Redox titration lab report

Business

Determination of Fe by Redox Titration Matt Cuff Quant 320L October 21, 2011 Abstract In this experiment the percent of iron in an unknown sample will be determined by using a redox titration and then compared to a different method. A primary standard which in this case is ferrous ammonium sulfate will be used to standardize potassium dichromate. The standardized potassium dichromate will then be used to titrate the unknown iron sample using the indicator p-diphenylamine sulfonate. The standardized potassium dichromate which has a concentration around 0. 017 M is then titrated into the unknown iron sample which is dissolved in deionized water. The unknown sample is titrated to its end point using the indicator p-diphenylamine sulfonate, the acid mixture helps to make the end point sharper which would make it more accurately and more easily determined.

The equation of the reaction taking place is: 6 Fe2+ + Cr2O72- +14 H+ ——–> 6 Fe3+ + 2 Cr3+ + 7 H2OThis equation can be used to convert moles of the dichromate ion to moles of the unknown iron to determine the percent of iron contained in the sample. To prepare the acid mixture add 12. 5 mL of both concentrated phosphoric acid and sulfuric acid to 500 mL of deionized water and mix well. To prepare the potassium dichromate solution dissolve about 1. 25 g of potassium dichromate in deionized water and dilute to 250 mL.

To standardize the potassium dichromate weigh out about 0. g of ferrous ammonium sulfate, hexahydrate into a 250 mL flask and dissolve in 50 mL of deionized water and mix for two minutes. Then add 50 mL of the acid mixture previously made and add three to four drops of p-diphenylamine sulfonate indicator to the solution. Then titrate with the potassium

dichromate until a change in color from green to purple occurs. Repeat these steps for three more trials. To titrate the unknown sample of Fe weigh out about 0.

5 g of the unknown into a 250 mL flask and dissolve the sample in 50 mL of deionized water and mix for two minutes. As before ass 50 mL of the previously made acid mixture and three to four drops of p-diphenylamine sulfonate and titrate with the potassium dichromate. Then use this information to calculate the percent iron in the unknown sample. The only obvious observations that could be made in the experiment was the color change of the solution from green to purple due to the indicator p-diphenylamine sulfonate and also titrating the solution with potassium dichromate. Data Analysis Trial 1Trial 2 Trial 3 Trial 4 Wt. Fe(NH)2(SO4)2 , g 0.

5025 g0. 5010 g0. 5003 g0. 013 g Vol. K2Cr2O7 , mL 13. 72 mL14.

22 mL13. 83 mL13. 69 mL Wt. Unknown , g 0. 5020 g 0. 5020 g 0.

5022 g 0. 5004 g Vol. K2Cr2O7 , mL 9. 07 mL 10. 18 mL 9. 53 mL9.

78 mL % Iron in sample10. 29%11. 55%10. 85%11. 11% Trial 1 10.

29% Fe Trial 2 11. 55% Fe Trial 3 10. 85% Fe Trial 4 11. 11% Fe Mean 10. 95% Fe STD ± 0. 5% Fe RSD ± 0.

05% Fe Calculations [K2Cr2O7] = 0. 017 M 9. 07 mL K2Cr2O7 * 0. 017 M = [pic] Spooled =[pic] Spooled = 9. 20 tcalc = [pic] tcalc = 1.

197 @ 90% ttable = 1. 90 ttable > tcalc The two methods are statistically comparableFcalc = [pic] Fcalc = 676 Ftable = 9. 28 Fcalc > Ftable The variances of the two methods are statistically different The average percent of iron present in the unknown sample was 10. 95% Fe with a standard deviation of ± 0. 5% Fe.

When statistically compared to an alternative method of determining percent iron in the same unknown sample using Beer's Law the two methods were found to be statistically the same to the 90% confidence interval but the results of the F-test was the variances are statistically different. It seems as though the redox titration is a more accurate and reliable method for determining the percent of iron in an unknown sample. It seemed as though analyzing the sample would be more accurate using the spectrophotometer but upon experimentation and statistical comparisons of the two methods it is clear the redox titration would be a better choice for better and more accurate data. Reference Buffalo State University. http://staff.

buffalostate. edu/nazareay/che112/chromate. htm (accessed Oct 21, 2011)