

PREPARATION AND CHARACTERIZATION OF BIODEGRADABLE CASSAVA STARCH THIN FILMS USING MICROWAVE METHOD

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Most petroleum-based polymers are non-degradable. Therefore, development of an environmentally friendly replacement for non-degradable plastics is of paramount importance. Thermoplastic starch (TPS) is a solution for non-biodegradable plastics. The gelatinization method is the most common practice in preparing starch-based thin films, and microwave heating can be used as a novel method. Microwave treatment can produce a higher amount of modified starch within a shorter period. In this study, the effect of microwave treatment on the properties of cassava starch thin films was studied. Microwave treatment was conducted at 10, 20, 30 and 40 s to obtain modified starch while the cassava starch-based thin films were prepared via the conventional casting method. The current study reports the effect of microwave time of cassava starch-based thin films using Fourier Transforms Infrared (FTIR) spectroscopy, tensile strength properties (ASTM D 882-02), biodegradability (aerobic compost environment test), and water absorption rate (ASTM D 570-98). FTIR studies showed the same bands for all samples, which are characteristics of starch. When the microwave treatment time increased from 0 s to 20 s, a significant increment ($p < 0.05$) in tensile strength (6.67 MPa) could be observed. In the biodegradation test, all the microwaved thin films had shown significant ($p < 0.05$) degradation within 15 days with respect to native cassava starch thin films. The lowest rate was achieved by the 20 s microwaved film. Therefore, microwave treatment time of 20 s was optimum in improving mechanical properties, water resistivity and reduced biodegradation. Also, these films can act as a substitute for petroleum-based inert plastics.

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