

# Coagulation of proteins essay sample



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Coagulation of protein refers to sticking together, like a blood clot, usually as a result of denaturation or coming out of solution due to abnormal ionic strength or a change of solvent. Definite characteristics of the proteins are changed when they are coagulated, among which is loss of solubility in water and dilute salt solutions. In some instances and under certain conditions the coagulation process may be reversible. (Campbell, et. al, 1979) 4A. 2. 2

### Chemistry behind Coagulation

Ovalbumin the main protein in egg white is a globular protein denatured by heat, this means reaction is more rapid with an increase in temperature of heating. Since heat is absorbed during coagulation of egg proteins, the reaction is endothermic. Egg white coagulated by heat changes from a transparent viscous solution to a opaque white gel, the water of white trapped by the protein. (De Mann, 1986) 4A. 2. 3

### Opalescence

Opalescence is a type of dichroism seen in highly dispersed systems with little opacity. The material appears yellowish-red in transmitted light and blue in the scattered light perpendicular to the transmitted light. The phenomenon is named after the appearance of opals (Fennema, 1996).

There are different degrees of opalescent behavior. One can still see through a slightly opalescent phase. The more particles and the bigger the particles are, the stronger the scattering arising from them and the cloudier the particular phase will look. At a certain concentration the scattering is so strong that all light passing through is scattered, so that it is not transparent any more (Fennema, 1996).

#### 4A. 2. 4 Different Factors that Influence Coagulation of Proteins

Coagulation is influenced by factors such as heat, beating, pH and also use of sugar and salt. Heat should be slow and mild. The egg white coagulates, and become solid at temperatures 62-65C. Egg yolks begin to coagulate at 65C and become solid at 70C. Beating should be done slowly because when an energy is applied, the protein begins to denature which will lead to coagulation. As the pH decreases and becomes more acidic, coagulation of the egg white occurs more readily. The more sugar added, the greater the heat required to bring about the coagulation; it also increases the heat stability of the proteins. The addition of salt lowers the temperature at which coagulation takes place. (Belitz, 1977)

#### Materials and Methods

##### Materials

- \* Egg Whites
- \* Distilled Water
- \* 0. 1M sodium chloride solution
- \* 0. 1M calcium chloride solution
- \* 0. 1M Ferric Chloride solution
- \* 0. 1M sucrose solution
- \* 1. 0M sucrose solution
- \* 0. 01M hydrochloric acid solution
- \* 0. 1M hydrochloric acid solution
- \* Filter papers
- \* Thermometer

\* pH meter

\* Test tubes

Dilute 25ml egg white with 75ml distilled water. Stir slowly but thoroughly.

Procedure (Schematic)

Filter using a filter paper

Add 10ml of the albumin solution and 5ml of each of the coagulant to each test tube. Use distilled water as controlled

Record the pH of the solution containing distilled water and 0. 01M and 0. 1M HCL

Place all in a beaker of water, heat slowly.

Note the temperature at which opalescence develops.

Textual Discussion

Dilute 1 egg white (slightly beaten) with 3 volumes of distilled water; stir slowly but thoroughly and filter. Final volume should attain at least 100ml. To each of a series of test tubes, add 10ml of the albumin solution and 5ml of each of the solutions listed above. Use distilled water as control. Record the pH of the solution containing distilled water and 0. 01M and 0. 1MHCl. Place all in a beaker of water, heat slowly. Note the temperature at which opalescence develops. Results and Discussion

Test Solution | Temperature for Opalescence (C)| pH value| 0. 1M sodium chloride solution| 63C| -|

0. 1M calcium chloride solution| 63C| -|

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0. 1M Ferric Chloride solution| 69C| -|  
0. 1M sucrose solution| 63C| -|  
1. 0M sucrose solution| 66C| -|  
0. 01M hydrochloric acid solution| 61C| 3. 04 pH|  
0. 1M hydrochloric acid solution| -| 2. 31 pH|  
Distilled water (control)| 64C| 8. 78 pH|

As seen in the table, most of the temperature for opalescence ranges from 60C-70C this is because egg white thickens at temperature 62C-65C according to Belitz. Also, as said by Belitz an addition of acid requires greater amount of heat to coagulate; this is shown in the table where 0. 1M hydrochloric acid solution which have a pH of 2. 31 didn't form opalescence even for a longer time or in higher temperature. 0. 1M sodium chloride solution which has a temperature for opalescence of 63C, the low temperature is due to the salt content because an addition of salt lowers the temperature at which opalescence takes place. Generalization and Recommendation

Coagulation of proteins depends mainly on the intense of the heat temperature use, also on the beating and addition of salt, sugar and acid. Not all coagulants could form opalescence this is because at a certain concentration the scattering is so strong that all light passing through is scattered, so it is not transparent anymore. Procedures must be properly conducted. Proper handling of materials and instruments is a necessity. Correct measurement obtained from the instruments must be checked. Cleanliness must be highly observed in doing the experiment.

## Reference

Vickie A. and Christian W., 2008. Essentials of Food Science. Dallas, Texas: Springer. B. Srilakshmi., 2003. Food Science. New Delhi: New Age International Ltd., Publishers. Anonymous. Date accessed: February 9, 2013. Proteins.

<http://anima9.wordpress.com/research-on-food/proteins/review-of-related-literature/>