Report on procedure

Environment, Plants

Caffeine is present in tea leaves and can be readily extracted. This is the producer that was demonstrated in this laboratory experiment. In the laboratory experiment, the teabags were heated to ebullition for five minutes. The ebullition was sequenced by an extraction which applied dichloromethane. All of the washings occurred in a separator funnel. The residual substrate was subsequently evaporated up to the point of where the crude caffeine remained as a residual. Sublimation was applied in order to separate the purified caffeine from the crude caffeine. The mass of the sublimate is was 0. 0035g. The percentage yield of the caffeine was 0. 082%. The liquefaction temperature of caffeine is 229° C to 240°C. The basis for the hypothesis of the laboratory experiment is founded upon the experiments conducted by Kato et al. (2002). In the experiment performed by Kato et al. (2002), the caffeine was extracted from young tea plants. The purification process was accomplished by the addition of a reagent (Kato et al., 2002).

INTRODUCTION

The objective of this experiment is to characterize, isolate and purify caffeine derived from the tea leaves and to extrapolate the percentage of caffeine that is recuperated. Caffeine is the most frequently consumed psychoactive drug that is used in the world. Over four fifths of the global population ingests caffeine daily. There is constant research being performed in order to determine the consequences and health benefits of caffeine. The chemical name for caffeine is 1, 3, 7- trimethylxanthine. As caffeine is recuperated from plants, it is transformed into an extremely bitter while solute that supplies a distinctive flavor in soft drinks.

Caffeine pertains to the wide category of compounds called alkaloids.

Alkaloids are derived from plants and are basically composed of nitrogen. Other characteristic of caffeine is that it is composed of a complex molecular structure and exerts an effect on the physiological systems. The most frequently encountered forms of caffeine that are found in the normal diet are found in energy drinks, cola, cocoa beans tea and coffee (Michigan State University 1).

Twenty grams of sodium carbonate was placed in a six hundred ml flask. Two hundred and seventy five milliliters of distilled water was added to the flask. The solation was heated until the solute dissolve. The aim of the aggregation of sodium carbonate is to differentiate the caffeine from the tannins by transforming the tannins into sodium salts that is insoluble in dichloromethane. Caffeine is inert in sodium carbonate and maintains its solubility in dichloromethane.

Ten tea bags were added to the fundamental water based solution. The tags were removed from the tea bags prior to adding the tea bags in the solution. The contents of the beaker were heated to ebullition for half an hour by using a hot plate. The beaker was removed from the heat and permitted to cool. The dark aqueous layer was separated in the six hundred milliliter beaker. Caution was exercised in order to derive the optimal quantity of liquid from the substrate. The aqueous solution was permitted to cool until it reached room temperature.

Thirty milliliters of dichloromethane was added to the refrigerated beaker. The beaker was gently agitated for four minutes. In the event that the extraction is conducted under the conditions of intense swirling, an emulsified compound will form that is very difficult to separate. The two

phase mixture was slowly poured into a separator funnel. The lower organic section of the substrate was extracted. Precautions were taken in order to prevent the emulsification of the substrate and solvent.

The organic layers were combined by the application of anhydrous calcium chloride. The dichloromethane section of the solvent was removed by the application of the hot plate. The residual liquid was poured into an Erlenmeyer flask with a one hundred and twenty five milliliter capacity. The weight of the flask was considered prior to its application. The six hundred milliliter flask was rinsed with the two small formulations of dichloromethane and the solutions were transferred to a one hundred and twenty five milliliter Erlenmeyer flask. The dichloromethane was extracted by the application of a hot plate. The final remains of the solvent were removed by means of the application of a hot air gun. The caffeine crystallized with the characteristic of a substance that had the qualities of a green tinted solid. The yield of the caffeine was obtained.

Results

Mass of the substrate = 0. 0032 g. The percentage yield of the caffeine was 0. 08%

Discussion

The caffeine can be readily separated from teabags. The process that would normally be performed in order to extract the caffeine content from the tea is the process of ebullition. The ebullition would be followed by permitting the tea bags to settle in hot water. This process has the quality of extracting the majority of the caffeine. Considering that caffeine in its purified form is a

fine powder, it becomes manifest that what is extracted from the tea leaves in the process of ebullition in water is more than caffeine. The solution that has a brown color is extracted afterward by means of applying dichloromethane in order to ensure separation of the caffeine from the additional substances found in tea leaves (PCC 1).

Cellulose is one of the primary structural substances in all plants. Considering that cellulose cannot be dissolved in water, the cellulose content in the tea leaves present no challenges to the caffeine isolation process. The tannins possess an elevated molecular mass. The tannins are responsible for the coloration of tea. Tannin is not referenced by a chemical compound that possesses a similar chemical formation. The tannins are categories of compounds that possess mutual characteristics. After the substance is subjected to desiccation, the crude caffeine is the resultant yield. The application of sublimation to the crude caffeine causes a yield of pure caffeine. The purified caffeine can be tested by application of its melting point (PCC 1).

Error Analysis

The sources of error in the experiment could be ascertained from the measurements in the Erlenmeyer flasks. The flasks possess a margin for error of ± 1ml. This could have been the attribute of some of the experimental error in the experiment.

Hazard Consideration

Dichloromethane is a comparatively non- toxic solvent that is frequently applied instead of carbon tetra chloride and benzene. The two substances

are carcinogenic. Dichloromethane possesses an elevated vapor pressure and rapidly evaporates in order to establish a moderate saturation of CH2Cl2 in the laboratory atmosphere. This concentration of CH2Cl2 may cause some of the student to feel uncomfortable. Ventilation considerations should be taken into account when performing experiments with dichloromethane.

Works Cited

PCC. " Experiment 1: Isolation of Caffeine from Tea" PCC, 2014. Web 22 October 2014. http://spot. pcc. edu//labs/Caffeine extraction /EXP1/ Isolation %20of%20Caffeine

Kato, Misako, Konichi Mizuno and Tatsuhito Fujimora et al. " Purification and ccharacterization of caffeine synthase from tea leaves" Plant Physiology 120. 2(1999): 579- 586.

Michigan State University. " What is caffeine?' Michigan State University, 2014. Web 22 October 2014. http://www. uhs. edu/caffeine.