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Nanotechnology for tissue regeneration and nanodelivery

Maria Helena Ambrosio Zanin

Palestra apresentada no Clínica Mattos Pimenta de Neurologia e Neurocirurgia Ltda, São Paulo, 2020.

A série “Comunicação Técnica” compreende trabalhos elaborados por técnicos do IPT, apresentados em eventos, publicados em revistas especializadas ou quando seu conteúdo apresentar relevância pública.

NANOTECHNOLOGY FOR TISSUE REGENERATION AND NANODELIVERY

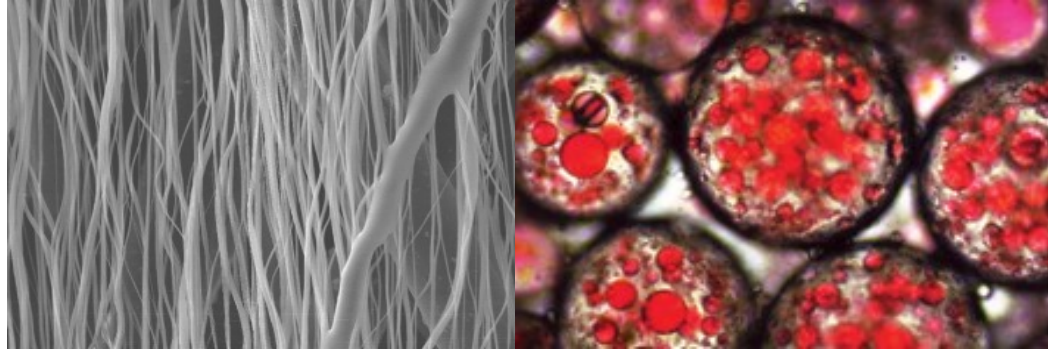
Dra. Maria Helena Ambrosio Zanin
mhzanin@ipt.br

20/05/2020



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Nucleus for Bionanomanufacturing



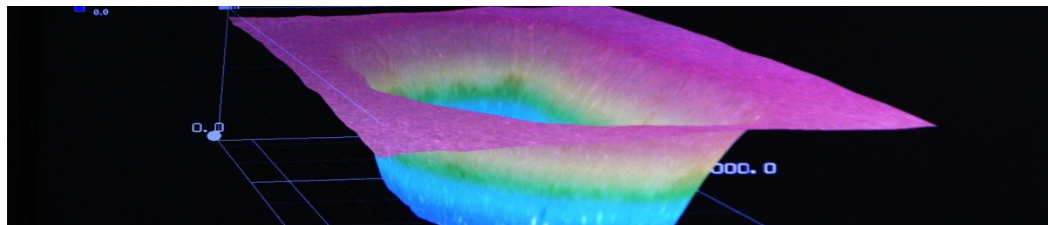
LPP – Chemical Processes and Particle Technology Laboratory

Nanotechnology and advanced chemical processes



LBI – Industrial Biotechnology Laboratory

Development and characterization of biotechnology solutions



LMI - Micromanufacturing Laboratory

Product and process miniaturization



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Nanotechnology in Medicine - Application

- 
- **Drug delivery**
 - ***In vitro* diagnostics**
 - ***In vivo* imaging**
 - ***Therapy* techniques**
 - **Biomaterials**
 - **Tissue engineering**
- 



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Biomaterials applied in scaffold building

Biomaterials relies on four main classes of materials:

 i. Polymers,



ii. Ceramics,



iii. Metals



iv. Composites (blends and combinations of the aforementioned materials).

Biomaterials : natural or synthetic sources

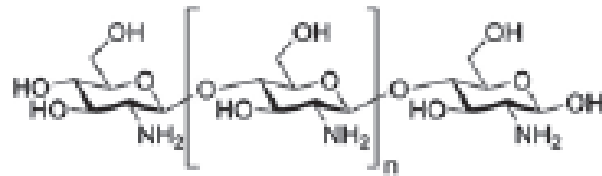


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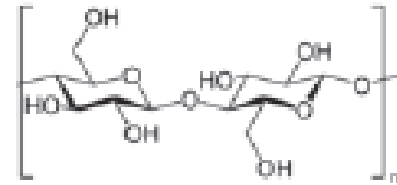
Polymers

Natural Polymeric

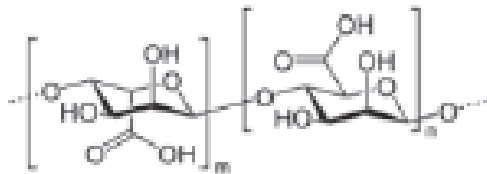
Synthetic Polymeric



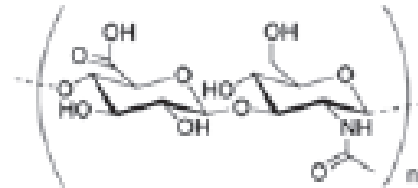
Chitosan



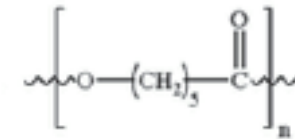
Hyaluronic acid



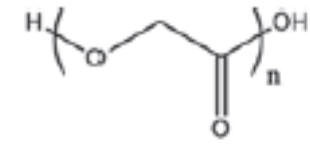
Alginate



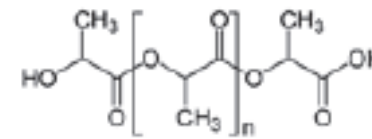
Cellulose



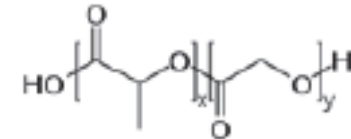
PCL



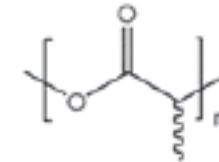
PGA



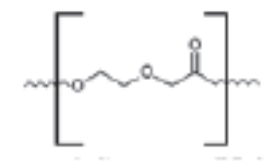
PLA



PLGA



PLLA



PDO



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Degradable periods of synthetic polymer

| Materials | Degradation period | Hidrophobicity |
|---------------------------------------|--------------------|-------------------------------------------------------------------------------|
| Polycaprolactone (PCL) | > 20 months | Hydrophobic |
| Poly L-lactic acid (PLLA) | 20 ≈ 60 months | Hydrophobic |
| Polydioxanone (PDO) | 6 months | Hydrophilic |
| Polyglycolic acid (PGA) | 1 ≈ 4 months | Hydrophilic |
| Poly (lactic-co-glycolic acid) (PLGA) | 2 months | Depend of PLA and PGA compositions. Increase of PLA => less hydrophilicity |

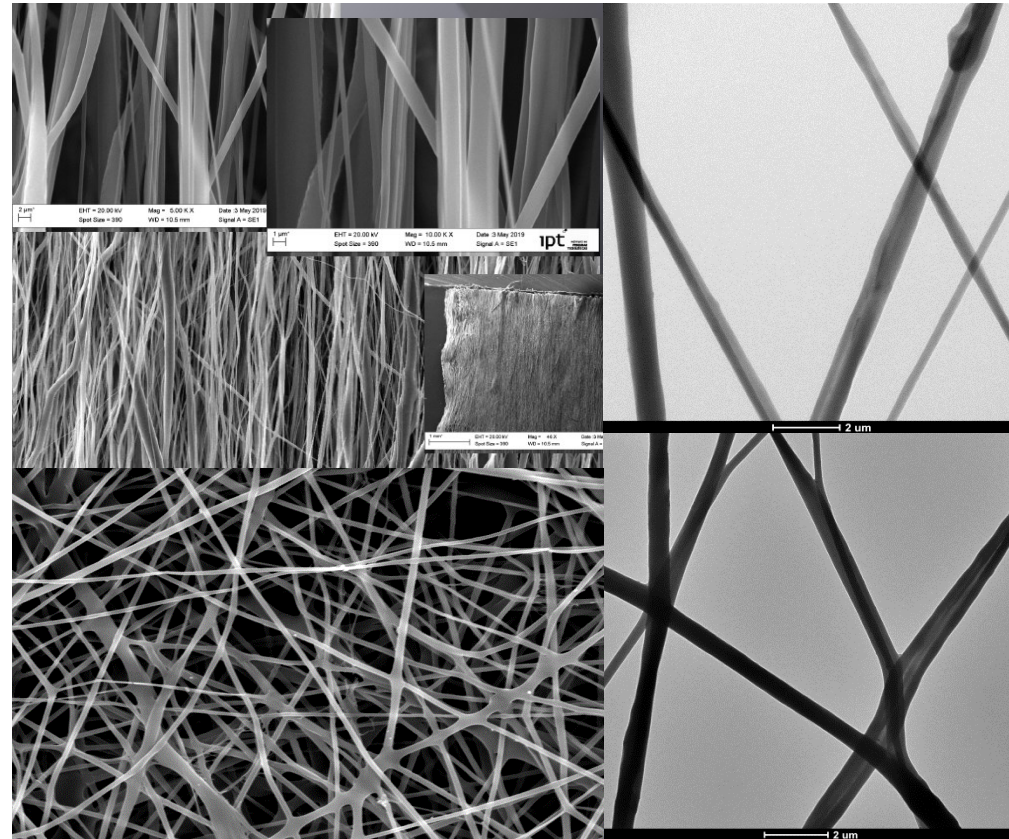
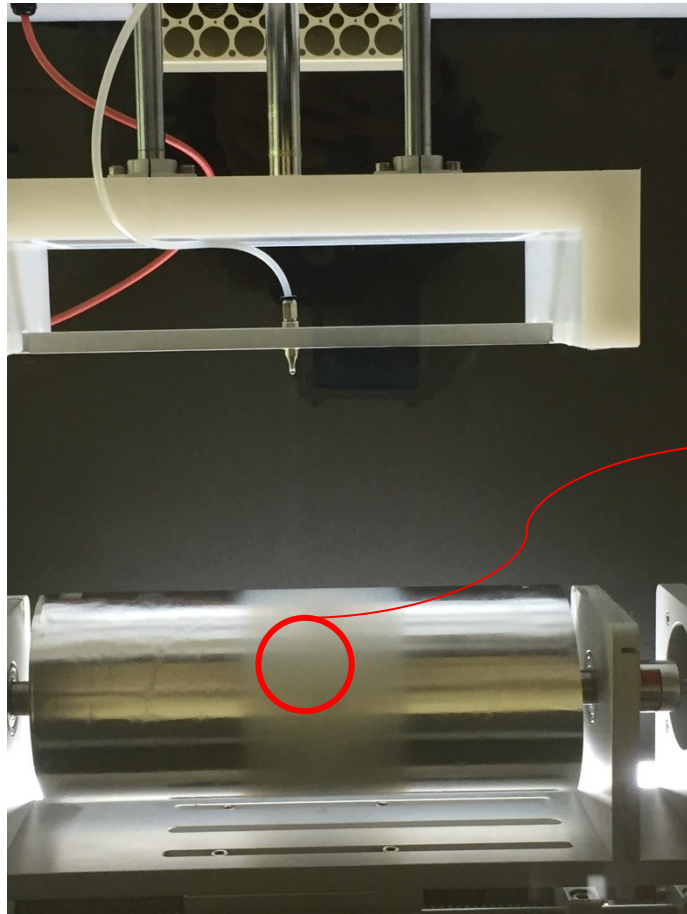
Walker et.al. 2009.



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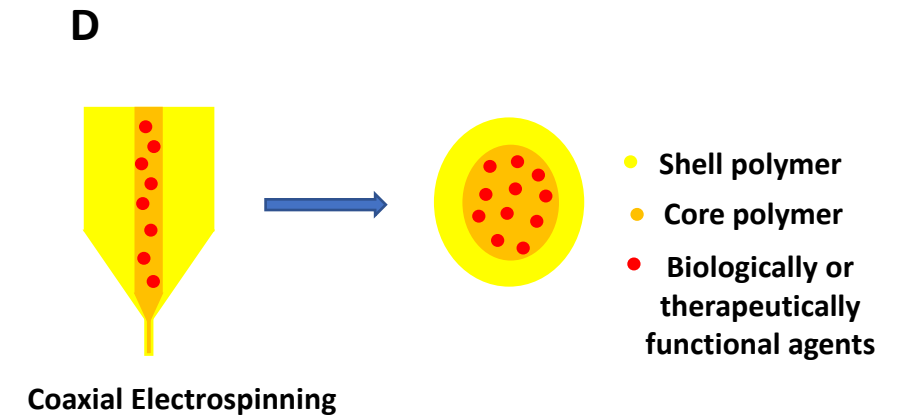
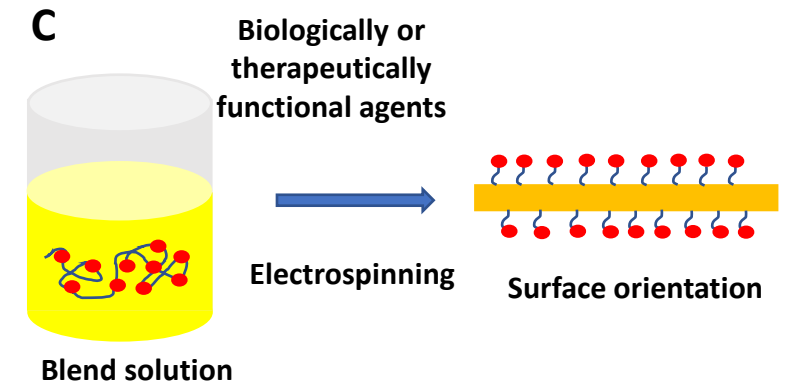
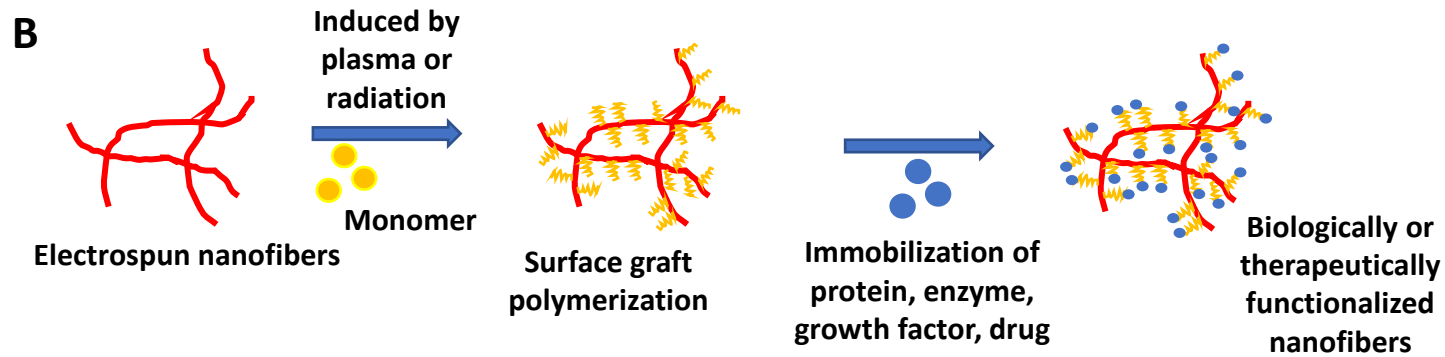
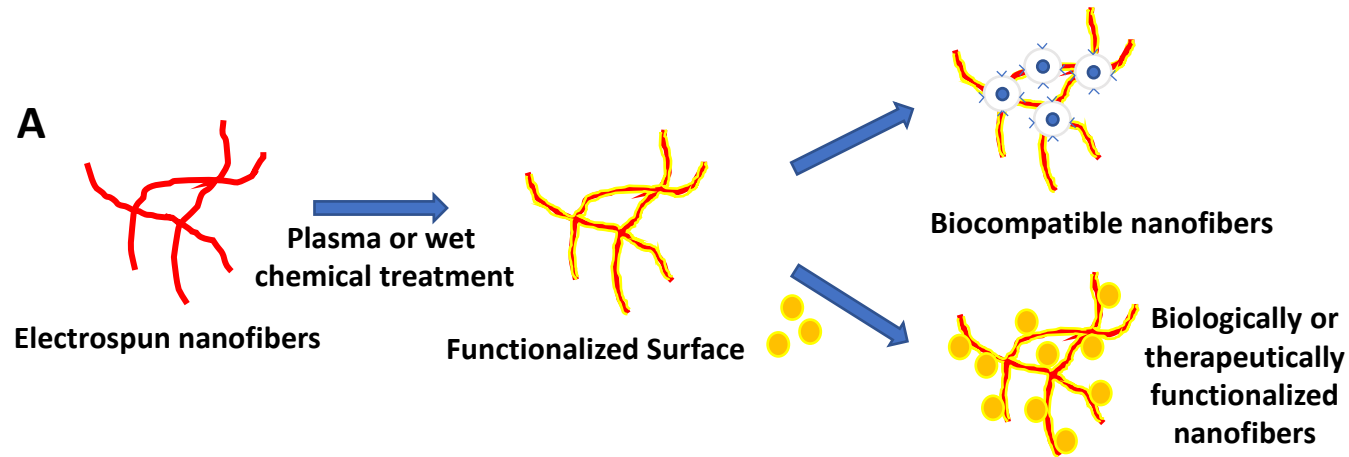


Nanofiber developed by Electrospinning



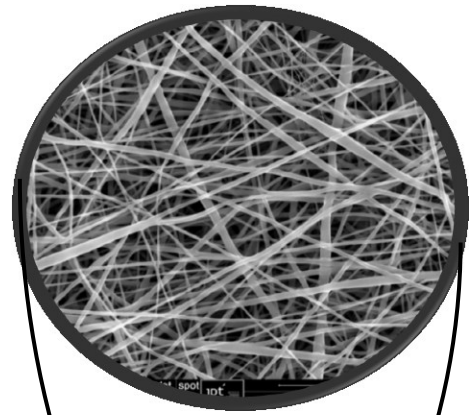
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Surface modification technique of electrospun nanofibers

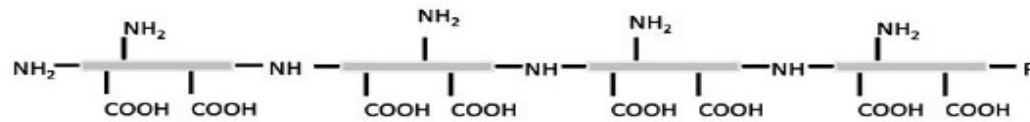
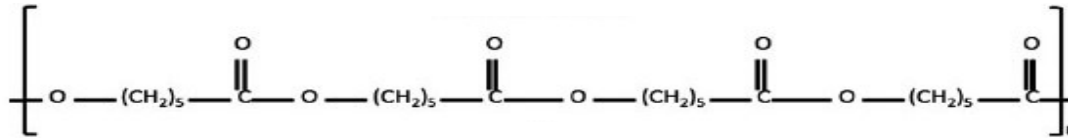
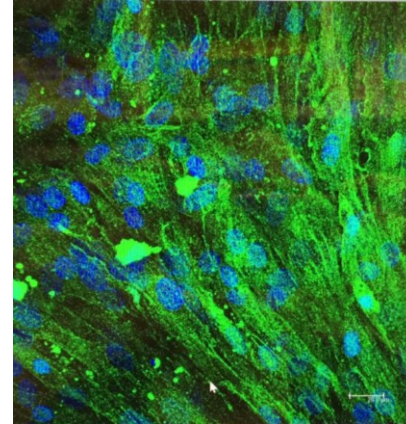


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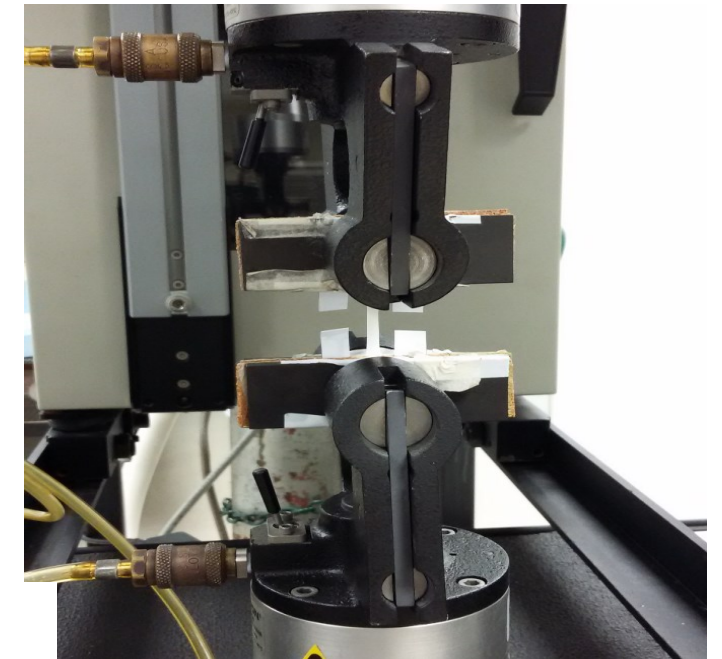
Case studies of nanofiber Scaffold at IPT



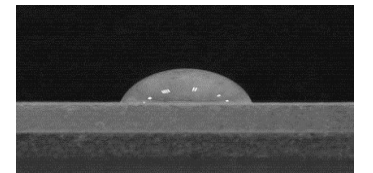
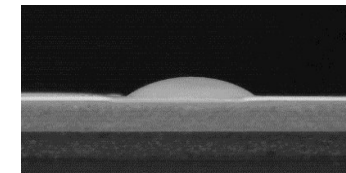
Stem Cell



Vanessa Tiemi Kimura (MSc.) Supervisors: Dra.Wang Hui (EPUSP) / Dra. Maria Helena Ambrosio Zanin (IPT)



Mechanical tensile strength



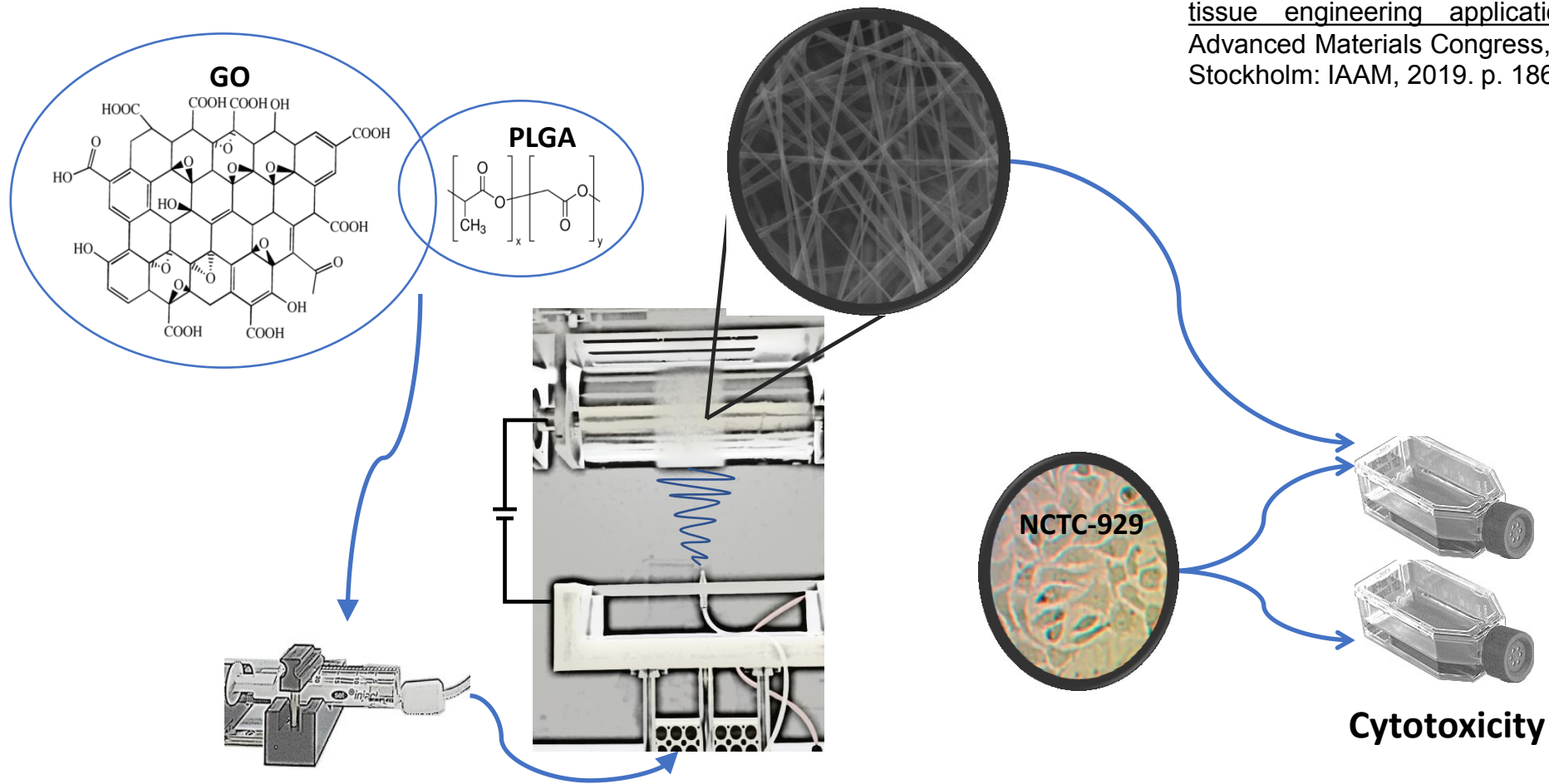
Wettability



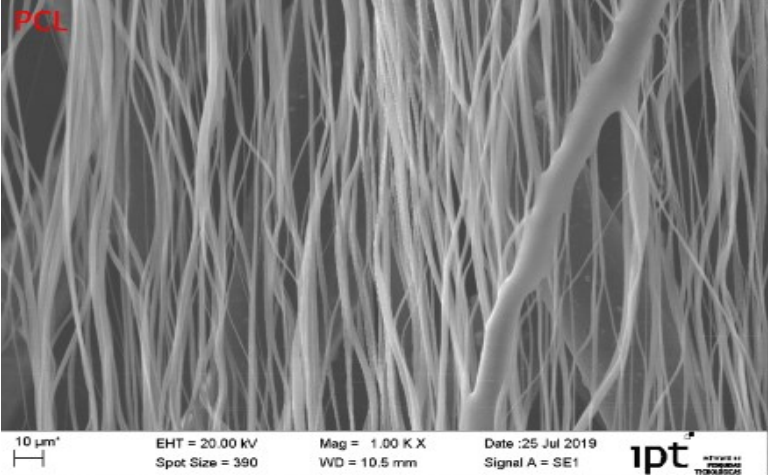
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Case studies of Scaffold at IPT

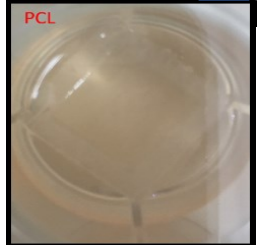
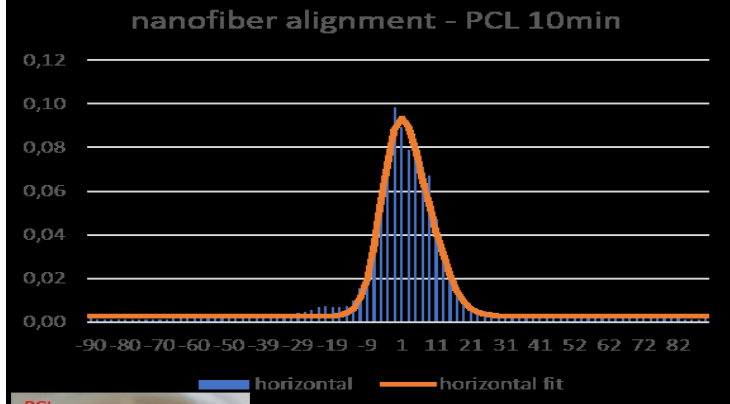
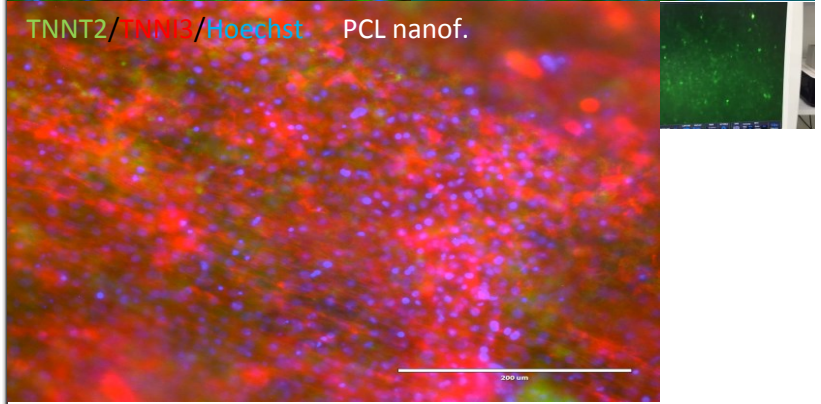
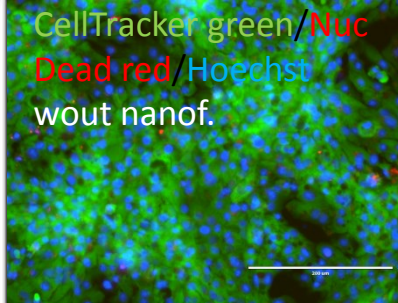
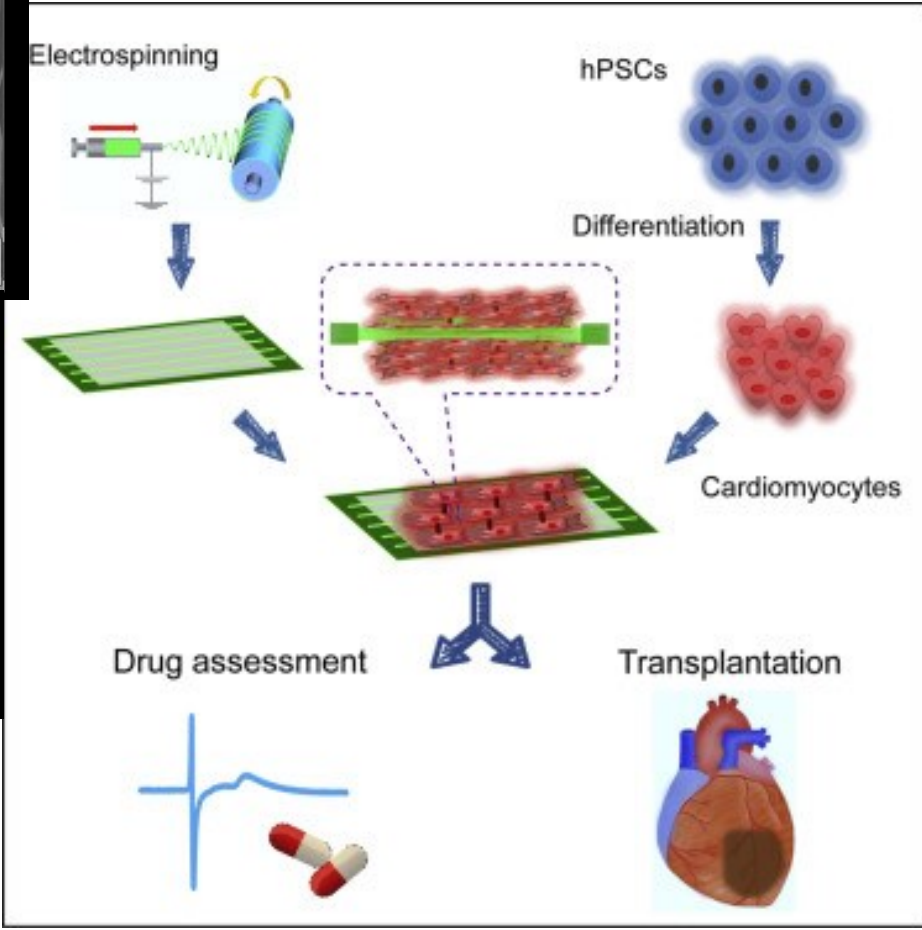
ZANIN, M. H. A.; KIMURA, V. T. ; SANT'ANNA, D. A. .
Fabrication of Graphene oxide-PLGA hybrid nanofiber for tissue engineering application'. In: 27th Assembly of Advanced Materials Congress, 2019, Stockholm. Abstracts... Stockholm: IAAM, 2019. p. 186-187.



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Aligned nanofiber scaffold for cardiomyocytes based on induced pluripotent stem cells



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Thank you!!!!

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mhzanin@ipt.br



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