

BIOAPPLICATION FOR ELECTROSPUN POLYMERS



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OUTILINE

- Electrospinning technique
- Bioapplication
 - Filtration
 - Biosensor
 - Regenerative medicine
 - Biotechnologies
- Conclusions





























Nanofibers deposition

89





Manufactures collection

89 18





Some examples











Characteristic of electrospun products

- nanometric fibers
- nanometric pores
- low fiber volume fraction
- high surface/volume ratio (1000 times higher of microfibrous)
- high efficiency in surface functionalization
- possibility of functionalization of fiber bulk ("encapsulation")





air pollution (HEPA filters) **Bioapplication** - Filtration Pre filter military wastewater protective food

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medical





Bioapplication – Filtration

Advantages of nanofibrous filters

- low pore dimension
- low fibers volume fraction
- low filter mass
- low thickness
- high surface/volume ratio
- ...



nanofibrous filter







Bioapplication - Biosensor





biological agent

glucose





wine analyses







chemical agent





active agent release (colouring, ...)

nanofibers

change in physical properties (reflection index, ...)







Bioapplication - Regenerative medicine





Bioapplication - Regenerative medicine

Our experience in small vessel regeneration

- material = Silk Fibroin
- vessel $\emptyset = 6 \text{ mm}$
- collector = rotating mandrel







Bioapplication - small vessel regeneration

Cell interaction (fibroblast): cells vitality by Alamar Blue test



ES-SF tub similar to culture dish decrease at 7 days due to confluence





Bioapplication - small vessel regeneration

Cell interaction (fibroblast): morphological analyses by SEM observation



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Bioapplication - small vessel regeneration

Mechanical test: compliance

Compliance is a measure of the tendency of a hollow organ to resist recoil toward its original dimensions upon removal of a distending or compressing force.





Bioapplication - Biotechnologies



Surface functionalization



encapsulation

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functions

processes

- drug delivery
- antibacterial
- antimicrobial
- ...
- ...

- dyeing
- bleaching
- ...

• ...



Bioapplication - Biotechnologies

Our experience with polyamide (PA) and enzyme

polyamide chips





PA Solution in formic acid





PA nanofibrous matrix (PA-mat)





Bioapplication - polyamide and enzyme





Bioapplication - Conclusions

Nanofibers useful in many technical fields

- high performance in filtration
- "flexibility" in biosensoring
- biomimicking in tissue regeneration
- high yield in biotechnological treatments
- new opportunity in functionalization





Bioapplication - Conclusions

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That's one small diameter for a fiber,

one giant leap for textile!



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