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# Stepwise Stability Constants of Metal Complexes of 2′-hydroxy-4′,5′-dimethyl-4-chlorochalcone Oxime

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The stepwise stability constant of Zn(II), Cu(II), Ni(II) and Co(II) complexes with 2′-hydroxy-4′-,5′-dimethyl-4-chlorochalcone oxime are calculated in 75% dioxane-water mixture at 25°C and ionic strength 0.1M($NaClO_4$). It is observed that the overall stability constants are in the order of Cu(II) > Zn(II) > Ni(II) > Co(II).

The formation constants of some bivalent metal ion chelates with 2′-hydroxy chalcone and 2′-hydroxy-5′-methyl chalcone in 70% v/v ethanol-water mixture were reported by Swamy *et al.*[1] Khadikar *et al.*[2] also studied the formation constants of some bivalent metal ion chelates with 2′-hydroxy chalcone in 60% v/v dioxane-water mixture. The present work deals with the determination of successive stability constants of complexes of 2′-hydroxy-4′,5′-dimethyl-4-chloro chalcone oxide (HDMCCO) with some transition methal ions, in 75% dioxane-water mixture at 25°C and $\mu = 0.1M(NaClO_4)$ by the method of Irving and Rossotti[3].

4,5-Dimethyl-2-hydroxy acetophenone oxime (DMHAO) was synthesised as reported earlier[4]. 2′-hydroxy-4′,5′-dimethyl-4-chloro chalcone oxime (HDMCCO) was prepared by condensing the DMHAO with 4-chlorobenzaldehyde in the presence of 50% sodium hydroxide solution. The solutions of the metal ions were prepared from BDH (AnalaR) sample of the salts in doubly distilled water and metal contents were estimated volumetrically by titrating against EDTA solution using suitable indicator. Solutions of sodium hydroxide and perchloric acid BDM (AnalaR) were prepared and standardised as usual. Sodium perchlorate (Riedel) was used to maintain the desired ionic strength. Dioxane was purified by the method described by Vogel[5]. An inert atmosphere was maintained by bubbling nitrogen through the solution during titration.

The pH measurements were made with systronic digital pH meter type 335 with a sensitivity of 0.01 unit. The pH meter was calibrated at pH 4.05 and 9.18 with aqueous potassium hydrogen phthalate and borax buffers respectively.

The experimental procedure of Irving and Rossotti[3] was used for potentiometric titrations of the following thermostated (25°) solutions in nitrogen atmosphere.

(A) 2.0 ml $HClO_4$(0.05 M)

(B) A + 10.0 ml ligand (0.01 M)

(C) B + 2.5 ml metal ion solution (0.008 M)

against standard carbonate free sodium hydroxide (0.05 M). The ionic strength 0.1 M was maintained by the addition of appropriate sodium perchlorate solution and keeping the total volume at 40.0 ml. by adding solvent.

The proton ligand stability constant of HDMCCO was determined by plotting $\bar{n}_A$ vs pH. From this plot the log $K_1^H$ was determined as 12.02. The stability constants of the metal chelates were determined using Bjerrum-Calvin pH meter titration technique as adopted by Irving and Rossotti[3]. The formation curves of metal complexes were obtained by plotting $\bar{n}$ vs pH. The values of log $K_1$ and log $K_2$ were calculated by various computational methods such as half integral method, mid point method and least square method. The average values are given in Table 1.

It can be concluded from the results in Table 1 that the order of over all stability constants (log $\beta_2$) of the complexes in the present investigation is Cu(II) > Zn(II) > Ni(II) > Co(II) which is in harmony with Irving William's order[6].

TABLE 1

STEPWISE STABILITY CONSTANTS OF VARIOUS COMPLEXES

| Complex | log $K_1$ | log $K_2$ | log $\beta_2$ |
|---|---|---|---|
| Cu(II) | 10.42 | 8.69 | 19.11 |
| Zn(II) | 8.72 | 6.17 | 14.89 |
| Ni(II) | 7.50 | 5.20 | 12.70 |
| Co(II) | 7.20 | 4.72 | 11.92 |

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