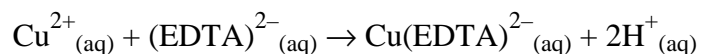


Lab Session 13, Experiment 12: Copper Analysis by Complexometric Titration

A quantitative analysis of copper in a soluble copper salt will be performed by complexometric titration. The complexing agent will be ethylenediaminetetraacetic acid (EDTA) in the form of its disodium dihydrate salt ($\text{Na}_2\text{C}_{10}\text{H}_{18}\text{N}_2\text{O}_{10}$), with a molar mass of $372.24 \text{ g mol}^{-1}$. Since EDTA forms complexes with many metal ions, this particular method can only be used in the absence of such ions as Ca^{2+} , Ni^{2+} , etc. The reaction of complexation is:



The stoichiometry is one

12A Experiment

1. Rinse your burette and fill it with standardized $\text{Na}_2\text{EDTA}\cdot 2\text{H}_2\text{O}$ solution (7.445 g $\text{Na}_2\text{EDTA}\cdot 2\text{H}_2\text{O}$ per liter of water).
2. Weigh accurately three approximately 0.1 g samples of the copper salt.
3. Dissolve each sample in 50 mL of de-ionized water.
4. Add *exactly* the same amount of indicator to each sample, three drops to start off with. If the indicator solution is not strong enough, add more but always the same for all samples. (The indicator's concentration should be 100 mg/100 mL H_2O)
5. Titrate each sample with the standardized EDTA. The light yellow solution turns green near the end point, then suddenly purplish blue at the end point. This end point is fairly hard to see, so put a white sheet of paper under your beaker and watch carefully. The distinctly purplish hue, due to free murexide, is the key to observing the end point.
6. For each titration, calculate the number of equivalents or (milliequivalents) of Cu(II) found.
7. For each titrated sample, calculate the mass of copper in that sample.
8. For each titration, calculate the % copper content in the sample, then average them.

	Sample 1	Sample 2	Sample 3	
(a) Normality of EDTA				
(b) grams of Cu(II) sample				
(c) mL of EDTA solution				
(d) eq (or meq) of Cu(II)				Average % copper content
(e) mass of copper				
(f) % copper content				

12B Exercise

In the experiment on hydrates, we found that copper sulfate was a hydrate which contained 36.1% by mass water. Since the only other component is the sulfate ion, SO_4^{2-} , we can now determine the complete formula of copper sulfate.

NOTE Solutions preparation:

Either weigh the EDTA analytically or standardize the solution. Label the bottles with the normality of EDTA. Use deionized water. About 1 liter will be used by 20 students, 10 groups. Make these solutions up fresh, including the murexide solution.

**Report Form 12: Copper Analysis
by Complexometric Titration**

Name _____

Partner _____ Section # _____

12A Experiment

	Sample 1	Sample 2	Sample 3	
(g) Normality of EDTA				Average % copper content
(h) grams of Cu(II) sample				
(i) mL of EDTA solution				
(j) eq (or meq) of Cu(II)				
(k) mass of copper				
(l) % copper content				

12B Exercise

Complete formula of copper sulfate. _____