

Effect of pomegranate peels and extract in barrier, optical and mechanical properties of polylactic acid-based active packaging

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INTRODUCTION

50% of pomegranate (*Punica granatum* L.) are non-edible parts (by-products).

The main by-products are Peels (50%) and Seeds (10%)

Peels and seeds present excellent antioxidant and antimicrobial activities and a high content of phenolic compounds

Active Food packaging based on polylactic acid (PLA) incorporated with 3 wt.% pomegranate peels (3PP) or 3 wt.% pomegranate peel extract (3PPE)

Evaluate the Mechanical and Optical Properties of the films PLA/3PP and PLA/3PPE

MATERIALS AND METHODS

Production of packaging flexible films

- Tubular film extrusion

Structural and morphological characterization of the films

- FTIR
- SEM

Others measurements

- Color (UV-Vis)
- Water Vapor Transmission
- Mechanical Properties

RESULTS

Table 1 Optical properties of the control (PLA) and active (PLA/3PPE and PLA/3PP) films.

Samples	L*	a*	b*	ΔL*	Δa*	Δb*	ΔE*
PLA	47.33	0.410	4.65	0	0	0	0
PLA/3PPE	40.84	0.600	8.77	-6.49	0.19	4.12	7.69
PLA/3PP	46.21	0.50	6.49	-1.12	0.085	1.84	2.15

Legend: PLA/3PPE – PLA with 3 % of pomegranate extract; PLA/3PP – PLA with 3 % of pomegranate peel. (L* - brightness, a* - red-green, b* - yellow-blue levels, ΔE* - total color difference)

RESULTS

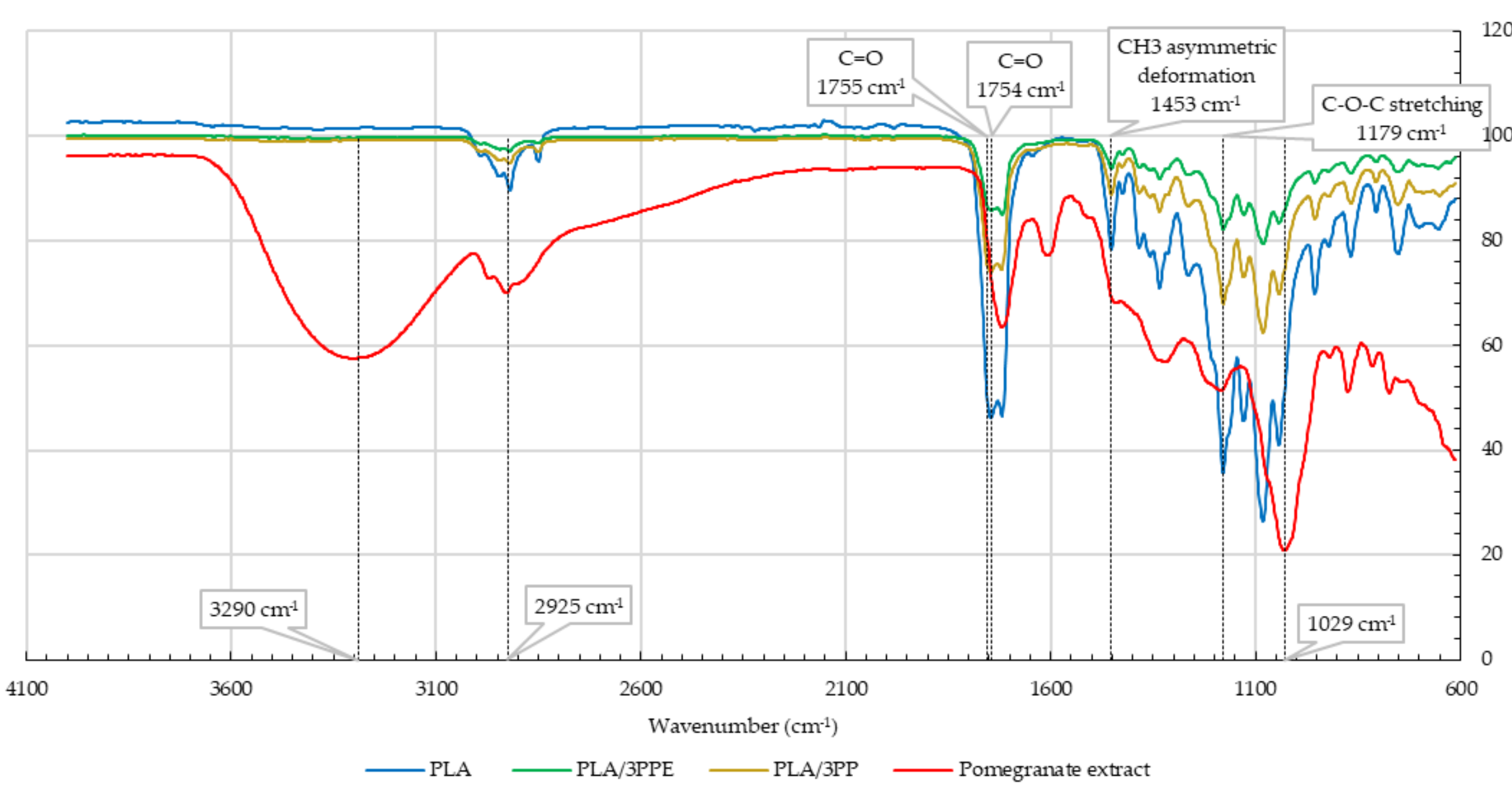


Fig. 1 – FTIR spectrum of the pomegranate extract (PPE-FD), control (PLA) and active films (PLA/3PPE and PLA/3PP).

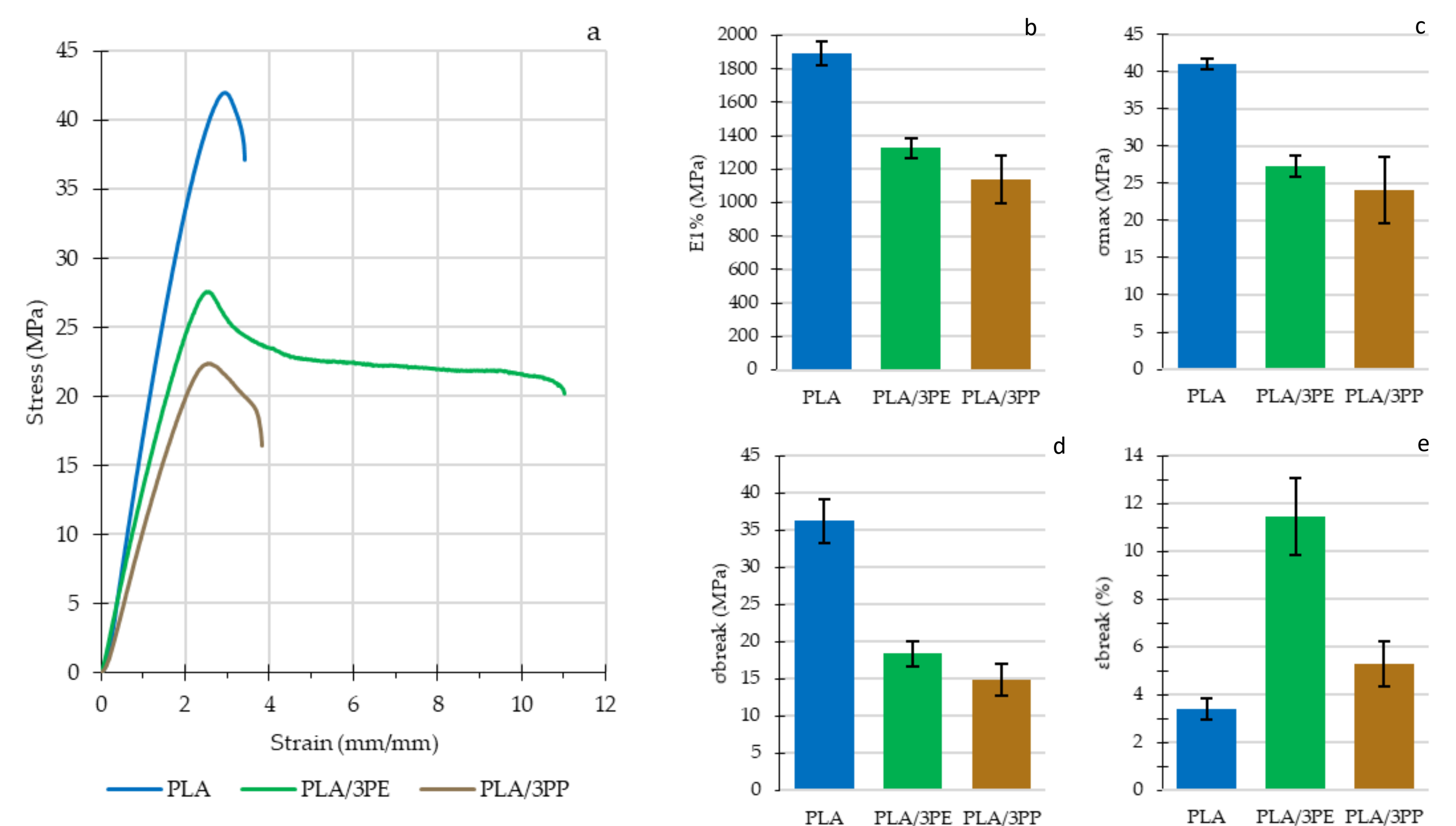


Fig. 3 Representative stress vs. strain curves of PLA, PLA/3PPE and PLA/3PP in MD (3.a), and respective mechanical indexes (3.b, 3.c, 3.d and 3.e).

CONCLUSIONS

The FTIR and SEM results indicate the incorporation of the pomegranate peels and peels extract in the PLA matrix, where PLA/3PPE showed better particle homogenization than the PLA/3PP. Regarding the color variations, the PLA/3PPE presented higher variations in terms of L*, a*, and b* values. The incorporation of pomegranate derivatives has a negative effect on the tensile strength and Young modulus, but a significant increase of the elongation at break for PLA/3PPE. The PLA film's water vapor barrier properties did not suffer any alteration with the incorporation of pomegranate extract.

Acknowledgements: Cássia H. Barbosa thanks the Fundação para a Ciência e Tecnologia (FCT), Portugal, for the Ph.D. Grant 2021.08154.BD. Funding: This work was carried out under the MobFOOD Project (POCI-01-0247- FEDER-024524 and LISBOA-01-0247-FEDER-024524), funded by POCI (Operational Programme "Competitiveness and Internationalization") and POR Lisboa (Lisbon Regional Operational Programme), through ANI, and by the Programa de Cooperación Interreg-A España-Portugal (POCTEP) 2014–2020 (project 0377_IBERPHENOL_6_E). This research was also funded by PT national funds (FCT/MCTES, Fundação para a Ciência e Tecnologia and Ministério da Ciência, Tecnologia e Ensino Superior) through the Grant UIDB/00211/2020).

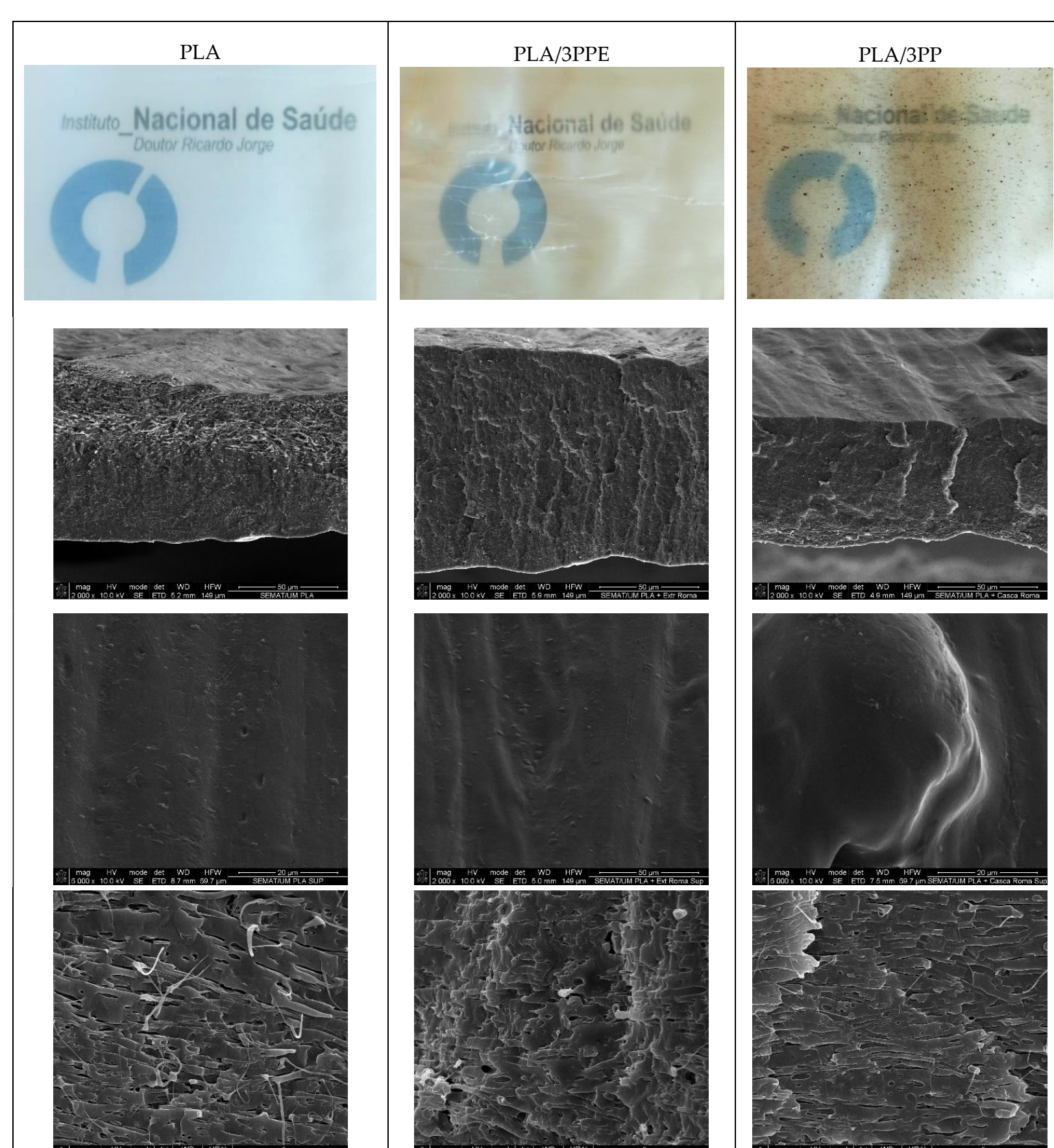


Fig. 2 Photographs of the control (PLA) and the active (PLA/3PPE and PLA/3PP) films, and the respective SEM images