

AMRS2024 Preconference Promoting Electrospinning in Africa

Date: 14 -15 December 2024

Venue: Carnegie Mellon University Africa (CMU-Africa), Kigali, Rwanda

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Purpose of the workshop:

To equip participants with the theoretical and experimental understanding of electrospinning. The expectation is that upon returning to their home institutions, the participants will be able to incorporate electrospinning in their research work with the goal of addressing Africa's challenges through collaborative work within the AMRS network and beyond.

Outline

a) Introduction to electrospinning

Electrospinning is a technique that relies on repulsive electrostatic forces to draw a polymer solution into nanofibers. The three most basic components of any electrospinning set-up are;

- (i) Power supply
- (ii) Source of a polymer solution
- (iii) A collector

In order to control the electrospinning process, solution parameters, applied parameters and ambient parameters need to be optimized. The lectures will focus on teaching the participants the principle and experimental aspects of needle, needleless and coaxial electrospinning at a laboratory scale.

b) Practical demonstration of laboratory scale electrospinning

The most basic electrospinning setup consists of the following;

- (i) Pasteur pipette
- (ii) Copper wire
- (iii) Power supply
- (iv) Aluminum foil and collecting stand
- (v) Polymer solution

Building such a set-up to conduct experiments on nanofibers is affordable to any University in Africa. The practical demonstration will involve at least two set-ups, the most basic one and one in which a syringe pump, needle and syringe are used as polymer solution feed. 2.5 wt%, 5 wt%, 7.5 wt% and 10 wt% PEO (Mw 300 000) dissolved in water will be electrospun. Voltage, Distance and flow rate will be varied, and fibers collected for a maximum of a minute onto a glass slide. A light microscope and SEM will be used to obtain images.

c) Pilot scale and Industrial scale electrospinning

The lectures will present the pilot scale facilities at BITRI and Industrial scale facilities that are on the market. Practical considerations for scaling up electrospinning will be presented.

d) Practical aspects of electrospun fiber product development

The different ways of handling nanofiber membranes which may include heat treatment, or mechanical strength enhancement among other approaches with a specific product in mind will be presented. Examples of electrospun nanofiber-based products will be presented.

e) Discussion on electrospun nanofiber-based solutions for Africa

Participants will propose ideas on how they think electrospinning can be used to address Africa's challenges. It is expected that plans for setting up electrospinning facilities at their home institutions will be discussed and establishment of links for collaborative work within the AMRS network.

Table 1: Timetable for the electrospinning workshop

Time	Activity
0800-0830	Introductions and purpose of the workshop
0830-1000	Introduction to Electrospinning
1000-1030	Break
1030-1230	Practical demonstration of laboratory scale electrospinning
1230-1330	Lunch
1330-1430	Pilot scale and Industrial scale electrospinning
1430-1530	Practical aspects of electrospun fiber product development
1530-1600	Break
1600-1700	Discussion on electrospun nanofiber-based solutions for Africa