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Jing Xie, Yen-Con Hung



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UV-A activated TiO₂ embedded biodegradable polymer film for antimicrobial food packaging application

Jing Xie, Yen-Con Hung*

Department of Food Science and Technology, University of Georgia, 1109 Experiment Street, Griffin, GA 30223-1797, USA

***Corresponding author. Tel.:+1 770 412 4739; fax:+1 770 412-4748. Email address: yhung@uga.edu**

Abstract

TiO₂ nanoparticles embedded polymer films were fabricated by solution casting method using three biodegradable polymers (cellulose acetate (CA), polycaprolactone (PCL) and polylactic acid (PLA)). Optical and physical properties of the films were assessed by measuring the thickness, color, UV-vis absorption spectra and UV-A transmission. Photodegradation of methylene blue was used to evaluate photocatalytic activity of different TiO₂ embedded polymer films. Photocatalytic bactericidal property of the films was evaluated by inactivation of *Escherichia. coli* O157:H7 under UV-A light illumination at a light intensity of 1.30±0.15 mW/cm² for 2 h. CA film incorporated with 5 wt% TiO₂ NPs had highest bactericidal activity and achieved 1.69 log CFU/ml reduction. Whereas, TiO₂ embedded PCL and PLA composite films did not show significant bactericidal property. TiO₂ embedded CA film has the potential to be used as antimicrobial food packaging.

Keywords: Photocatalysis, TiO₂ nanoparticles, antimicrobial packaging, *E. coli* O157:H7, biodegradable polymer

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