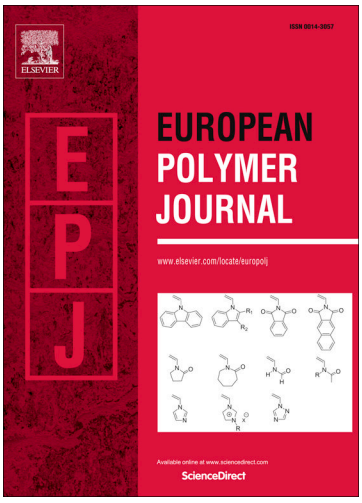
Accepted Manuscript



Biodegradable poly(ester-urethane) incorporated with catechin with shape memory and antioxidant activity for food packaging

M.P. Arrieta, V. Sessini, L. Peponi

PII: S0014-3057(17)30621-3
DOI: http://dx.doi.org/10.1016/j.eurpolymj.2017.06.047
Reference: EPJ 7954

To appear in: *European Polymer Journal*

Received Date: 7 April 2017
Revised Date: 29 June 2017
Accepted Date: 30 June 2017

Please cite this article as: Arrieta, M.P., Sessini, V., Peponi, L., Biodegradable poly(ester-urethane) incorporated with catechin with shape memory and antioxidant activity for food packaging, *European Polymer Journal* (2017), doi: http://dx.doi.org/10.1016/j.eurpolymj.2017.06.047

Biodegradable poly(ester-urethane) incorporated with catechin with shape memory and antioxidant activity for food packaging

Arrieta M.P.[1,*], Sessini V.[1], Peponi L.[1,*]

[1] Institute of Polymer Science and Technology (ICTP-CSIC), Madrid, Spain

Corresponding authors: marrieta@ictp.csic.es*, lpeponi@ictp.csic.es*

Abstract

Biodegradable poly(ester-urethane) (PU) based on a tri-block copolymer of poly(L-lactic acid) and poly(ε-caprolactone), with shape-memory behaviour, and further loaded with catechin (Cat), as antioxidant agent, were developed with the dual objective to obtain a smart as well as an active material for food packaging purpose. Well dispersed catechin produced somewhat UV blocking effect, but slightly amber and red tonality. Catechin demonstrated positive interaction with PU matrix enhancing the interfacial adhesion and leading to a reduction in the surface wettability. The active PU composites, with thermally-activated shape memory ability at temperatures close to those required to pack thermally proceeded food (i.e.: 40 ºC), showed increased ability to recover the initial shape of the neat PU matrix. The antioxidant effectiveness of catechin released after the exposition to a fatty food simulant was proven after 10 days which represents the worst foreseeable conditions of the intended use. The disintegration process in composting conditions of the active PU-based materials was speeded up due to the catechin incorporation. The PU formulation loaded with low amount of catechin (1 wt% or 3 wt%) showed enough transparency, enhanced shape memory behaviour, improved water resistance, reduced UV-light transmission, right catechin release and effective antioxidant activity as well as appropriate disintegration in compost. Thus, active PU-Cat composites result very interesting as smart and active materials for biodegradable food packaging applications.

Key words: poly(urethane); catechin; food packaging; shape-memory; antioxidant; biodegradable.

1. Introduction

Renewable and biodegradable polymers as well as natural additives are currently considered sustainable alternatives for food packaging applications, enhancing resource