

Streszczenie pracy doktorskiej

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pt.: „Wpływ jonów magnezu, wapnia i potasu na właściwości fizykochemiczne i reologiczne oktenylobursztynianu skrobiowego”

One of the more and more popular method of starch chemical modification is esterification using octenyl succinic acid anhydride (OSA). With the incorporation of hydrophobic alkenyl groups into a hydrophilic starch molecule, the modified starch obtains surface active properties which are useful in stabilising oil/water emulsions. The presence of hydroxyl and octenyl succinate groups in OSA starch chains allows the binding metal ions to them. Nevertheless, the presence of mineral elements incorporated to OSA starches both increases their nutritive value and affects their physicochemical and rheological properties. Hence, the aim of this work was to evaluate the effect enrichment of magnesium, calcium and potassium ions on the physicochemical and rheological properties of octenylsuccinate starches.

Potato and maize starches were esterified with octenyl succinic anhydride (OSA) at levels 3% or 9%. Then obtained OSA starches were incorporated with the magnesium ions (using the mixture of $MgCl_2$ and $Mg(OH)_2$), calcium ions (using the mixture of $CaCl_2$ and $Ca(OH)_2$) and potassium ions (using the mixture of KCl and KOH). The effectiveness of modifications was investigated by determination of degree of substitution, Fourier transform spectroscopy (FT-IR), metal content using atomic absorption spectroscopy (ASA).

The following physicochemical analyses were conducted: molecular weight distribution by a gel permeation chromatography (GPC), water-binding capacity and solubility in water, susceptibility to enzymatic hydrolysis using α - amylase, measurement of surface tension of 0,5% starch pastes, emulsion stability during storage, particle size distribution of oil droplets using laser particle size analyzer. To determine the rheological properties of native and modified starches were prepared starch pastes which were analysed for pasting characteristics by rapid visco analyzer (RVA), flow curves, back extrusion test, susceptibility to retrogradation during storage. Moreover intrinsic viscosity of examined samples were determined.

On the basis of the results it was stated that potassium was the metal which was incorporated into the OSA starches in the largest amount. Various amounts of the minerals resulted in changes in physicochemical and rheological properties of modified starches. The applied modifications affected decrease in molecular weight distribution. Complexation of starch with potassium ions exerted the greatest increase values of water binding capacity and

solubility in water. Samples of starch enriched with metal ions were more susceptible to enzymatic hydrolysis than esterified starches. Evaluation of emulsion stability and particle size distribution of oil droplets demonstrated that the OSA potato starch modified with potassium characterized the best stability of the emulsion during storage. RVA results indicated that potato and maize starch derivatives modified with potassium gelatinized in lower temperature. Starch pastes showed non-Newtonian, shear-thinning flow with tendency to yield stress. The metal ions introduced to starch structure caused changes in values of the rheological parameters describing the flow curves. The applied modifications in most cases affected in decrease in values of textural parameters and susceptibility to retrogradation of starch pastes during storage.