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Experiment 20 – Precipitation of Strontium Sulfate

In this experiment, you will study a precipitation reaction between sodium sulfate and strontium chloride. You will collect, dry, and weigh the precipitate and compare this experimental yield to the theoretical yield.

Procedure

Weigh a clean, dry, 100-mL beaker. Add about 0.25 g (0.350 g max!) of solid sodium sulfate to the beaker and weigh it again. Dissolve the sodium sulfate in about 20 mL of D.I. water. Add 5.0 mL of 0.50 M strontium chloride solution and heat for fifteen minutes. Try to keep the mixture from boiling.

After the heating period has passed for the mixture, set it aside so as to return to room temperature, and then cool it further by putting the beaker in a cold water bath. Your precipitate should settle to the bottom, leaving a relatively clear solution above it. Obtain a piece of filter paper and weigh it on the analytical balance. Set up a vacuum filtration apparatus with a Büchner funnel and your weighed filter paper (your instructor will show you how). Using a stirring rod to guide the stream of liquid, pour the contents of the beaker into the Büchner funnel. Use your wash bottle (filled with D.I. water) to rinse any solid out of the beaker and into the filter. Make sure no precipitate remains in the beaker or on the stirring rod. Fill the beaker with 15 mL of D.I. water, swirl it around, and then pour it into the filter. Repeat the washing process, and then draw air through the funnel for a few minutes to help dry the crystals.

Turn off the vacuum, carefully remove the filter paper containing your precipitate with a spatula, and place it over a watch glass. Fill a 100-mL beaker half-way with water, place the watch glass with filter paper over the beaker, and heat to boil for twenty minutes to dry the precipitate (alternatively, you can place the watch glass with filter paper in a drying oven at 130 °C for twenty minutes). Allow to cool, then determine the mass of your precipitate. Heat for another five minutes, cool, and reweigh. The two weights should agree within $\pm$0.05 g or a third heating should be done.

Data and Calculations for Experiment 20

1. Weight of empty beaker _____

2. Weight of beaker and sodium sulfate _____

3. Weight of sodium sulfate

   Show Calculation _____

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4. Moles of sodium sulfate:

   Show Calculation _____

5. Moles of strontium chloride

   moles $SrCl_2$ = 5.0 mL $SrCl_2$ $\left(\frac{10^{-3}\text{ L } SrCl_2\text{ solution}}{1\text{ mL } SrCl_2\text{ solution}}\right)\left(\frac{0.50\text{ mol } SrCl_2}{1\text{ L } SrCl_2\text{ solution}}\right)$ =

   Solve the Equation Shown _____

6. Write a balanced MOLECULAR equation for the reaction:

7. Write a balanced NET-IONIC equation for the reaction:

8. Weight of empty filter paper _____

9. Weight of filter paper and dried precipitate (first time) _____

   Weight of filter paper and dried precipitate (second time) _____

   Weight of filter paper and dried precipitate (third time) _____

10. Weight of precipitate:

    Show Calculation _____

11. Determine the limiting reactant and excess reactant for your reaction. Also, calculate the theoretical yield (in grams) of strontium sulfate.

    Limiting Reactant: _____ Excess Reactant: _____

    Show Calculation (theoretical product yield) _____

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12. Determine the percentage yield of your reaction.

Show Calculation _____

13. Calculate the theoretical yield (in grams) of strontium sulfate if you had used half as much $SrCl_2(aq)$?

Show Calculation _____

14. Calculate the theoretical yield (in grams) of strontium sulfate if you had used twice as much $SrCl_2(aq)$?

Show Calculation _____

15. Briefly describe how you could have improved your percentage yield in this experiment.