OPTIMIZATION OF POLYMER CONCENTRATION AND ELECTROSPINNING PARAMETERS TO DEVELOP A NANOFIBROUS MEMBRANE

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Background

- Electrospinning technology as an innovative approach to develop a nanofibrous membrane
- A unique technology with customizable porosity, fiber diameter, and thickness
- Nanofibrous membranes offer a wide range of advantages in liquid food filtration applications
- Non-thermally processed food retains most of its nutritional, and organoleptic qualities

Methodology

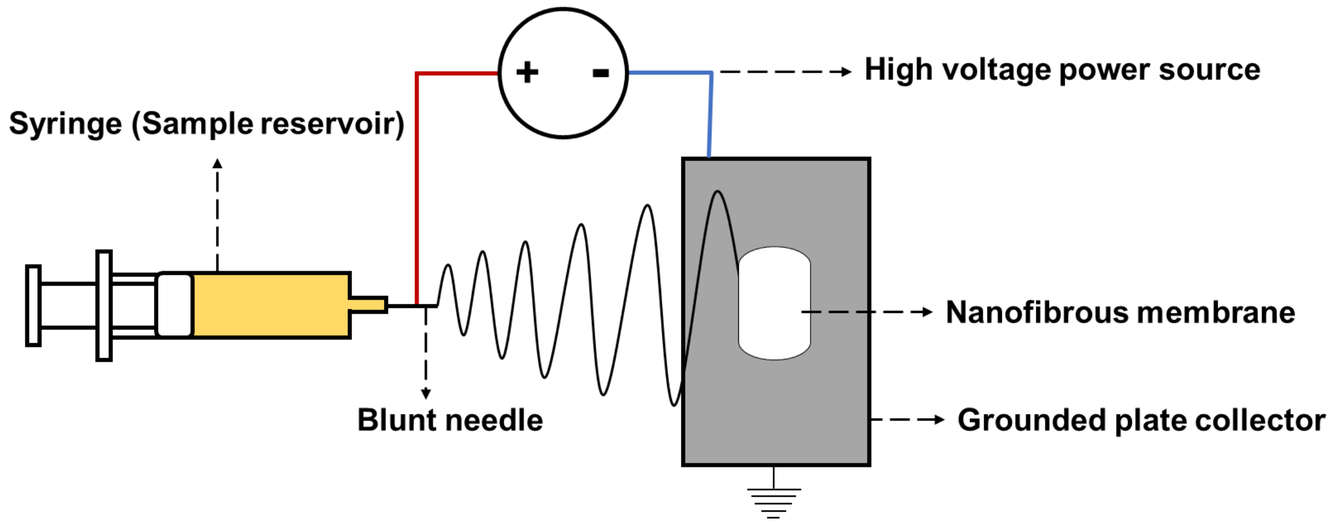
Technique: Electrohydrodynamic process

Compositions: Polycaprolactone (PCL), chloroform (CF), ethanol (ET)

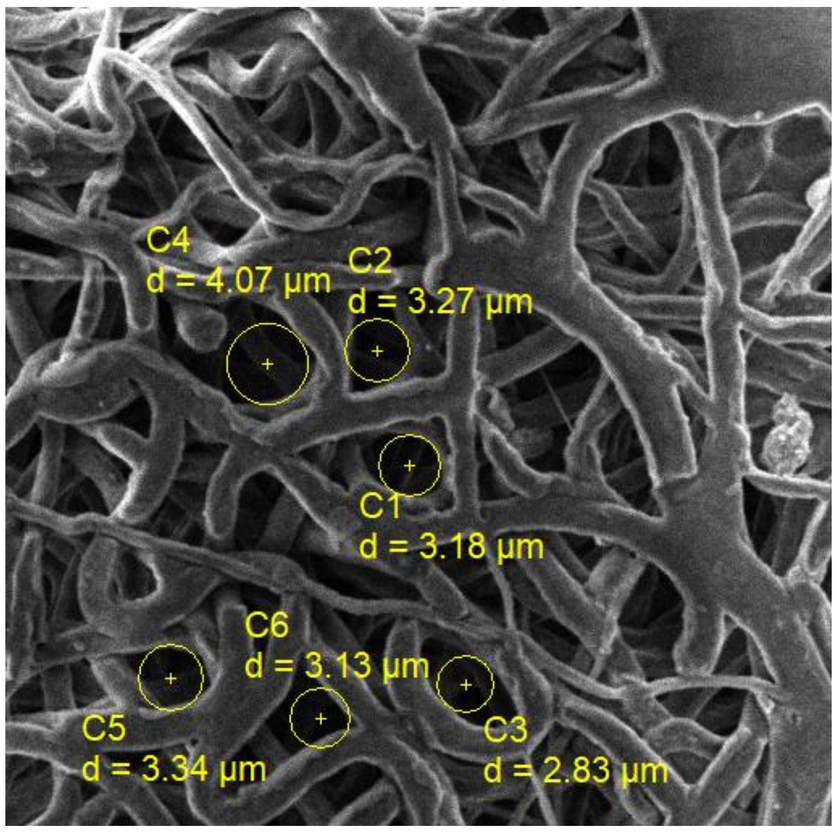
- The PCL solution (10% w/v); CF : ET = 7 : 3

Conditions:

- Applied voltage – 15 kW; Needle – 24G × 3
- Polymer flow rate – 2.4 mL/h, 1.6 mL/h, 0.8 mL/h
- Needle and collector plate distance – 10 cm, 8 cm, 8 cm

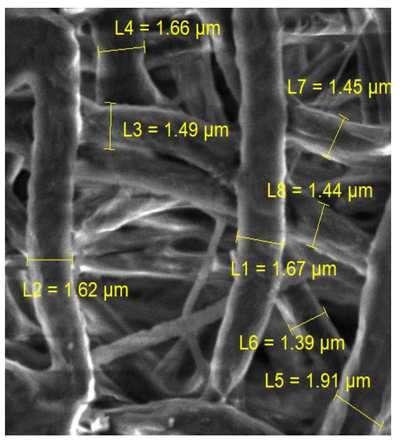


Results



3 Syringe spinning

PCL membrane



Increased fiber diameter

Thickness (µm)	450
Pore diameter (µm)	3.30
Fiber diameter (µm)	1.57

Conclusion

- Polytetrafluoroethylene, and polysulfone polymers does not exhibit various characteristics required for electrospinning, however PCL formed a non-beaded nanofibrous membrane when optimized with a solvent ratio of 70:30 (CF: ET)
- The strengthened PCL membrane is recommended to use in beverage applications such as fruit juice filtration, concentration and clarification

References

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- Prakash, S. P., Yoha, K. S., Leena Michael, M., Moses, J. A., & Anandharamakrishnan, C. (2024). Emerging Applications of Electrospun Nanofiber Membranes for Liquid Foods. *ACS Food Science and Technology*, *4*(8), 1805–1816. https://doi.org/10.1021/acsfoodscitech.4c00226