Stoichiometry of metal ligand complex - lab report example

Science, Chemistry

Stoichiometry of metal ligand complex

Stoichiometry of metal ligand complex Objective: To determine the correct ligand-to-metal ratio using tissue culture plate and spectrophotometric methods.

Procedure

Into each of the five wells (A, B, C, D and E), 3 drops of hydroxylamine were added. 2 drops of 0. 02 M Fe(II) solutions were then added to well A, 4 drops to well B, 6 drops to well C, 8 drops to well D and 10 drops to well E. The reverse order was followed in adding 0. 02 M of ferrozine.

The above procedure was repeated in the case of phenanthroline and terpyridine ligands.

Results

Table 1: Concentrations of Stock Solutions

Compound

Concentration, g/L

Concentration, M

iron (II)

1. 000

0. 020

Ferrozine

1. 000

0. 002

terpyridine

0. 500

0. 002

phenanthroline

1. 000

0. 006

Table 2: Data from Spectrophotometric Analysis

Ferrozine

Solution

Volume of Iron (II) in cuvette, mL

[Iron (II)], M

Volume Ferrozine in cuvette, mL

[Ferrozine], M

Absorbance

A

0. 270

0. 150

1. 330

0. 0030

0. 4140

B

0. 530

0. 075

1. 070

0. 0037

0. 4100

C

0. 800

0. 050

0. 800

0. 0050

0. 3960

D

1. 070

0. 037

0. 530

0. 0075

0. 4320

E

1. 330

0. 030

0. 270

0. 0150

0. 4160

F

Terpyridine

Solution

Volume of Iron (II), mL

[Iron (II)], M

Volume terpyridine, mL

[terpyridine], M

Absorbance

A

. 195

B

. 290

C

. 400

D

. 535

E

. 516

F

Phenanthroline

Solution

Volume of Iron (II) in cuvette, mL

[Iron (II)], M

Volume phenanthroline in cuvette, mL

[phenanthroline], M

Absorbance

A

0. 267

0. 015

0. 137

0. 0900

0. 0250

B

0. 533

0. 075

1. 067

0. 0110

-0. 0830

C

0. 800

0. 050

0. 800

0. 0150

0. 0480

D

1. 067

0. 037

0. 533

0. 0230

-0. 0554

E

0. 133

0. 030

0. 267

0. 0450

0. 0976

F

Figure 1: A graph of wells as a function of no. of drops for Ferrozine

Figure 2: A graph of wells as a function of no. of drops for Phenanthroline

Figure 3: A graph of volume of metal solution versus absorbance for Ferrozine

Figure 4: A graph of volume of metal solution versus absorbance for phenathroline

Discussion

From the concentration of Phenanthroline and iron, moles of Fe in the complex = 0. 00004 while those of Phenanthroline = 0. 00008, therefore mole ratio is 1: 2 therefore n value is 2. The experimental n value for Phenanthroline in Fe (II) is 2 while that of ferrozine is 3(Amaal et al, 2008). The experimental n values agree with the values predicted by the sructures of the ligand.

Works cited

Amaal Y. Assaf , Jassim M. Alyass , Abeer S. Mohammed. (2008). Synthesis and characterization of Fe(II), Co(II), Ni(II), Cu(II) and Zn(II)complexes with mixed ligands of α-naphthylamine dithiocarbamate and 1, 10-

phenanthroline. Department of Chemistry, College of Education, Mosul University , Mosul , Iraq.