

Characterization of antioxidant tapioca/polyaniline composites film prepared using solution casting method

ABSTRACT

Recently, the incorporation of polyaniline (PANI) as an additive into the biofilm to produce food packaging material is of particular interest due to the need to improve in the properties of the biocomposite film. The aim of this work is to evaluate the effect of concentration and size of PANI loading into the film on the antioxidant properties of PANI/starch film with the analysis of mechanical and Fourier-transform infrared spectroscopy (FTIR) spectra. Composite films with 0.02 g, 0.05 g, and 0.1 g of PANI loading into the tapioca starch film were prepared with different sizes of PANI. The antioxidant and mechanical properties of tapioca starch/PANI composite film properties were investigated. The composites exhibited an increase in free radical scavenging capacity (a measure of antioxidant activity), with increasing of PANI loading in the film irrespective to the size of PANI. However, the highest free radical scavenging activity showed in sample B with the distribution size of PANI range $100\ \mu\text{m} \leq x \leq 125\ \mu\text{m}$. In the mechanical test, with the favorable to have more flexibility film rather than hard film, sample B with 0.05 g of PANI loading showed more flexible with high elongation at break (EAB) compared to others. Based on the FTIR spectra, the starch/PANI film spectra were similar to the starch/glycerol without PANI. However, one notable weak pick near $1455\ \text{cm}^{-1}$ can be found in sample B and C with respective to the concentration of PANI loaded. The incorporation of PANI greatly affected the antioxidant activity of the film which affected the mechanical properties as well.

Keyword: Tapioca starch; Polyaniline; Mechanical properties; Radical scavenging