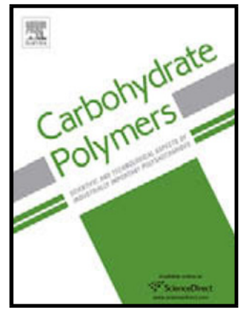
Accepted Manuscript



Title: Preparation and characterization of poly(ethylene terephthalate) films coated by chitosan and vermiculite nanoclay

Authors: Fatima Essabti, Alain Guinault, Sébastien Roland, Gilles Régnier, Saïd Ettaqi, Matthieu Gervais

PII:	S0144-8617(18)30986-X
DOI:	https://doi.org/10.1016/j.carbpol.2018.08.077
Reference:	CARP 13974

To appear in:

Received date:	17-4-2018
Revised date:	13-8-2018
Accepted date:	19-8-2018

Please cite this article as: Essabti F, Guinault A, Roland S, Régnier G, Ettaqi S, Gervais M, Preparation and characterization of poly(ethylene terephthalate) films coated by chitosan and vermiculite nanoclay, *Carbohydrate Polymers* (2018), https://doi.org/10.1016/j.carbpol.2018.08.077

Preparation and characterization of poly(ethylene terephthalate) films coated by chitosan and vermiculite nanoclay

Fatima Essabti [a], Alain Guinault [a], Sébastien Roland [a], Gilles Régnier [a], Saïd Ettaqi [b], Matthieu Gervais *[a] (matthieu.gervais@lecnam.net)

[a] : PIMM, Arts et Métiers ParisTech, CNRS, CNAM, 151 Bd de l'Hôpital, 75013 Paris, France

[b] : Laboratory materials, metallurgy and Process Engineering, ENSAM, Meknes, MOROCCO

Highlights

- Poly(ethylene terephthalate) (PET) 130 µm thick films have been successfully coated with 1 to 3 µm thick of homogeneous layers of chitosan or vermiculite/chitosan nanocomposite (with 0 to 50 wt% of vermiculite)
- Improvement of the Barrier improvement factor (Bif) of a PET film of 100 in helium with a 2.40 µm thick chitosan/vermiculite (50 wt%) layer
- Decrease in the oxygen transmission rate from 0.36 to 0.016 cm^3/m^2.day with addition of 40 wt% of vermiculite to chitosan layers
- Permeability of nanocomposite layers are two decades lower than poly(vinylidene chloride) (PVDC) in dry condition

Abstract

Chitosan (CS) layers are coated on a poly(ethylene terephthalate) (PET) film in order to decrease the oxygen permeability through the polymeric films for food packaging applications. Oxygen transmission rate (OTR) of the 130 µm PET films can be decreased from 11 to only 0.31 cm^3/m^2.day with a coated layer of 2 µm of CS. Additional decrease is obtained with the addition of vermiculite (VMT) to CS matrix in high proportion (40 to 50 w/w%). The OTR of the coated PET films decreased to very low values, below the detection limit of commercial instrumentation ($\leq$ 0.008 cm^3/m^2.day). This high-barrier behavior is believed to be due to the brick wall nanostructure, which produces an extremely tortuous path for oxygen molecules.

Keywords: Chitosan, Vermiculite, Poly(ethylene terephthalate), Barrier properties, Food packaging, Coating.

1. Introduction

Plastics have been widely adopted in food packaging because of their advantages over other materials. These advantages are reflected in the physical, mechanical