

EFFECT OF OSMOTIC PRESSURE TREATMENT IN COMPARISON WITH THE HEAT-MOISTURE TREATMENT ON THE PHYSICO-CHEMICAL PROPERTIES OF POTATO, SAGO AND MAIZE STARCHES**CHIRDCHAN PUKKAHUTA 4536522 SCBT/D****Ph.D. (BIOTECHNOLOGY)****THESIS ADVISORS: SAIYAVIT VARAVINIT, Dr. Ing., SUJIN SHOBSNGOB, Ph.D., MANOP SUPHANTHARIKA, Ph.D., PAIROJ LUANGPITUKSA, Dr. Agr. Chem., SOMCHAI CHAUVATCHARIN, Ph.D.****ABSTRACT**

Osmotic pressure treatment (OPT) is a new method of physical modification of starch utilizing high concentrated salt solution. OPT was introduced in order to produce the same physically modified starch products as those produced by conventional heat-moisture treatment (HMT). Potato starch (tuber starch, B-type diffraction pattern), sago starch (stem starch, C-type diffraction pattern) and maize starch (cereal starch, A-type diffraction pattern) were selected for this comparative study on the physicochemical properties of osmotic pressure and heat-moisture treated starch. For OPT, native starch was suspended in saturated sodium sulfate solution in Duran Bottle with screw cap and heated by autoclave at high temperature for different time periods (15 - 60 min). The conditions used were: potato starch, 105 °C and 120 °C (15, 30 and 60 min), sago starch 100 °C, 110 °C and 120 °C (60 min), and maize starch 120 °C (15, 30 and 60 min). The temperatures of 100 °C, 105 °C, 110 °C and 120 °C corresponded to the calculated osmotic pressures of 32,728, 33,234, 33,640 and 34,552 kPa (assuming sodium sulfate dissociates completely). For the HMT method, starch with 20% moisture content was packed in Duran bottle with screw cap, and the same heat treatment method in an autoclave followed. Light and Scanning Electron Microscopy (SEM) showed a deformed structure in osmotic pressure treated starch granules, while HMT starch slightly changed from the native starch. X-ray diffraction patterns of potato starch altered from B-type to C-type (A+B-type) and A-type. Sago starch also changed from C-type to A-type after OPT whereas maize starch remain unchanged (A-type). Viscogram from the Rapid-Visco Analyzer (RVA) for the OPT starches exhibited a decrease in the peak viscosity, breakdown viscosity and an increase of the pasting temperature similar to those for HMT starch. In the OPT, the onset (T_o), peak (T_p), and conclusion (T_c) gelatinization temperatures of starch from Differential Scanning Calorimeter (DSC) increased significantly with increasing treatment temperature and treatment time. However, both methods resulted in a similar decrease in the gelatinization enthalpy (ΔH). Also the biphasic broadening of T_p for the HMT was found. The broadening of the peaks (high $T_c - T_o$) could be explained by an inhomogeneous heat transfer during the HMT of starch. Narrow DSC peaks could indicate better homogeneity for the OPT samples. These properties suggest that OPT starch is more suitable for large-scale production.

KEY WORDS: OSMOTIC PRESSURE TREATMENT/ HEAT-MOISTURE TREATMENT/ HYDROTHERMAL TREATMENT/ PHYSICO-CHEMICAL PROPERTIES/ POTATO STARCH/ SAGO STARCH/ MAIZE STARCH