Free report on procedures

Environment, Water

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Lab report on Preparation of Aspirin

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Introduction

The chemical name for aspirin is the acetylsalicylic acid and is a drug that is used as an antipyretic. Aspirin reduces fever, relieves the pain and inflammation (Thomson Healthcare, 2012). The compound structure of acetylsalicylic acid has an ester group and is produced through an esterification reaction. Aspirin is synthesized through a reaction of salicylic acid with acetic acid using sulfuric acid as a catalyst. The reaction equation occurs as shown below.

The experiment aimed at synthesizing aspirin, providing an opportunity to familiarize with vacuum filtration as well as melting point techniques. The

experiment also had an aim of calculating the percentage (%) yield of the synthesized product as well as performing a test for purity of the product produced.

Synthesis of Aspirin

A hot water bath was set up using a 400-mL beaker that was half filled with water and placed on a hot plate as a source of heat. The temperature of the water in the beaker was maintained at 100OC. A dry filter paper and a 125 mL Erlenmeyer flask were weighed separately and their masses recorded in Table 1 below. Into the flask, 2. 39 grams of salicylic acid were added and the flask reweighed. The mass was recorded in table 1 and the mass of the salicylic acid calculated. Into the Erlenmeyer flask, 3. 0mL of acetic anhydride was added and mixed in the hood. Into the flask, 8 drops of concentrated sulfuric acid slowly, stirring the mixture using a glass-stirring rod. The Erlenmeyer flask containing the mixture was placed in the hot water bath while stirring was continued periodically for 20 minutes.

The Erlenmeyer flask was taken out of the bath and given time to cool to room temperature. Into the Erlenmeyer flask, 20mL of ice-cold water was added and the flask placed in an ice bath, stirred, and the formation of aspirin crystals observed. The crystals were collected using vacuum filtration. The filter paper that had the crystals was weighed and the actual weight of the synthesized aspirin calculated.

Test the product for purity

- Melting point

The melting point of both the commercial and experimental aspirins was

determined using the melting point equipment and the readings recorded.

- The use of FeCl3

A pinch of the prepared aspirin and a crashed commercial aspirin were placed in two different test tubes, and 5 drops of FeCl3 added into the test tubes. The color of the product was noted and recorded in the table.

Results

The results of the weight of the filter, flask as well as, the crystal were as below (Table 1). The weight of the aspirin yielded was 2. 14 grams with a melting point of between 115 and 131OC. The melting point of the commercial aspirin was between 131 and 133OC. The prepared aspirin gave a dark purple color on the use of FeCl3 test while the commercial one gave a light purple color.

The theoretical yield was calculated using the formula

mass gof salicylic acid×1 mole of SA138 g of SA×1 mole of ASA 1 mole of SA×180 g ASA1 mole ASA= Grams of aspirin (ASA)

Grams of aspirin ASA= 2. 39 g×1 mole of SA138 g of SA×1 mole of ASA 1 mole of SA×180 g ASA1 mole ASA

Grams of aspirin = 3. 12 g of ASA

The percentage yield was calculated using the formula

percentage yield= Actual YieldTheoretical Yield×100

= 2. 143. 12×100

= 68. 59%

Discussion

The experiment resulted in the expected product, which was aspirin. The process gave a product that was low in percentage yield than the expected amount. The product also gave a dark purple color when the use of FeCl3 test was done. This was an indication of high levels of un-reacted salicylic acid and hence less pure. The range of the boiling temperatures was 16OC, which was higher than that of a pure substance (1-3OC). The sources of error may have been inaccurate measurement of the reactants. The un-reacted salicylic acid may have resulted from reduced amount of acetic anhydride.

Answers to the Questions

- Question 1

- The theoretical Yield

Grams of aspirin (ASA) = mass gof salicylic acid×1 mole of SA138 g of SA×1 mole of ASA 1 mole of SA×180 g ASA1 mole ASA

= 4. 75 g×1 mole of SA138 g of SA×1 mole of ASA 1 mole of SA×180 g ASA1 mole ASA

Grams of aspirin = 6. 19 g of ASA

- Percentage yield

percentage yield= Actual YieldTheoretical Yield×100

= 4. 696. 19×100

= 75. 86%

- An unknown compound with a range of boiling temperatures of 120-128OC is not pure since the range of the melting temperatures of a pure substance is 1-3OC (Jasperse, 2013).

Conclusion

The experiment successfully enabled synthesis of aspirin, and provided an opportunity to familiarize with vacuum filtration as well as melting point techniques. The experiment also enabled the calculation of the percentage (%) yield of the synthesized product as well as performance of a test for purity of the product produced. The errors that resulted in reduced percentage yield and impure product may be reduced by being more accurate in sampling techniques.

Reference List

Jasperse, C. P. (2013). Melting Range. Retrieved March 10, 2013, from http://web. mnstate. edu/jasperse/Chem355/Melting%20Range. doc. pdf

Thomson Healthcare. (2012). Salicylate (Oral Route, Rectal Route). Retrieved March 10, 2013, from http://www. mayoclinic. com/health/drug-information/DR602341/DSECTION= proper-use