Example Abstracts for a General Chemistry Lab

TITLE
Gravimetric Determination of the Solubility Product Constant for Lead (II) Chloride, PbCl$_2$

INTRODUCTION

In this experiment, the equilibrium exhibited by slightly soluble ionic compounds in water is explored. Most ionic compounds, even those called “soluble”, have a limited solubility in water. If more than this amount is added, some solid will remain undissolved. In a saturated solution at a particular temperature, equilibrium exists between the undissolved and dissolved solid. Slightly soluble ionic compounds are often called “insoluble” because they have a relatively low solubility (little dissolves before equilibrium is reached).

Lead (II) chloride, the insoluble ionic compound used, is assumed to dissociate according to equation 1.

\[
PbCl_2(s) \rightleftharpoons Pb^{2+}(aq) + 2 \text{Cl}^-(aq) \quad (1)
\]

\[K_{sp}\], the equilibrium constant for the dissociation reaction, is written according to equation 2.

\[K_{sp} = [Pb^{2+}][\text{Cl}^-]^2\quad (2)\]

Mass measurements are made in order to determine the amounts of dissociated and undissociated PbCl$_2$. $K_{sp}$ is then calculated using Eq. 2. Since PbCl$_2$ is “insoluble”, $K_{sp}$ should be very small ($<<1$). This reflects the fact that the concentration of the dissolved ions, Pb$^{2+}$ and Cl$^-$, is very low.

ABSTRACT

Instructions

Rate the following abstracts from 1 to 5.

1 = beginning, 2 = developing, 3 = adequate, 4 = accomplished, 5 = exemplary

Sample Abstracts

A The $K_{sp}$ for PbCl$_2$ dissociation was found. Three trials were performed using about 0.770 g PbCl$_2$ each time. One trial was performed in 25.00 mL pure water; one trial was performed in 25.00 mL 0.10 M NaCl; and, one trial was performed in 25.00 mL 0.10 M Pb(NO$_3$)$_2$ so the effect of additional dissolved ions could be assessed. $K_{sp}$ of PbCl$_2$ was found to be $1.59 \times 10^{-5}$. Even though it was hard to measure the Pb$^{2+}$ and Cl$^-$ concentrations, the results were pretty good.
Equilibrium dissociation constants that compare favorably with literature values can be obtained by the gravimetric method used in this work. The solubility product constant, $K_{sp}$, of lead (II) chloride was found to be $1.59 \times 10^{-5} \pm 6.00 \times 10^{-7}$ at 298 K, which is within 1% of the accepted value. Primary sources of error can be minimized if the work is performed carefully.

We calculated $K_{sp}$ for PbCl$_2$ which is an ionic compound that doesn’t dissolve in water too much but does a little bit depending on factors like temperature and other things. We had to do three tests with solid PbCl$_2$ and pure water or 0.10 M NaCl or 0.10 M Pb(NO$_3$)$_2$ and then figure out how much Pb$^{2+}$ and Cl$^-$ were in the solution part. We got a $K_{sp}$ that was close to the value our TA said was right.

PbCl$_2$, an “insoluble” ionic compound, has a low solubility product constant ($K_{sp}$) of $1.6 \times 10^{-5}$ at 25°C. Using gravimetric analysis, the experimentally determined $K_{sp}$ of PbCl$_2$ was found to be $1.59 \times 10^{-5} \pm 6.00 \times 10^{-7}$. The small percent difference between the expected and observed $K_{sp}$ values indicates that this method of analysis is a valid and accurate way of determining the extent of dissociation of slightly soluble ionic compounds in water. Problems such as precipitate loss and/or contamination during filtration can introduce error if care is not taken during the experiments.