

Finding the Solubility of Calcium Hydroxide by Three Different Methods

by Andy Pratt

Experiment Overview

The concentration of dissolved calcium hydroxide in a saturated solution of calcium hydroxide is determined by three independent methods:

- ☐ gravimetric analysis (evaporation of the water followed by weighing the solid residue);
- ☐ titrimetric analysis (titration with hydrochloric acid); and,
- ☐ pH measurement (via estimation of the concentration of hydroxide ion present).

The practical illustrates the fact that there are often complementary ways of making chemical measurements. Independent measurements can increase our confidence in the value of an experimental parameter, but they call attention to the need to choose an appropriate method of analysis. For this, it is important to have a critical understanding of issues of measurement such as experimental error, accuracy and precision. The practical highlights the fact that in this case, contrary to the prejudice of many students, a chemical method (titration) is a more accurate analytical tool than the use of an electronic device (a pH meter).

Level of Experiment

General introductory-level first year undergraduate chemistry

Keyword Descriptions of the Experiment

Domain

general chemistry, analytical chemistry

Specific Descriptors

solubility, titration, measurement, precision, accuracy

Course Context

CHEM 114 is an introductory chemistry course for students at the University of Canterbury who are not (yet?!) committed to major in chemistry and who typically have little or no background in chemistry prior to the course. This practical accompanies a series of lectures which is focused on aqueous chemistry, including acid-base chemistry and the solubility of salts.

Prerequisite Knowledge and Skills

It is assumed that lectures, laboratories and course textbook provide a working understanding of:

- moles;
- concentrations;
- acid-base chemistry, including pH;
- solubility; and,
- titration.

Time Required to Complete

Prior to Lab: 15 min (reading procedure) plus any additional time spent revising / reading the textbook, etc.

In Laboratory: 2 h (approximately) - this includes analysis of results and write-up

After Laboratory: N/A

Experiment History

Graham Townsend (Foundation Studies, University of Canterbury) developed this experiment in about 1996/7 as a way of trying to get introductory students to synthesize their understanding of different topics and techniques in quantitative analysis. Since 2002 it has been used on the University of Canterbury Introductory Chemistry first year course, CHEM 114 (for non-specialists).

References

A representative undergraduate reference, used on the course is:

Kotz, J. C., Treichel, P. M., & Weaver, G. C. (2006). *Chemistry and Chemical Reactivity* (6th ed.). Belmont, CA: Brooks / Cole. Relevant sections: 1.7, 14.1, 14.2 and chapter 18.