Summary:

To summarize, the non-enzymatic browning in foods includes Maillard reaction, caramelization; ascorbic acid, lipid and protein browning. Maillard reaction results in the formation of brown nitrogenous polymers and copolymers. The reaction involves the sugar-amine condensation, the Amadori rearrangement resulting in the keto form, and the Strecker degradation which results in action on the alpha amino acids with the loss of one molecule of CO_2 and the formation of an aldehyde followed by formation of colored pigments. When sugars are treated under anhydrous conditions with heat, or at high concentration with dilute acid, caramelization occurs, with the formation of anhydro sugars. Ascorbic acid browning occurs due to thermal decomposition of ascorbic acid under both aerobic and anaerobic conditions, by oxidative or non-oxidative mechanisms, either in the presence or absence of amino compounds. These reactions can be controlled with factors such as pH, temperature, moisture content, time, concentration, and nature of the reactants. Browning reactions in food can therefore be advantageous and disadvantageous depending on its use in food system.