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Essential oils loading onto cellulose acetate/polycaprolactone fibers via coagulation bath for an improved antimicrobial action

Natália C. Homem*, Catarina P. Miranda, Sandra G. Machado, M. Teresa P. Amorim and Helena P. Felgueiras
Centro de Ciência e Tecnologia Têxtil (2C2T), Universidade do Minho, Portugal
*natalia.homem@outlook.com

Introduction

Essential oils (EOs) have been considered as a potential alternative to antibiotics in the treatment of several diseases, due to its antimicrobial properties. For instance, the **tea tree essential oil (TTO)**, extracted from the *Melaleuca alternifolia*, has been reported to exhibit analgesic, antiviral, antibacterial, antifungal, antiprotozoal and anti-inflammatory properties. Likewise, the **cinnamon leaf essential oil (CLO)**, has exhibited excellent antioxidant and antibacterial properties. However, one of the major drawbacks associated with the use of EOs in biomedical applications is their toxicity and the difficult control of EOs degradation and loss during manufacturing of the substrate. For this reason, recently, alternatives for the **controlled release of EOs** have been proposed, being the **manufacturing of polymeric films loaded with EOs** highlighted. In this work, we report the production of polymeric fibers loaded with EOs by a simple **wet-spinning method**.

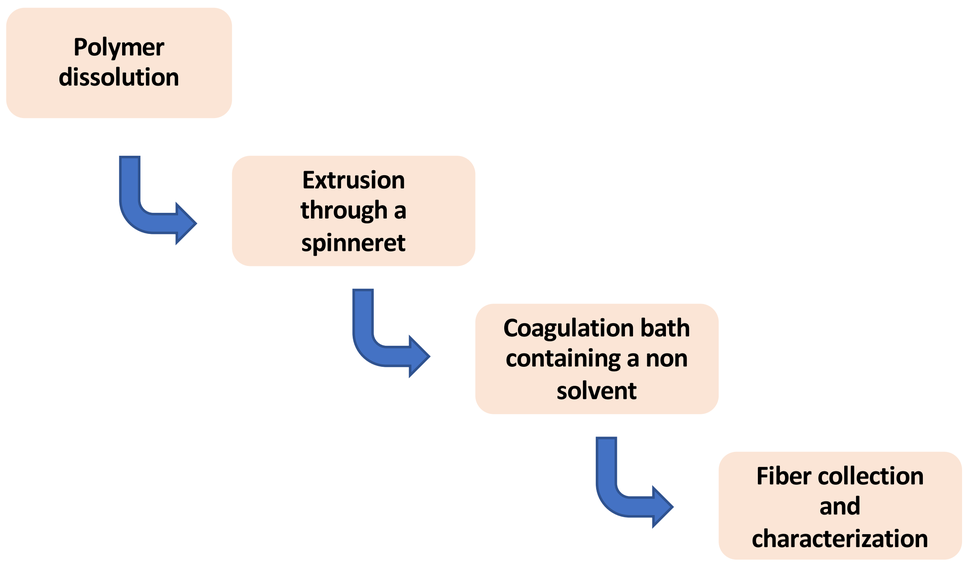


Fig 1. Production of fibers via wet-spinning technique: based on the principle of precipitation [1].

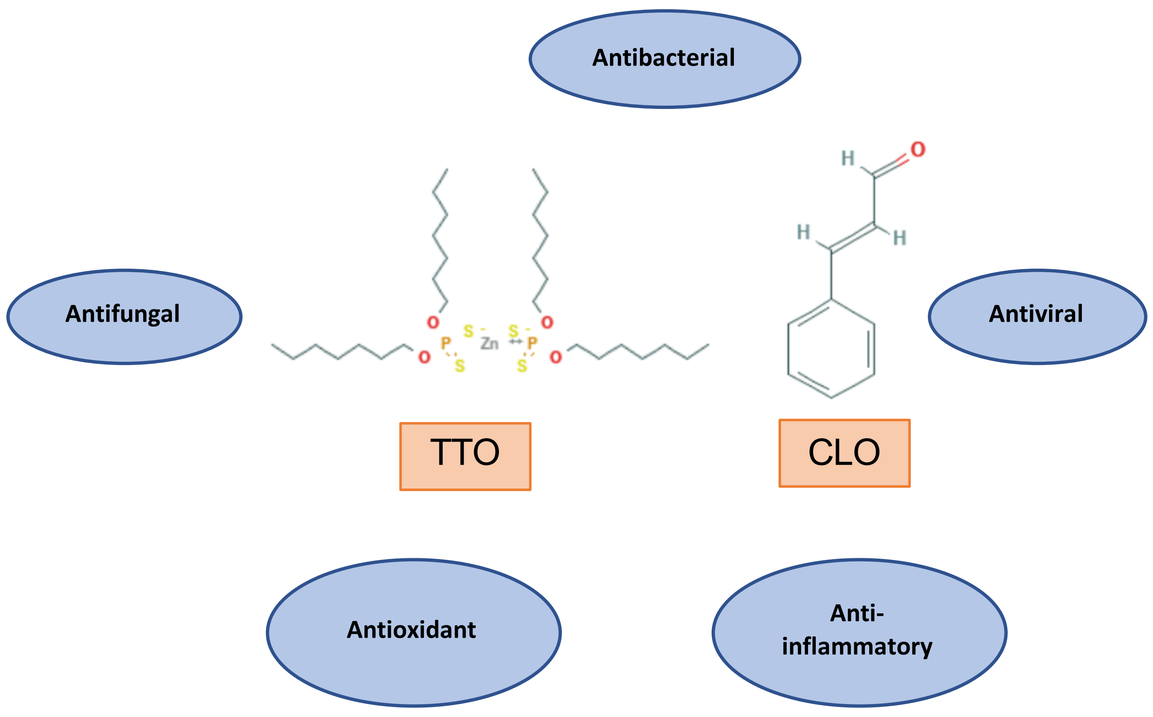
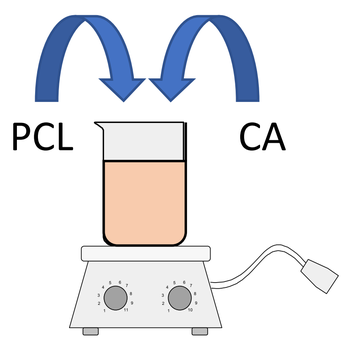


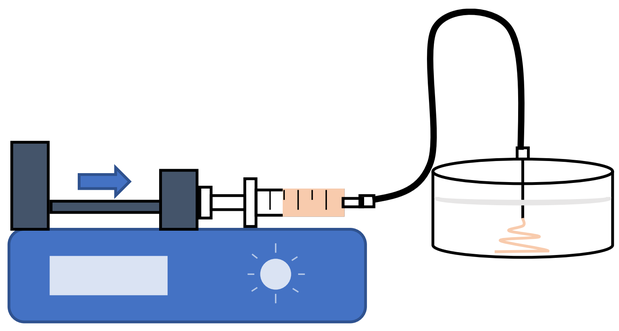
Fig 2. Chemical structure and some properties of tea tree and cinnamon leaf oils [2].

Wet-spinning of polymeric fibers

Cellulose acetate (CA) and polycaprolactone (PCL) at different ratios were processed in the form of wet-spun fibers, using acetone/acetic acid as solvent and ethanol as coagulation bath.



Solvents: Acetic acid + acetone
1h, 75ºC, 200 rpm



Coagulation bath: Ethanol + EOs
Flow rate: 0.1 mL/min

Fig 3. Manufacturing of CA/PCL fibers loaded with EOs [3].

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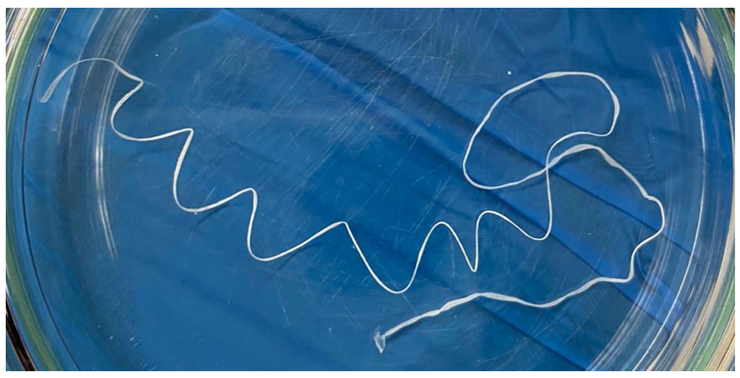

Fig 4. CA/PCL fibers.

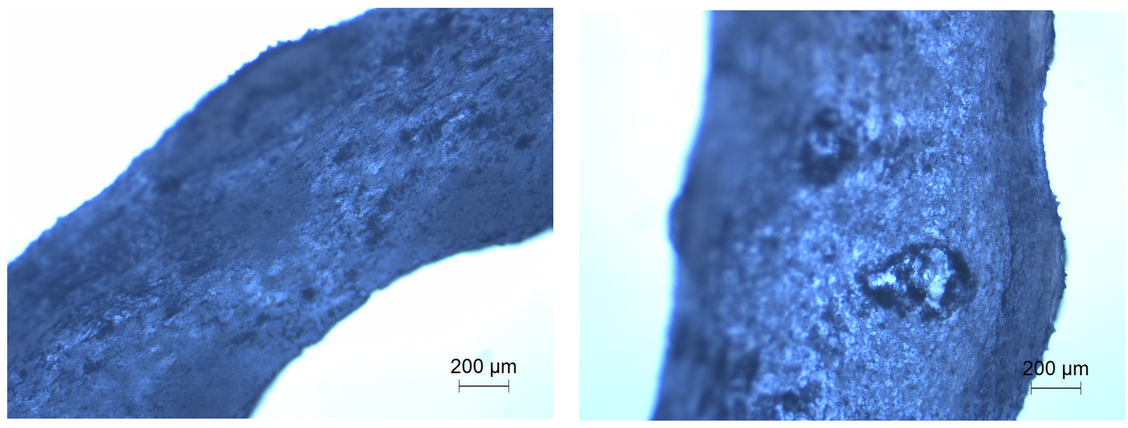

Fig 5. CA/PCL fibers (optical microscope, magnification: 5x)

Conclusions

Data reported the EOs-modified fibers to be successfully prepared and that the addition of the TTO and CLO to increase significantly the antimicrobial action of the polymers.

References

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[2] Teixeira, M. A. *et al.*, Nanomaterials, doi:10.3390/nano10030557, 2020;
[3] Khoshnevisan, K. *et al.*, Int. J. Bio. Macro. doi:10.1016/j.ijbiomac.2019.08.207, 2019.

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COMPETE
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