**Precipitation Reactions**

Benson Long

*Department of Chemistry and Biochemistry, Queens College – CUNY*

*CHEM 131.1, 07, Fall 2012*

*Instructor: Freida Zavrov*

**ABSTRACT**

In order to observe precipitation reactions, two solutions containing soluble ionic salts are mixed. A precipitation reaction occurs when the soluble ionic salts combine to form new insoluble salts. These insoluble salts are the precipitant or solid in a precipitation reaction. In this experiment, we make predictions about which mixtures will have a precipitation reaction. We then test the possible different mixtures and record observations. These observations may reveal a trend that could explain why some mixtures form precipitants and why others do not.

1. **INTRODUCTION**

The purpose of this experiment was to teach us about precipitation reactions and why and when they occur. Precipitation reactions can occur when soluble solutions are mixed. A precipitant forms if the soluble ionic salts of the solutions combine and make insoluble salts. The insoluble salts may appear as apparent solids or make the solution cloudy. If there is no precipitation reaction, the mixed solution will remain clear and unchanged. There are specific trends that can be discovered by combining solutions. By the end of the experiment, we should know which mixtures form precipitants and why those specific mixtures do so.

1. **EXPERIMENTAL**

In order to test which mixtures of solutions form precipitation reactions, we used six different solutions: copper (II) sulfate, barium nitrate, sodium chloride, silver nitrate, lead nitrate and sodium sulfate. We first predicted which mixtures would form precipitants and proceeded to test the fifteen different mixtures after showing our predictions to the instructor.

I retrieved the solutions by pouring them into six different beakers with each of them in order labeled from A to F. I wrote down the fifteen possible mixtures in my notebook one by one before mixing them in test tubes. After mixing each reaction, I recorded my observations that discussed the color, texture, presence of a precipitant or not, and presence of bubbles or not in the mixture. The amounts of the solution used to create each mixture were not measured but were less than 5mL each. Each mixture and recording of observation would take a minute or two to do.

After all the observations were recorded, I poured all of the mixtures into one beaker and disposed of it in a waste bottle. Overall, the equipment we used for this experiment were: beakers, aqueous solutions, test tubes and test tube rack.

1. **RESULTS AND DISCUSSION**

There were a total of seven mixtures that had a precipitation reaction. These mixtures were: copper (II) sulfate and silver nitrate; copper (II) sulfate and lead nitrate); copper (II) sulfate and barium nitrate; barium nitrate and sodium sulfate; sodium chloride and silver nitrate; silver nitrate and sodium sulfate; and lead nitrate and sodium sulfate.

The precipitates that formed in all of these mixtures were all white even if the mixture was a different color. A possible explanation for why the color of the solution and the color of the precipitate did not match could be because the solution is comprised of soluble ionic salts. However, the precipitate that forms in the mixture is solid and insoluble which means it has nothing to do with the aqueous solution. Therefore, the color of the solution and the color of the precipitate do not have to match.

The solution mixture that I expected not to form a precipitate was sodium chloride and sodium sulfate. This prediction turned out to be true and can be explained by the fact that both of the solutions had the same cation sodium. Therefore, there would be no formation of insoluble compounds.

The balanced equations for the precipitation reactions are as follows:

1. Copper (II) sulfate and Barium nitrate

CuSO4 + Ba(NO3)2 🡪 BaSO4 + Cu(NO3)2

1. Copper (II) sulfate and Silver nitrate

CuSO4 + 2 AgNO3 🡪 Cu(NO3)2 + Ag2SO4

1. Copper (II) sulfate and Lead nitrate

CuSO4 + Pb(NO3)2 🡪 Cu(NO3)2 + PbSO4

1. Barium nitrate and Sodium sulfate

Ba(NO3)2 + Na2SO4 🡪 BaSO4 + 2 NaNO3

1. Sodium chloride and Silver nitrate

NaCl + AgNO3 🡪 NaNO3 + AgCl

1. Silver nitrate and Sodium sulfate

2 AgNO3 + Na2SO4 🡪 Ag2SO4 + 2 NaNO3

1. Lead nitrate and Sodium sulfate

Pb(NO3)2 + Na2SO4 🡪 PbSO4 + 2 NaNO3