

Swelling, tensile and thermal behaviors of citric acid crosslinked tapioca starch/cellulose biocomposite films

Abstract

The biocomposite films were prepared using a solution casting method and allowed to dry in the oven of 50 °C. The cellulose used in this research was extracted from the rice straw. The biocomposite films firstly were prepared without crosslinker with various cellulose content; (0.2, 0.4, 0.6, 0.8 and 1.0) g wt%. Based on the tensile strength result, 0.6 g of cellulose is an optimum amount to prepare the biocomposite films with various amounts of crosslinker; (1, 2, 3, 4 and 5) g. The tapioca starch/cellulose biocomposite films crosslinked with lemon juices have higher tensile strength (16 MPa) and lower in swelling percentage (3.32%) compared to the biocomposite films crosslinked with key lime juice (5.44 %). The thermal behavior was studied based on the Differential Scanning Calorimetry test shows the biocomposite film that highly crosslinked needs higher energy during their phase change. The energy liberated in the tapioca starch/cellulose biocomposite film with key lime juice as crosslinker is 201.6 J/g while that of biocomposite film with lemon juice as crosslinker is 383.0 J/g.

Keywords

Cellulose; Crosslinked biocomposite film; Rice straw; Tapioca starch