Synthesis of Asprin

Ryan Coyne

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Introduction

The purpose of this lab lab was to produce asprin and determine the % yield of our product.

Theory Discussion

The expected amount of product can be calculated from the initial amount of the reagents using the chemical equation which in this case is:

$$C_7H_6O_3 + C_4H_6O_3 \leftrightarrows C_9H_8O_4 + C_2H_4O_2$$

The percent yield is the percentage of the expected prodcut that was actually obtained and can be calculated using the formula:

$$\% \text{ yield} = \frac{\text{Theoretical Yield}}{\text{Actual Yield}} \cdot 100\%$$

Procedure

1. Fill a 600 ml beaker half full of water.
2. Add boiling chips to the beaker.
3. Weigh an empty 125 ml Erlenmeyer flask.
4. Add 2.85 - 3.15 g of salicylic acid to the flask.

5. Under a fume hood, with safe glasses on, carefully measure 6.0 ml of acetic anhydride in a 10 ml graduated cylinder and add it to the flask.
6. Swirl the mixture for 20-30 seconds and add 5 drops of H_2SO_4.
7. Heat the flask for 10 minutes in a water bath at a temperature between 80 and 90 degrees C.
8. Remove the flask and cool to room temperature.
9. Add 40 ml of water to the flask and put it in an ice bath.
10. Weigh a filter paper and watch glass.
11. When the asprin has fully recrystallized, filter it.
12. Put the filter paper and asprin on the watch glass.
13. Wait for the asprin to dry.
14. Weigh the asprin, fitler paper, and watch glass.
15. Put a little ferric chloride solution into a test tube and add a bit of asprin. If the color changes to purple, this indicates the presence of salicylic acid.

Calculations

	Mass (g)
Salicylic Acid	2.85
Filter Paper	0.20
Watch Glass	42.43
Asprin, Filter Paper, & Watch Glass	44.53

$$
\begin{aligned}
\text{Theoretical Yield} &= 2.85\text{g} \cdot \frac{1\text{mol}}{132.13\text{g}} \cdot \frac{180.17\text{g}}{1\text{mol}} \\
&= 3.89 \text{ g of } C_9H_8O_4 \\
\text{Actual Yield} &= 44.53 \text{ g} - 0.2 \text{ g} - 42.43 \text{ g} \\
&= 1.90 \text{ g} \\
\text{\% yield} &= \frac{1.90}{3.89} \\
&= 48.8\%
\end{aligned}
$$

Conclusion

The goal of this lab was to synthesize asprin and calculate the % yield. Our % yield was 48.8%, but the ferric chloride did not turn purple which indicates that our product was pure. We assumed that the salicylic acid was the limiting reagent which may not be the case since we did not calculate the ammount of acetic anhydride that was used. The asprin may have also not completely recrystallized out of the solution. When transfering the asprin and filter paper from the filter to the watchglass, dropped all of it and were probably not able to completely collect the asprin. back onto the watchglass.