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Chem 1045 Lab

Separating the Components of a Mixture

Introduction

In this experiment, you will use both physical and chemical methods to separate the components of a mixture. Mixtures can be separated into their constituents by using physical methods (i.e no chemical reaction involved. Separation techniques are physical methods where the technique used depends on the different properties of the constituents. Physical methods included centrifugation, decantation, extraction, evaporation, and others. Chemical methods involve the selective reaction of a substance with one or more of the components of the mixture.

The mixture in the experiment contains sodium chloride (NaCl), silicon dioxide (SiO2), and calcium carbonate (CaCO3). I will extract the NaCl from the mixture using distilled water. The NaCl will dissolve whereas both the SiO2 and CaCO3 will not. If the resultant solution is filtered, the insoluble components (SiO2 and CaCo3) will remain on the filter paper. The water can then be evaporated leaving solid NaCl. When HCl is added to the solid residue, the CaCO3 will dissolve with CO2 gas produced. The calcium carbonate may be recovered from the filtered solution by adding a solution containing carbonate ions causing CaCO3 to precipitate. The SiO2 may be recovered by rinsing the sand off the filter paper and drying in the oven.

Procedures

1. Obtain an unknown mixture and record the identification code.

2. Place approximately 3 (g) of your unknown mixture into a beaker. Do not include the mass of the beaker.

3. Add approximately 50mL of distilled water to the beaker while stirring. The NaCl will dissolve whereas both the SiO2 and NaCl will not.

4. After the addition is complete, stir for 2-3 minutes.

5. Weigh a dry , clean beaker.

6. Set up a vacuum filter apparatus.

7. Vacuum filter this solution. Quantitatively transfer the filtrate ( the liquid) into the pre weighed beaker using a squirt wash bottle to rinse the vacuum flask. Do not throw away the filter.

8. Place the beaker on a hot plate to boil and evaporate the water.

9. Once the water has completely evaporated allow the beaker to cool to room temperature.

10. Weigh the beaker and determine the mass of the NaCL and beaker. Determine the mass of NaCl by difference.

11. Discard the NaCl in the regular trash.

12. Transfer the solid residue from the filter paper to a clean beaker. You don’t need to know the mass of the beaker.

13. Use the squirt bottle to rinse the filter paper to ensure complete transfer of the solid residue.

14. Slowly add 10 mL of 3M HCl. The HCl will dissolve CaCO3.

15. You will know that you have dissolved all of your CaCO3 when you no longer see any bubbling. The only solid particles in your beaker should be brownish in color. There should be no white particles. This process is about 10 minutes.

16. Label a piece of filter paper with your initials.

17. Place the filter paper on a watch glass and record the mass.

18. Vacuum filter using the pre-weighed filter paper.

19. Quantitatively transfer the filtrate containing the calcium ions into a clean beaker using a wash bottle to rinse the vacuum flask. You don’t need to know the mass of the beaker.

20. Please the filter paperback on the watch glass and place in the over for a minimum of 10 minutes to ensure drying of the recovered SiO2.

21. Weigh and determining the mass of SiO2 by difference.

22. Place the filtrate solution from step 19 on a hot plate and bring to a gentle boil.

23. Once the solution boils, remove the beaker from the hot plate using beaker tongs.

24. Add 30 mL of 1M K2CO-3. Swirl the beaker.

25. Using a glass rod, place one drop of the solution onto a piece of red litmus paper. If the paper turns blue, proceed to the next step. Is the paper remains red, add an addition 5 mL o f 1M K2CO3.

26. Allow the solution to sit for 5 minutes. This will allow the solid particles to increase in size. If you attempt to filter too quickly, the solid precipitate particles are small enough that they will pass through the pores of the filter.

27. Label a piece of filter paper with your initials.

28. Place the filter paper on a watch glass and record the mass.

29. Vacuum filter using the pre-weighed filter paper.

30. Place the filter paper on the watch glass and place in the over for a minimum of 10 minutes to ensure drying of the recovered CaCO3. Alternatively, you may place the watch glass and filter paper in your drawer to dry until the next laboratory period.

31. Weigh and determine the mass of the CaCO3 by difference.

Data/ Results



Conclusion

My group was not able to determine accurate results since we did not measure the sample correctly at 3 (g) in Step 1. We used several different techniques to separate the components of the sample including filtering, heating, dissolving and certain chemical reactions. Our data represented is that from a group that did do Step 1 correctly. From using all of the component separating techniques we were able to calculate that 90.5% of the sample was recovered at the end of the processes.