Volumetric analysis chemistry lab report

Business

Introduction: The purpose behind (the first step in) this experiment is to show that similarly to week 1, the molarity of an acid or base in solution can be determined (so long as one value's is known) using titration. In this case though, finding the molarity of the acid used in the reaction is then used to determine the percent of that acid in a vinegar solution and compared to the standard value for % acid present in vinegar. The second part of the experiment was to see if by titrating a solution of NaOH and an unnamed mystery acid, you could find the molar mass of the unknown acid (solving the mystery).

It must be understood that the number of moles of the reacting NaOH and the number of moles of the product NaX acid, must both equal (in this case 1: 1) in order for the calculation to find the molar mass to work.

Procedure: Begin the procedure by first making sure all glassware has been cleaned. Next set up the buret for the titration using the same method as week 1. Similar to week 1 the titration is performed using NaOH as a base in the solution so the buret should filled with the NaOH and the initial volume may be recorded. The acid (acetic acid) should be mixed in solution with 5. 0 mL of acid and 50.

0 mL of water. The water can be added in excess because the hydrogen that bonds with the OH to make water as a product is already present in vinegar and so it doesn't bond with other water molecules. Once the solution is mixed the indicator is added and the titration process may be initiated. As the base is added to the solution a faint purple color appears and disappears. The color fades much slower as the titration is almost complete.

After completion the final volume of the NaOH in the buret was recorded and used in calculation.

This entire process was repeated for a second titration. The average molarity of NaOH was found and used to determine the percent acetic acid present in vinegar. After calculating the percent acetic acid in vinegar the second part of the experiment was initiated. The first step was weighing out two samples of the unknown acid to between given values on the container. Each sample was used in separate titrations.

Each titration was carried out using the same methods as before. Once the molar mass of each sample was found the values were then averaged and the deviation was found.

To prove that the molar mass was accurate the deviation had to be within 1%. Calculations: VINEGAR 1) Molarity of acid: a = vinegar b = NaOH Run #1: Ma * (5. 00mL)Va = (0.

02116)Mb * (14. 1)(Vf – Vi) Ma = 0. 5967 Run #2: Ma * (5. 00mL)Va = (0. 02116)Mb * (14.

1)(Vf – Vi) Ma = 0. 5967 2) Average Molarity of Acid: (Ma1 + Ma2)/2 = (0. 5967 M) 3) Density (g/L) (Avg. M) * MM(CH3COOH) (0. 5967M) * (65.

05 g/mol) = 35. 85 g/L 4) Percent Acid ((g/L)/(given density)) * 100 ((35. 85 g/L)/(1005 g/L)) * 100 = 3. 57% UNKNOWN ACID 1) Moles of NaOH ((Vf – Vi)/1000) * M

Run #1: ((31. 11 – 0.

51)/1000) * 0. 2116m = . 006475 Run #2: ((31. 35 – 0. 38)/1000) * 0. 2116m = .

006553 2) Calc Moles of Acid because 1: 1 ratio moles acid equals moles NaOH moles acid = Run 1: . 006475 and Run #2: . 006553 3) Molar Mass (grams used/moles acid) Run #1: (1. 3160g/. 006475) = 203.

24 g/mol Run #2: (1. 3276g/. 006553) = 202. 59 g/mol 4) Average Molar Mass (203. 24 + 202. 59)/2 = 202.

92 g/mol 5) Average Deviation ((202. 92 – 203. 24) – (202. 92 – 202. 59))/2 = .

005 6) % Deviation (. 005/202. 92) * 100 = . 0025 which is < 1% Conclusion/Discussion:

Using titration as a method to calculate the molarity, and in turn the percent acid present in solution proved to be accurate. When solving for the percent of acetic acid present in vinegar the end result of 3.

57% was not far off from the standard 4%. The small error could be a result of error in experiment or an actual failure of the acid to meet the federal standard. An example of error in experimentation is while the solution is titrated completely, the flask being swirled is removed from underneath the buret and a drop or two of NaOH can sneak out before the valve is closed.

Those few missed drops as well as excess NaOH in titration can affect the accuracy of the results. Human error is almost always a factor for example when measuring any values without digital assistance leaves room for the naked eye to make mistakes. As far as the second part of the experiment was, the 0.

0025% deviation indicates that the titration was accurate. The ending molar mass (202. 59 g/mol) of the mystery acid points to two possible suspects. The first being Cesium Diuranate, and the second Sodium Diuranate. Without the information it wasn’t possible to determine which one it would be.

There is also a chance that the results had small deviation (accurate) but were not precise. For example if both titrations had error due to the mass of the samples being incorrect. There was also a potential error during the second titration. While adding the indicator to the acid solution the tip came in contact with the buret and the drop of indicator managed to seep up the buret into the NaOH and so all the NaOH that had turned purple had to be drained. Normally flushing the buret would get rid of the indicator but even after flushing the entire system there was still a faint purple lingering in the tip of the buret.