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UV-A activated TiO_2 embedded biodegradable polymer film for antimicrobial food packaging application

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Abstract

TiO_2 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 TiO_2 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/cm^2 for 2 h. CA film incorporated with 5 wt% TiO_2 NPs had highest bactericidal activity and achieved 1.69 log CFU/ml reduction. Whereas, TiO_2 embedded PCL and PLA composite films did not show significant bactericidal property. TiO_2 embedded CA film has the potential to be used as antimicrobial food packaging.

Keywords: **Photocatalysis, TiO_2 nanoparticles, antimicrobial packaging, *E. coli* O157:H7, biodegradable polymer**