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Data Article

Data on physicochemical properties of active films derived from plantain flour/PCL blends developed under reactive extrusion conditions

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A B S T R A C T

The data given below relates to the research paper entitled: “Eco-friendly films prepared from plantain flour/PCL blends under reactive extrusion conditions using zirconium octanoate as a catalyst”, recently published by our research group [1]. This article provides information concerning the physicochemical properties of the above-mentioned film systems: thickness, density, opacity, moisture content and surface moisture.

Specifications Table

Subject area	*Polymers.*
More specific subject area	*Active eco-friendly films derived from plantain flour/PCL blends using zirconium octanoate ($Zr(Oct)_4$) as a catalyst under reactive extrusion (REx) conditions.*
Type of data	*Table.*

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How data was acquired	*Thickness was determined with a digital micrometer. Density and moisture content were calculated gravimetrically. Opacity and surface moisture were estimated with the aid of a UV–vis spectrophotometer (u-2001) and a Moisture Analyzer (Model MA150), respectively.*
Data format	*Raw, calculated and analyzed.*
Experimental factors	*The films were conditioned at ~ 57% relative humidity in desiccators at 25 °C for 7 days using a saturated NaBr solution.*
Experimental features	*Film thickness was determined from eighteen random positions on each sample. Film density and moisture contents were determined at 105 ± 1 °C for 24 h. Film opacity was measured at 600 nm. Surface moisture content of the different films was measured after drying at 105 °C for 120 s.*
Data source location	*Mar del Plata, Argentina.*
Data accessibility	*Data are presented in this article.*

Value of the data

- The data gives detailed descriptions of the physicochemical properties of active eco-friendly films based on plantain flour/PCL blends using $Zr(Oct)_4$ as a catalyst under REx conditions.
- The data provides information to researchers about the effects of the catalyst and the PCL-containing blends on the opacity of the materials.

1. Data

The data given in this study (Table 1) shows the physicochemical properties (thickness, density, opacity, moisture content and surface moisture) of active films derived from plantain flour/PCL blends under REx conditions, described in the article by Gutiérrez and Alvarez [1]. These characteristics add to the properties previously investigated [1]. This data widens the knowledge we have about the physicochemical properties of plantain flour/PCL systems cross-linked under REx conditions using $Zr(Oct)_4$ as a catalyst. Thickness, density, opacity, moisture content as well as surface moisture were evaluated.

Equal letters in the same row indicate no statistically significant differences ($p \leq 0.05$).

Film systems: plantain flour (TPPF), plantain flour + PCL (M_w = 10,000 g/mol) (TPPF/PCL(10,000)), plantain flour + PCL (M_w = 10,000 g/mol) + catalyst (TPPF/PCL(10,000)+CAT), plantain flour + PCL (M_w = 80,000 g/mol) (TPPF/PCL(80,000)) and plantain flour + PCL (M_w = 80,000 g/mol) + catalyst (TPPF/PCL(80,000)+CAT).

Table 1
Thickness (*e*), density (*ρ*), opacity, moisture content (*MC*) and surface moisture of the different films.

Parameter	TPPF	TPPF/PCL (10,000)	TPPF/PCL(10,000)+ CAT	TPPF/PCL (80,000)	TPPF/PCL(80,000)+ CAT
***e* (mm)**	1.23 ± 0.04^{b}	1.03 ± 0.04^{a}	1.04 ± 0.04^{a}	1.17 ± 0.06^{b}	1.14 ± 0.05^{b}
***ρ* (g/cm³)**	1.2 ± 0.1^{a}	1.24 ± 0.03^{a}	1.19 ± 0.04^{a}	1.1 ± 0.1^{a}	1.16 ± 0.09^{a}
Opacity	0.32 ± 0.01^{d}	0.20 ± 0.01^{b}	$0.22 \pm 0.01^{b,c}$	0.16 ± 0.01^{a}	0.19 ± 0.01^{b}
***MC* (%)**	$17.2 \pm 0.5^{b,c}$	16.1 ± 0.6^{b}	16.64 ± 0.08^{b}	16 ± 1^{b}	13.3 ± 0.4^{a}
Surface moisture (%)	0.9 ± 0.6^{a}	0.8 ± 0.2^{a}	0.7 ± 0.1^{a}	0.8 ± 0.1^{a}	0.72 ± 0.02^{a}

2. Experimental design, materials and methods

The systems characterized here are the active eco-friendly films that were studied in [1]. All the films were prepared from plantain flour/PCL blends under REx conditions using $Zr(Oct)_4$ as a catalyst. The blends were then thermo-compressed to obtain the films. Five film systems were developed as follows: plantain flour (*TPPF*), plantain flour + PCL (M_w = 10,000 g/mol) (*TPPF/PCL(10,000)*), plantain flour + PCL (M_w = 10,000 g/mol) + catalyst (*TPPF/PCL(10,000)+CAT*), plantain flour + PCL (M_w = 80,000 g/mol) (*TPPF/PCL(80,000)*) and plantain flour + PCL (M_w = 80,000 g/mol) + catalyst (*TPPF/PCL (80,000)+CAT*). The resulting materials were conditioned with a saturated NaBr solution (a_w ~0.575 at 25 °C) for seven days prior to each test.

2.1. Film characterization

2.1.1. Thickness

Film thickness was determined using a digital micrometer (Micromaster®, Mitutoyo, USA) with 0.001 mm accuracy. Measurements were taken from eighteen random positions on each sample. Results were reported as the average thickness ± standard deviation (SD). These mean values were used to determine the density and opacity as described in the following sections.

2.1.2. Density

Film density (ρ) was determined by cutting samples of each film type into 6 mm radius (r) discs. The thickness (e) of the discs was then determined by taking 18 random measurements of each one. Afterwards, the discs were dried at 105 °C for 24 h and weighed. The density was then calculated as the ratio between the weight and volume (thickness × area) of each disc using the equation proposed by Gutiérrez [2]:

$$\rho = W_i - W_f / r^2 * \Pi * e \tag{1}$$

where W_i is the initial dry weight, and W_f the final dry weight.

Results were reported as the density ± SD from three measurements.

2.1.3. Opacity

The opacity was determined according to the method proposed by Sukhija et al. [3]. The ultraviolet (UV) and visible light barrier properties of dried films were measured at selected wavelengths between 400 and 800 nm using a UV–vis spectrophotometer (u-2001, Japan). Film opacity was measured at 600 nm and calculated using the following equation given by Han and Floros [4]:

$$Opacity = A_{600}/e \tag{2}$$

where: A_{600} = the absorbance at 600 nm and "e" = film thickness (mm).

2.1.4. Moisture content (MC)

Moisture content of the films was calculated gravimetrically. For this, square-shaped samples (4 cm^2) were weighed using an analytical balance (±0.0001 g; Ohaus, USA) in order to determine their initial mass (m_i). The samples were then placed in an oven at 105 ± 1 °C (Memmert, Germany) for 24 h until constant weight (final dry mass = m_d) was reached. All the tests were performed in triplicate, and the means ± SD were reported. Moisture content was determined by the following equation:

$$\mathrm{MC}(\%) = (m_i - m_d/m_i)\tilde{n}100 \tag{3}$$

2.1.5. Surface moisture

The surface moisture contents of the films were determined using a Moisture Analyzer, Model MA150 (Goettingen, Germany). Square shaped samples (2 × 2 cm) were dried at 105 °C for 120 s. Measurements were then conducted in triplicate for each film and the results were reported as % of average surface moisture ± SD.

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Transparency document. Supporting information

Supplementary data associated with this article can be found in the online version at http://dx.doi.org/10.1016/j.dib.2017.09.071.

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