Quantitative determination of copper concentration in aqueous solution essay samp...

Oxidation-reduction titration is a kind of volumetric analysis where the titrant used undergoes a redox reaction with the analyte. In this experiment, the oxidation of iodide (I-) to produce iodine (I2) is taken into consideration. The use of this concept in a redox titration is called iodometry. Iodimetry, on the other hand, deals with the reduction of I2 into I-. Between these two methods, iodometry is more popular because it is more efficient to conduct due to the presence of more oxidizing agents strong enough to react with the iodide. The copper concentration of an unknown copper sample was determined using iodometric titration.

The first part of the experiment involved the preparation of the working standard Cu(II) solution of specific concentration from CuSO4•5H2O. A standard sodium thiosulfate (Na2S2O3) solution was also prepared to serve as the titrant for the analysis. Proper handling should be administered for this solution since it decomposes into its component ions when it is exposed to acids, light, and bacteria. Sodium carbonate was added to the solution to act as a preservative. Boiled distilled water was also used in dissolving the crystals to remove bacteria that may eat on sulfur. Starch indicator was also prepared using warm distilled water to detect the endpoint in the titration. Toluene may also be used as an indicator. The disappearance of the pink organic layer signals the depletion of iodide at the endpoint.

For the standardization of Na2S2O3, samples of the working standard Cu(II) solution were transferred to Erlenmeyer flasks, adding a few drops of NH4OH solution until a light blue precipitate of Cu(OH)2 is formed. The formed precipitate was then dissolved with glacial HOAc. Solid potassium iodide (KI) was added to the solution and swirled to complete the reaction. To lessen

the oxidation of iodide to iodine by air, the solution was titrated immediately with Na2S2O3. After the brownish color of iodine has almost disappeared, starch indicator was then added before the titration was continued until the blue color disappeared. It is advisable to add the indicator until the endpoint is nearly approached since it decomposes in the presence of iodine. Potassium cyanide (KSCN) was also added to sharpen the endpoint as the precipitate absorbs the iodine. The disappearance of the blue color marks the endpoint. The blue color reappears due to air oxidation of the excess iodide. The concentration of the standard Na2S2O3 was known to be at 0. 0478 mol/L.

The same titration procedure was done for the unknown Cu(II) sample. From the calculations, the sample contained 0. 100 mol of Cu2+ per liter and 6389 ppm of copper. The range and RSD for the molarity are 0. 004 and 25. 27, respectively. The measure for accuracy in confidence limits was given by 0. 100 ± 0. 006 mol/L. From these statistical values, it can be concluded that the data gathered were both precise and accurate. For the concentration in parts per million, the range and RSD were 280 and 25. 30, respectively. The confidence limits were ± 401 from the mean of 6389 ppm. These statistical values may be relatively large, raising questions on the data’s accuracy and precision.

Several errors may have caused these discrepancies. These may include loss of material due to the unavoidable air oxidation of iodide. The amount of thiosulfate may have also decreased over time because of its reactions brought by the conditions in the surroundings. Impurity of the reagents used may have also caused changes in the concentrations of the substances in

focus. Color recognition is also a big factor in this experiment. Bias may have been present thus, affecting the stated values at the endpoint.