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.

$$PbCl_2(s) \rightleftharpoons Pb^{2+}(aq) + 2\ Cl^-(aq) \tag{1}$$

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

$$K_{sp} = [Pb^{2+}][Cl^-]^2 \tag{2}$$

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 1.59×10^{-5}. Even though it was hard to measure the Pb^{2+} and Cl^- concentrations, the results were pretty good.

B 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.

C 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.

D $PbCl_2$, an "insoluble" ionic compound, has a low solubility product constant (K_{sp}) of 1.6×10^{-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.

