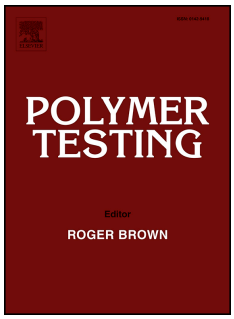

Morphology and physicochemical properties of a novel *Lallemantia iberica* mucilage/ titanium dioxide bio-nanocomposite

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Morphology and Physicochemical Properties of a Novel Lallemantia iberica Mucilage/Titanium Dioxide Bio-Nanocomposite

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Abstract

This paper characterizes a novel bio-nanocomposite that was synthesized by embedding titanium dioxide (TiO_2) nanoparticles into the polymeric matrix of *Lallemantia iberica* mucilage as a new source of polysaccharide. The proposed *Lallemantia iberica* mucilage/TiO_2 (LMT) bio-nanocomposite was prepared by solution mixing process followed by ultrasonic-assisted treatment and casting method. Morphology, intermolecular bondings, and physicochemical properties of the fabricated LMT bio-nanocomposite with respect to its TiO_2 dosage were evaluated using X-ray diffractometry (XRD), Fourier transform infrared spectroscopy (FTIR), field emission scanning electron microscopy (FE-SEM), and atomic-force microscopy (AFM). Experimental results indicated that distribution of TiO_2 nanoparticles in the LMT bio-nanocomposite matrix was more uniform at low dosages of TiO_2 nanoparticle, at which improved mechanical, thermal and barrier properties were observed. Water sorption isotherms of the LMT bio-nanocomposite were modelled using GAB and BET models, indicating that the LMT bio-nanocomposite stable in different humidities. An increased white index was also observed in the LMT bio-nanocomposite compared with the TiO2-free pristine film. The obtained results indicate that the proposed LMT bio-nanocomposite has a good potential for use in bio-degradable packaging industries.

Keywords: Lallemantia iberica mucilage; bio-nanocomposite; Titanium Dioxide; edible film; biopolymer; water sorption isotherm

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