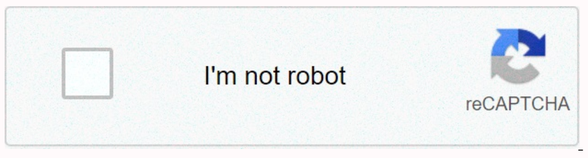


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# Water hardness lab report conclusion

Thank you for your participation! Determination of water hardness By: Diane Krehbiel Abstract: In this experiment, the hardness of an unknown water sample will be determined. Calcium in water is measured by titration with EDTA. Eriochrome Black T will be used as an indicator. First, standardization of EDTA is carried out, and then calcium concentration is determination. After standardisation of EDTA, the mean molarity was found to be 0.01114 M. Calcium concentration was found to be 203.8 ppm ± 5.66. Introduction: Complexometric titrations are titrations that can be used to discover the hardness of water or to discover metal ions in a solution. Ethylene diaminetetractic acid, also known as EDTA, is commonly used in complexometric titrates. This is because it makes six bonds with metal ions to form one to one complex (complex titration). With complexometric titration, the ion transforms into a complex ion. The point of balance is determined by a metal indicator. Erichrome black T is an indicator that can be used to determine the calcium content of the solution. The complex that is originally created is red. After all the calcium ions have responded, the complex then turns blue. This indicates the titration endpoint (Tabor and Seely). In the experiment, EDTA will first be performed and then standardized. This will be done by preparing a solution of calcium chloride. In response with EDTA, calcium carbonate is converted into calcium chloride. Ammonium ammonium chloride will also be ready for use as buffer in the solution. The professor prepared erichrome black T to be used as an indicator. This indicator causes the solution to turn red before titration, and then at the end point the solution turns blue. Make sure it's blue and not purple. After standardization of EDTA, calcium content will be found in an unknown water sample. This will be done in the same way as the first titration occurred. Hardness is then calculated in parts per million. Experimental: To begin this experiment, prepare 0.01 M sodium-EDTA. Set aside about 4.0 grams of sodium dihydrogen EDTA to dehydrate into a 400 ml beaker. Dissolve the solids in water and transfer this solution to a pure 1 litre volumep flask. Water the water on the line. If the solution is cloudy, add a few drops of 0,1 M sodium hydroxide. Mix the solution thoroughly. Next, prepare a standard solution of calcium chloride. This is precisely the case with about 0,4 g of primary standard calcium carbonate, which has already been dried at 100 °C. Transfer the solid to a 500 ml volumep flask and dissolve about 100 ml of water. Add 50% hydrochloric acid until there is noise and the solution is clear. It is diluted with water to the mark and mix the solution thoroughly. This reaction converts calcium carbonate into calcium chloride as shown below: Prepare ammonia buffer and ammonium chloride by dissolving about 6.75 g chloride in 57 ml of concentrated ammonia. Transfer to a 100 ml volumes flask and diluted to the mark. Be sure to handle concentrated ammonia in the hood. Erichrome Black T was prepared by the professor by dissolving 0.50 g of erichrome black t reagent indicator in 100 ml of alcohol. Solutions older than 2 months should not be used. Now standardize EDTA solutions. Place 50 ml of calcium chloride solution in three Erlenmeyer flasks. Add 5 ml and 5 drops of Erichrome Black T to each flask of ammonium buffer. This solution is titrating using EDTA to the point where the colour changes from red to pure blue. Do not stop titrate with purple or purple. Make sure the Erichrome Black T indicator is ready fresh. Repeat this titration with all three tests and record the volume. The average molarity of the EDTA solution is calculated from the concentration of calcium chloride solution and the volume of EDTA used for titration. An unknown concentration of calcium in the water sample shall be determined. Into three Erlenmeyer flasks of 50 ml of unknown water up to three 250 ml. Add 5 ml of ammonia and ammonium buffer and Erichrome Black T. Titrate with EDTA until blue appears. The volume and molarity of EDTA shall be used to calculate the hardness of the water in ppm Ca+2. Data: Part 1 Sodium-EDTA used: 4,204 g Calcium carbonate used: 0,4050 g Initial titration volume: 1) 0,31 ml 0,55 0 3) 0.36 Final titration volume: 1) 37.51 ml 2) 36.41 3) 36.30 Titration volume difference: 1) 37.20 ml 2) 35.86 3) 35.94 Calculated EDTA molarity: 1) 0.01088 M 2) 0.01128 3) 0.0 1126 Mean molarity: 0.01114 M Part 2 Initial titration volume : 1) 0.62 ml 2) 0.08 3) 1.89 Final tiration volume : 1) 24.17 ml 2) 22.5 3) 24.36 Volume difference for titration: 1) 23.55 ml 2) 22.43 3) 22.47 ppm Ca+. 2 calculated: 1) 210.3 ppm 2) 200.3 3) 200.7 Average ppm Ca+2: 203.8 ppm Standard deviation: 5.66 Results: Molarita EDTA calculated: 1) 0.01088 M 2) 0.01128 3 ) 0.01126 Average molarality : 0.01114 M ppm Ca+2 calculated: 1) 210.3 ppm 2) 200.3 3) 200.7 Average ppm Ca +2: 203.8 ppm ± 5.66 Discussion: The results of this experiment were very reasonable. In the first part of the experiment, I found that the average molarity is 0.01114 M. We had to make a solution with a molarity of 0.01 M, so the EDTA had an exact molarity. In the second part of the experiment, we found the hardness of the water sample. This was done by finding calcium content in the water. All three studies of this have yielded similar results that suggest they are accurate. The mean calcium content found was 203.8 ppm Ca+2. Since two tests showed results of 200 ppm and one had a result of 210 ppm, this means that the actual hardness of the water was closer to 200 ppm. Water hardness structured by a numerical range. Soft water has a ppm between 0 and 75. Slightly hard has a range of 75-150. Hard is between 150 and 300. Anything above 300 ppm is considered very heavy. Our sample was in the hard weight range. If I had to do this experiment again, it would be helpful to put in more pointers at the beginning. I haven't turned one court blue yet. After adding a few more drops of the indicator, the color immediately changed to blue. The final point has already been passed. In other studies, I added another indicator before starting and ended up with much more accurate results. In this laboratory, it was difficult to know exactly when the endpoint occurred, because the color turned purple before blue. Sometimes it was difficult to distinguish between these colors. A sharper discoloration would be better to ensure more accurate results. Conclusion: In conclusion, the results of this experiment were reasonable. The hardness of the water sample was successfully determined by detecting the calcium content of the sample. The calcium content of the three studies conducted was 210.3 ppm, 200.3 ppm and 200.7 ppm. The mean of these three standard deviation studies was 203.8 ± 5.66 ppm. This showed that the water fell within the range of numbers indicating hard water. Camp, Ulrich De La, and Oliver Seely. Complexometric determination of ca. N.p., n.d. Web. October 15, 2013. Complexometric titration. Chp. N.p., 2000. Web. October 15, 2013. 