25

(Your Name)

Chemistry 101B CRN: 30076

Experiment 34: The Solubility Product of Silver Acetate

(Lab Partner Name)

Purpose: The purpose of this experiment is to determine the K_{sp} value of silver acetate and also to demonstrate the common ion effect.

Results: For Part 1: Determination of Silver Acetate in Distilled Water, the K_{sp} value of silver acetate is 3.6×10^{-3}. For Part 2: Determination of Silver Acetate in 0.100M Sodium Acetate, the K_{sp} value of silver acetate is 3.9×10^{-3}. Based on the K_{sp} values for Part 1 & 2, the mean values K_{sp} is 3.75×10^{-3} and the standard deviation K_{sp} is 1.5×10^{-4}.

Procedure: The procedure followed for this experiment is on pages 315-316 in *Experimental Chemistry* Lab Manual written by James Hall.

Data/Observation:

1. Determination of Silver Acetate in Distilled Water

mL standard KCl taken	10mL		
	Sample 1	Sample 2	Sample 3
Initial vol. AgAc	7mL	16mL	24.3mL
Final vol. AgAc	16mL	24.3mL	32.4mL
Vol. AgAc used	9mL	8.3mL	8.1mL
Molarity Ag^+ ion	0.06M	0.06M	0.06M
Mean molarity of Ag^+ ion	0.06M		
K_{sp} for silver acetate	3.6×10^{-3}		

you rounded 1SF

Calculations: 0.0500M KCl x 10mL KCl=0.5mmol KCl=0.5mmol Ag^+

Sample 1: **$[Ag^+]$**= 0.5mmol Ag^+/9mL= **0.06M**

***Repeat for samples 2 & 3**

Mean molarity: (0.06+0.06+0.06)/3=**0.06M**

K_{sp}=$[Ag^+][C_2H_3O_2^-]$ K_{sp}=(0.06)(0.06)=**3.6×10^{-3}**

2. Determination of Silver Acetate in 0.100M Sodium Acetate

mL standard KCl taken	25mL		
	sample 1	sample 2	sample 3
Initial vol. AgAc	0mL	0mL	4mL
Final vol. AgAc	46mL	45.4mL	50mL
Vol. AgAc used	46mL	45.4mL	46mL
Molarity Ag^+ ion	0.03M	0.03M	0.03M
Mean molarity Ag^+ ion	0.03M		
K_{sp} silver acetate	3.9×10^{-3}		

) again

I get 3.5×10^{-3}

.002729 M Ag^+

Calculations: 25mL x 0.0500MKCl=1.25mmol KCl=1.25 Ag^+

Sample 1: **$[Ag^+]$**=1.25mmol Ag^+/46mL=**0.03M**

***Repeat for sample 2 & 3**

Mean molarity: (0.03+0.03+0.03)/3=**0.03M**

K_{sp}= 0.03(.100+0.03)=**3.9×10^{-3}**

Based on Part 1 & 2 Results:

Mean value: $(3.6 \times 10^{-3}) + (3.9 \times 10^{-3})/2 =$ **3.75×10^{-3}**

Standard Deviation: $(3.75 \times 10^{-3}) - (3.6 \times 10^{-3}) = (1.5 \times 10^{-4})^2 = 2.25 \times 10^{-8}$

$(3.75 \times 10^{-3}) - (3.9 \times 10^{-3}) = -(1.5 \times 10^{-4})^2 = 2.25 \times 10^{-8}$

$2.25 \times 10^{-8} + 2.25 \times 10^{-8} = 4.5 \times 10^{-8}/2 = 2.25 \times 10^{-8} = (2.25 \times 10^{-8})^{1/2} =$ **1.5×10^{-4}**

Discussion/Error Analysis:

The percent error for this experiment was 93.3% (Part 1 & 2 K_{sp} results). This is because the temperature in the classroom was not even near the temperature of 25C. At 25 degrees Celsius the K_{sp} value for silver acetate is supposed to be 1.94×10^{-3}. The temperature of the classroom was colder than 25C (or 77F). That is why our K_{sp} value was larger;K_{sp} **mean** value was 3.75×10^{-3}. Since the temperature was colder, the silver acetate became less soluble. The main reason of error for our experiment was the temperature and that is because K_{sp} depends on temperature. Other possible errors could be not having the glass buret in the Erlenmeyer flask completely inside; the titrant can spill and not fall inside the analyte.

usually Ksp smaller if T↓

Post-Lab Questions:

Percent Error $K_{sp}=1.94 \times 10^{-3}$ Source: CSUDH website Chem. Data

2. $(3.75 \times 10^{-3}) - (1.94 \times 10^{-3})/(1.94 \times 10^{-3}) \times 100=$**93.3%**

depends on ΔH

3. K_{sp} varies with temperature. The theoretical values given are at 25 degrees Celsius. When a laboratory classroom is not at that temperature, the value of the K_{sp} can be significantly smaller or greater, depending on the temperature. For example, if the room is colder than 25C silver acetate will be less soluble (K_{sp} larger value) and if it is warmer than 25C the silver acetate will be more soluble (K_{sp} smaller value).

Conclusion: The purpose of this experiment was indeed met. We were able to find the K_{sp} values of silver acetate and also demonstrate a common ion effect. We saw this effect in Part 2 when the solution contained silver acetate with sodium acetate. The solubility was decreased because the equilibrium shifted to the left and decreases the amount of AgCl that can dissolve. This experiment was interesting in seeing the different color changes and being able to understand the concept of the common ion effect.

EXP. NUMBER 34 | EXPERIMENT/SUBJECT Solubility Product of Silver Acetate | DATE 3/12/13

NAME | LAB PARTNER | LOCKER/DESK NO. Chem | COURSE & SECTION NO. 101B

Results/observations

1.) Determination of Silver Acetate in Distilled Water

mL standard KCl taken 10mL

	sample 1	sample 2	sample 3
initial vol. AgAc	7mL	16mL	24.3mL
final vol. AgAc	16mL	24.3mL	32.4mL
vol. AgAc used	9mL	8.3mL	8.1 mL
molarity Ag+ ion	0.06M	0.06M	0.06M

mean molarity Ag+ ion 0.06M

Ksp silver acetate 3.6×10^{-3}

Calculations: 0.0500M KCl • 10mL KCl = 0.5mmol KCl = 0.5mmol Ag^+

sample 1: $[Ag^+] = \frac{0.5\text{mmol } Ag^+}{9\text{mL}}$ = 0.06M

sample 2: $[Ag^+] = \frac{0.5\text{mmol } Ag^+}{8.3\text{mL}}$ = 0.06M

sample 3: $[Ag^+] = \frac{0.5\text{mmol } Ag^+}{8.1\text{mL}}$ = 0.06M

mean molarity: (0.06 + 0.06 + 0.06) / 3 = 0.06M

$K_{sp} = [Ag^+][C_2H_3O_2^-]$

$K_{sp} = (0.06)(0.06) = 3.6 \times 10^{-3}$

SIGNATURE | DATE | WITNESS/TA | DATE

EXP. NUMBER	EXPERIMENT/SUBJECT	DATE
34	Solubility Product of Silver Acetate	3/12/13

NAME	LAB PARTNER	LOCKER/DESK NO.	COURSE & SECTION NO.
			Chem. 101B

2.) Determination of Silver Acetate in 0.100M Sodium Acetate

ml standard KCl taken 25ml

	sample 1	sample 2	sample 3
initial vol. AgAc	0ml	0ml	4mL
final vol. AgAc	46ml	45.4ml	50 mL
vol. AgAc used	46ml	45.4ml	46 mL
molarity Ag^+ ion	0.03 M	0.03 M	0.03 M

mean molarity Ag^+ ion 0.03 M

Ksp silver acetate 3.9×10^{-3}

Calculations: 25mL KCl • 0.0500M KCl = 1.25mmol KCl = 1.25 Ag^+

sample

1.) $[Ag^+] = \frac{1.25 \text{mmol } Ag^+}{46 \text{ml}}$ = 0.03 M

2.) $[Ag^+] = \frac{1.25 \text{mmol } Ag^+}{45.4 \text{mL}}$ = 0.03 M

3.) $[Ag^+] = \frac{1.25 \text{mmol } Ag^+}{46 \text{ml}}$ = 0.03 M

mean molarity: $(0.03 + 0.03 + 0.03)/3$ = 0.03 M

Ksp: $0.03(.100 + 0.03)$ = 3.9×10^{-3}

Based on Part 1 & 2 results

mean value Ksp: (3.9×10^{-3}) (pt. 2) + (3.6×10^{-3}) (Pt. 1) / 2 = 3.75×10^{-3}

standard deviation Ksp:

$(3.75 \times 10^{-3}) - (3.6 \times 10^{-3}) = (1.5 \times 10^{-4})^2 = 2.25 \times 10^{-8}$

$(3.75 \times 10^{-3}) - (3.9 \times 10^{-3}) = -(1.5 \times 10^{-4})^2 + = 2.25 \times 10^{-8}$

$4.5 \times 10^{-8} / 2$

$\sqrt{2.25 \times 10^{-8}}$ = 1.5×10^{-4}

SIGNATURE	DATE	WITNESS/TA	DATE