PHOTOMETRIC TITRATION OF COPPER (II) WITH EDTA

The reaction for this experiment is:

$H_2Y^{2-} + Cu^{2+} === CuY^{2-} + 2H^+$

Where $H2Y^{2-}$ is Na_2H_2Y

The titration is performed at 625 nm; both the copper-EDTA chelate and the copper (I) ion absorb at this wavelength, but the molar absorptivity of the chelate is much higher.

Figure 1a is a plot of absorbance (uncorrected for dilution) vs. milliliters of titrant. The points fall below the extrapolated lines in the end-point region, because the reaction is incomplete near the equivalence point. After the equivalence point, the added excess EDTA titrant forces the reaction to completion. The further addition of titrant leads to dilution; therefore, the absorbance will then decrease slightly.

The pH is critical for this titration, because a large change in pH changes the effective binding constant. An acetate buffer is used to maintain the pH between 2.4 and 2.8 to avoid this problem. This low pH also permits the copper to be titrated in the presence of metal ions that form weaker complexes with EDTA. Photometric titrations offer additional advantages. s.

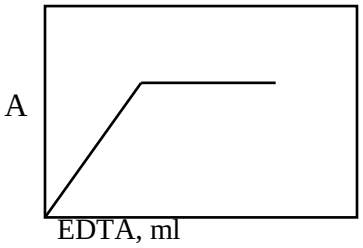

Figure 1. Photometric titration of copper (II) with EDTA titrant at pH 2.4

Procedure

1. Turn on the spectrometer to allow it to warm up. Set the wavelength to 625 nm and zero the meter with distilled water.

2. Add 10 ml of Cu^{2+} solution and 10ml of the acetate buffer solution to all 9 the beakers. At this point, the pH of the solution should be 2.4 to 2.8.

3. Add 0.2M EDTA to all 9 the beakers with these volume (0 ,2 , 3 , 4 , 4.5 , 5 , 5.5 , 6 , 7).

4. Record the absorbance of all solution at 625 nm

5. Plot the absorbance of the solution against the volume of the EDTA, determine the endpoint by extrapolating the two linear portions of the curve to an intersection point.