

Department of Chemistry

Electrospun Wound Dressings

Polymer Synthesis and Processing in Supercritical Carbon Dioxide



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Objectives

This PhD project aims to develop asymmetric non-adherent wound dressings. The produced constructs should present a top side that acts as a physical barrier against external infectious agents, while the bandage bottom side should rely in a wide open architecture that favors mass transfer phenomena.

It is also aimed to incorporate a multi-drug therapeutic cargo that promotes a synchronized sustained release of healing agents, which dynamically meets and accelerates the different wound healing stages.

Methodology

The desired wound dressings are being produced by electrospinning, a technique that continuously produce polymeric nanofibers through the use of an electric field. By exploiting the process parameters, one can take advantage of the present electrostatic forces and tune the constructs' inner morphology – (Lab 510, Prof. Ana Aguiar-Ricardo/FCT-UNL).

The therapeutic cargo will be added by alternating the deposition of charged polyelectrolytes, building a stable multi-drug film which coats the constructs bottom side architecture providing a sustained release into the wound bed – (Hammond Research Group, Prof. Paula Hammond/MIT).

Expected Results

Bandage rational design:

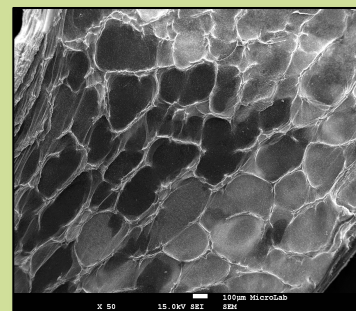
- Impermeability to external infectious agents;
- Allowed gaseous exchanges;
- Thermally insulating;
- Balanced moisture environment and excess wound exudate removal.

Therapeutic rational design:

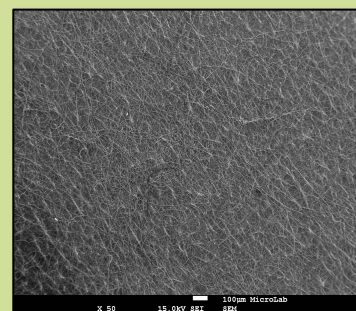
- Successful incorporation a multi-drug film coating that synchronously meets the multi-dimensional healing stages of chronic wounds.



Electrospun bandage



Electrospun bandage – top side



Electrospun bandage – bottom side