STARCH HYDROLYSIS BY HEATING IN HERMETICALLY SEALED SYSTEMS AT NEUTRAL PH

by

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INTRODUCTION

Starch is one of the most abundant plant materials in the world. It has been in the diet of man and his ancestors since the beginning of time. Because of its availability, much research has been conducted on starch. This research has dealt in great part with the physical and chemical changes that take place when starch is heated. This includes heating dry, acid solutions, and aqueous suspensions. Most of the studies have been concerned with heat treatments below 100°, especially when these studies dealt with the heating of aqueous suspensions or acid solutions. Temperatures in this range cause starch to undergo several physical changes. The most important change is the irreversible swelling of the starch granule. This hydration and swelling is called gelatinization. Gelatinization primarily affects the film and paste characteristics of the starch.

A second area of study has dealt with the hydrolysis of starch. Upon hydrolysis, the polysaccharide starch yields glucose and higher oligosaccharides due to incomplete hydrolysis, as well as dehydration and decomposition products of glucose. In this area of study, there has been a great deal of interest in the amount of hydrolysis, the reactions produced under various

conditions and the products formed. While much is known about these products after acid or enzyme hydrolysis, very little work has been done on trying to hydrolyze starch in a neutral, aqueous system. This investigation was undertaken to determine if starch could be hydrolyzed in a neutral starting solution, and if so, what were the necessary conditions, what products could be formed and what starch concentration could be used in this hydrolysis.

REVIEW OF LITERATURE

Structure of Starch

Naturally occurring starch is found in many different sizes and shapes. The characteristics of different plants are such, however, that starch can be identified microscopically. Under a microscope, the starch granules are minute structures built up of molecules arranged in layers usually concentrically. The size of these granules vary from less than 1 micron to over 150 microns in diameter (1). Wheat starch has been found to vary between 2 u and 35 u in size (2). Sponsler (3) reported that the starch granule has a regular and fairly uniform arrangement of atoms. He also reported (4) that the starch granule is built up of units arranged in concentric layers and that the structure was neither strictly amorphous or crystalline. Meyer (5) reports that the starch granules consists of intermixed linear and branched starch molecules arranged in a radial fashion. When these molecules are branched or when linear molecules are parallel to each other, hydrogen bonding takes place. These forces pull the chain together in associated crystalline bundles or micelles. It is conceivable that the long chain starch molecules pass through many micellar areas and that those chains on the outer edges of