Experiment 6a : Qualitative Analysis of Carbohydrates using Anthrone Reagent

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The anthrone method is one of colorimetric method that can be used to determine carbohydrates both qualitatively and quantitatively. Anthrone method (mixing anthrone reagent which is made of anthrone and sulfuric acid with carbohydarates) is one of widely used method for determining different sugar (saccharides) because of the fact that it gives different color for different sugar solutions, thus the results can be easily distinguished and qualitative analysis can be done easily. The aims of this experiment are to understand how carbohydrates qualitative analysis is performed and to understand the principle behind the qualitative analysis of carbohydrates.

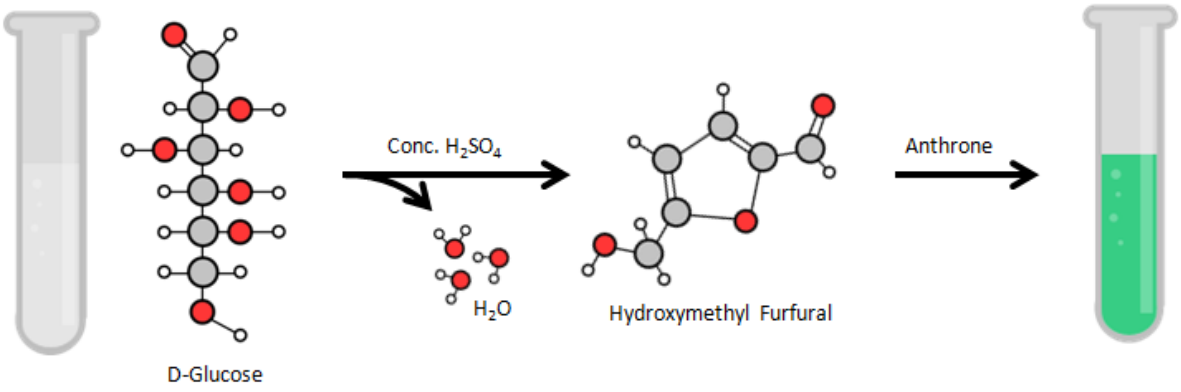
1. INTRODUCTION

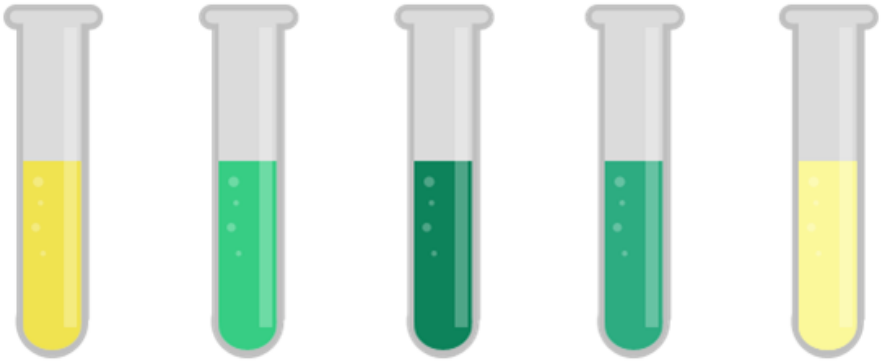
Carbohydrates are one of the most important components in many foods. Carbohydrates may be present as isolated molecules or they may be physically associated or chemically bound to other molecules. Individual molecules can be classified according to the number of monomers that they contain as monosaccharides, oligosaccharides or polysaccharides. (McClement). Qualitative analysis of carbohydrates is important , because qualitative analysis of carbohydrates can tell us whether the carbohydrates are present in a solution or not, also for some cases qualitative analysis can help us distinguish different types of saccharides. One of the most used qualitative analysis method is anthrone method. Anthrone method is performed by mixing anthrone reagent (0.2% anthrone per liter sulfuric acid) with the carbohydrate-containing solution (this could be anything). Anthrone reagent is chosen as the reagent because of the fact that the sulfuric acid in anthrone reagent will dehydrate the saccharides (carbohydrates) which then leads the carbohydrates to form compound called 'Furfural compounds', the furfural compounds then will be condensed by anthrone and result in a green color complex.

2. EXPERIMENTAL PROCEDURE

In this experiment one drop of each saccharides solutions (lactose, glucose, fructose, sucrose and starch) is placed into five different tubes. Ten drops of anthrone reagents then were added to each tube. Those tubes were left for several minutes then color changes were observed.

3. RESULTS AND DATA





Type	Lactose	Glucose	Fructose	Sucrose	Starch
Initial Color	Transparent				
Final Color	Dark yellow	Clear Bluish Green	Opaque Bluish Green	Clear Dark Bluish Green	Clear Greenish Yellow

Figure 1. depicts the reaction between D-Glucose with anthrone reagent (**red** = O, gray = C, **white** = H) and how the reaction changes the color of the solution from transparent to clear bluish green.
Figure 2. Table showing the color change of each solution.

Addition of anthrone reagent to the solutions result in color change. Color of solutions containing lactose and starch changed from transparent to yellow, while color of solutions containing gluctose, fructose and sucrose changed from transparent to bluish green. All of them only differ in the opacity and transparency of the solutions (see Figure 2). It was also observed that the tube gets warmer as the anthrone reagent was added to the tube drop by drop.

4. DISCUSSION

The change of color in the tube was caused by the condensation of furfural/furfural derivative (furfural derivative is the result of dehydration of sugar by sulfuric acid) by anthrone, this is the reason why different type of sugar has different amount of reducing agents, in this case aldehyde and ketone group. The more the reducing agents a solution has, the opaque the final color of the solutions get. Also the fact that the volumes of each

solution and anthrone that were put into the tube weren't precisely measured (they were taken using normal pipette) probably caused the different opacity too, for example the glucose solution that was put in the tube was around 0.9ml while the fructose solution that was put in the tube was around 1.3ml (need further investigation). The experiment using anthrone reagent because it is relatively fast in changing the color of the initial solution.

5. REFERENCES

[1] McClement, J. "Analysis of Carbohydrates". people.umass.edu/~mcclemen/581Carbohydrates.html. Accessed 20 October 2016.