

The smart apple-based foil: The role of pectin-glycerol-lipid interactions on thermoresponsive mechanism

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Streszczenie

In this article, fully biodegradable films based on high methylated (HM) apple pectin, glycerol, and margarine were made. The influence of different crosslinking agents on the structure and functional properties of the obtained films was investigated. Fourier-transform infrared spectroscopy (FTIR), thermogravimetry (TG), differential scanning calorimetry (DSC), small-angle X-ray scattering (SAXS) and polarized light microscopy (POM) analyses showed the key importance of the crosslinking agent on the chemical interactions between the individual components of system. A series of phase transitions related to the melting of lipid fractions have been observed, which occur in a cascade with increasing temperature. Thermomechanical analysis (TMA) indicated that the obtained samples show a rapid change in dimensions as a function of temperature. Measurements of the impedance spectroscopy demonstrated that foil's electrical parameters change as a function of temperature. Both shape and conductivity changes are related to processes occurring in the pectin-glycerol-lipid system. It was found that the pectin glass transition, lower critical solution temperature (LCST) and lipid melting had the most pronounced effect on the operational properties. Taking into account the obtained results, the developed apple foils may have potential applications as thermosensitive smart materials for example in active packaging as sensing materials.

Słowa kluczowe

High methylated apple pectin, Crosslinking, Thermoresponsive, Shape change, Impedance change

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