

4.13.10:Composition and stability constant of the Pb(II)-DMHBIH Complex

By adopting the general procedure from Chapter-3 the ratio of metal to ligand and stability of complex was studied andthe data obtained was plotted as **Figure 5.7.4 and 5.7.5**

Section.4.14: Derivative Method

First and Second order derivative methods were developed from Zero order method.

4.14.1: Derivative spectrophotometric determination of Pb(II) – DMHBIH complex

The first and second order derivative spectrum of Lead(II) – DMHBIH complex were recorded in pH 9.0 and are presented in **Figure. 5.7.6, 5.7.7**, **5.7.8 & 5.7.9** respectively.

4.14.2: Verification of Beer's Law (First and Second Order)

From the zero order spectrum the derivative amplitudes were measured at different concentrations of Cadmium and plotted **(Figure.5.7.10 and 5.7.11)** graphs between amount of Cadmium and amplitude at 470 and 539 nm.

4.14.3: Foreign Ion Effect

The ions showing interference were studied according to the general procedure given in Chapter-3 and are tabulated in **Table 5.7.6**

4.14.4: Applications

Estimation of Pb(II) in synthetic alloy samples

The estimation was carried out as explained in zero order spectrophotometric determination of metal ion. The results are presented in **Table 5.7.7**