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CHEM 117L 01 - PRINCIPLES OF CHEMISTRY I LAB

Experiment 3: Determination of Waters and of Hydration percent molecules in a hydrated ionic compound after heating

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Abstract

Determining the mass percent of water and number of water molecules in a hydrated ionic compound. In this experiment, a hydrate of the unknown piece will be heated to eliminate the waters of hydration and both the percentage of water and the number (n) of waters of hydration will be determined. Numerous ionic compounds join artificially with water, ammonia, and other polar molecules. Those that join with water are called hydrates. In these counts, the loss of weight after warming (the water or steam released) is divided by the weight of the example which, when multiplied by 100% is the percentage of water in the compound. The number of moles of water given might be calculated by dividing the loss of weight by 18g/mol (molar mass of water). Dividing the number of moles of water by the number of moles of the anhydrous compound gives the number (n) of waters of hydration. The molar mass of the anhydrous salt of your unknown hydrate will be 161g/mol. The experiment was carried out twice and two different set outcomes where recorded. In the first trial the percentage of water 47.099g, moles of water recorded 0.0565mol, the molar mass of anhydrous compound 161, moles of anhydrous compound 0.0071018mol, and waters of Hydration (n) 0.00565. In the second trial percentage of water 47.203g, moles of water recorded 0.0564mol, the molar mass of anhydrous compound 161, moles of anhydrous compound 0.0070950mol, and waters of Hydration (n) 0.00564.

Introduction:

This report talks about an experiment to ascertain the percent of water and the quantity of water particles inside a hydrated ionic compound. Since water is lost inside a hydrated compound when warmed, number-crunching activities were utilized to decide the percent and number of waters within the compound. The goal of this experiment was to decide the percent of water and the quantity of water particles that were within a hydrated ionic compound.

Statement of Purpose:

The reason for the experiment is to distinguish the level of water and the measure of water hydration inside a hydrated compound. The scientific method was used during this experiment.

Background Information:

"A hydrate is a compound that has at least one water particles bound to every equation unit. The anhydrous type of a hydrate has no water in its structure". (Libre, 2020). The water inside most hydrates has a clear proportion of water. For the majority of the hydrates, you can ascertain the measure of water within them by warming it on a Bunsen burner so water can be delivered by fluid or by fume. A scale helps especially in deciding the percent of water and the quantity of hydrations inside a hydrated compound. "Hydrates are ionic compounds." (Kauffman, n.d.).

Procedures:

In this experiment, two crucibles and their spreads were set on three-sided holders that were over two Bunsen burners. They were gauged, and the estimations were reported. Inside the primary crucible, an example of a hydrated compound with a load of 2.1614 grams was set inside. Within the subsequent crucible, a hydrated example with an estimation of 2.1524 grams was put inside. The two were estimated and archived. Each of the two of the crucibles were warmed with the goal that the hydrated compounds can change into an anhydrous compound. For the two crucibles, after warming and cooling, the heaviness of the crucible was recorded. The two crucibles with the anhydrous compounds were warmed and left to cool once more. The mass of water lost was dictated by taking away the mass of the hydrated compound from the gathering of the anhydrous compound. The percent of the water lost was found by partitioning the mass of water lost by the mass of the hydrated blend. The moles of water lost was additionally dictated by separating the mass of water lost by the mole of water. After distinguishing what the molar mass of the anhydrous compound is, the moles of the compound were dictated by separating the mass of the anhydrous compound by the molar mass. At last, the waters of hydration were found by isolating the moles of water by the moles of the anhydrous compound.

Data:

The level of water inside the hydrated compound in crucible 1 was 47.099% and 47.203% in crucibles 2. The quantities of hydration in the two crucibles were 8. It was seen that

the quantity of hydration inside the waters of the two examples were the equivalent. This demonstrated the proportions of water in hydrated compounds are the equivalent.

Materials and Methods:

Materials:

Unknowns Triangle holder Crucibles with covers

Methods:

Clean and dry a porcelain crucible and cover. Put unfilled, covered crucible on a triangle holder and warm it until a cherry redness shows up. Permit the crucible to cool to room temperature and gauge it to the closest 0.01 of grams. As the main crucible is cooling, repeat the procedure with a second crucible, Acquire an example of an unknown hydrate from your educator. Add about 2.0 - 2.20 grams of the hydrate to the crucible and weight the covered crucible with the example to a similar exactness as in the past. Record the two weights in the Data Area. Put the covered crucible with the example on the triangle and warm delicately for a couple of moments. Start with delicate warming so that there will be no loss of material from splattering during the underlying warming. Keep on warming for around 15 minutes with the most sweltering aspect of the burner fire. Permit the covered crucible to cool until it has reached room temperature. Presently gauge the covered crucible and residue. Warm the crucible for 5 minutes, cool, and recheck. Repeat the warming, cooling, and rechecking until two continuous weighing’s are the equivalent inside 0.01 gram. As the principal crucible with the test is cooling,

repeat the whole cycle with a second example of the unknown hydrate. This second preliminary might be run all the while with the main preliminary to spare time. At the point when one crucible is cooling another might be heated or weighed.

Data of mass from the experiment

	Crucible 1	Crucible 2
Mass of Crucible and Cover	36.1571 grams	36.1605 grams
Mass of crucible, cover, and hydrated compound	38.189 grams	38.1655 grams
Mass of hydrated compound	2.1614 grams	2.1524 grams
Mass of crucible, cover, and anhydrous compound	37.3005 grams	37.2981 grams
Mass of anhydrous salt	1.1434 grams	1.1398 grams
Mass of water lost	1.018 grams	1.016 grams
Moles of water	0.056 mol	0.056 mol
Molar mass of an anhydrous compound	161 g/mol	161 g/mol
Moles of the anhydrous compound	0.007 mol	0.007 mol
Waters of Hydration	8	8

Discussion and Conclusion:

After the completion of the experiment, it could be seen that the experiment within itself worked great. It is crucial to be able to identify and find the amount of water within a hydrated compound because testing can prove that a specific hydrated compound has a fixed or defined amount of water within it. That can be seen in this experiment. Both samples were of different masses within the beginning. However, towards the end, the molar calculations and number of hydrations were the same. The accuracy of this experiment was spot on. The calculations were very much straightforward. However, there was an error within the calculations of the mass of the hydrated compound. The subtraction between the mass of the crucible and cover and mass of crucible, lid, and hydrated compounds did not equal the mass of the hydrated compound. This possibly affected the calculations. When conducting this experiment, one must be able to complete necessary arithmetic calculations on a calculator. Before experimenting, research was conducted to understand more of the topic. Overall, this experiment went well. It was not a challenging experiment, and it did not have any complicated formulas to receive the data. The anticipated output of the investigation was reached.

References:

Kauffman,G.(n.d.) “Hydrate” Retrieved from https://apastyle.apa.org/learn/faqs/web-page-no-author

“Percent water in hydrate”.(2020, Aug 12). Retrieved from https://apastyle.apa.org/learn/faqs/web-page-no-author