



INDTECH2018

Innovative industries for smart growth

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PILLAR 2

Session 2.7

Bridging the gap between science and industry.
Innovative technologies in biopolymers synthesis

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AIMPLAS

31 October 2018



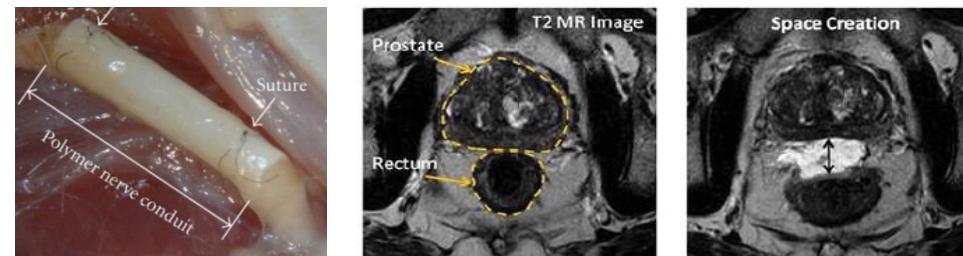
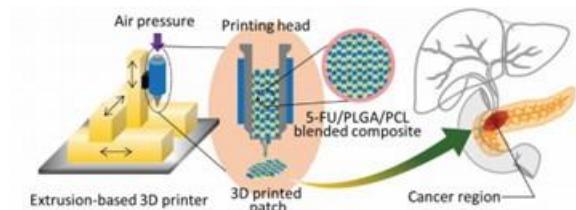
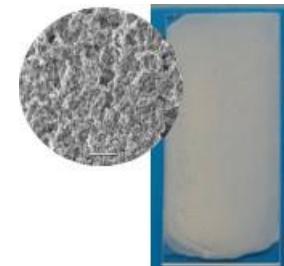
The problem, the necessity...



AIMPLAS aims to add value to the society to improve the **quality of life** and ensure **environmental sustainability**.

Synthesis Department develops biopolymeric materials for medicine solutions:

- Nanomarkers
- Materials for diagnosis and therapeutic
- Biocompatible and bioabsorbable polymers
- Hydrogels
- Controlled release
- Bone and tissue regeneration
- Hybrid organic-inorganic materials





The problem, the necessity...

Synthesis of Polymers

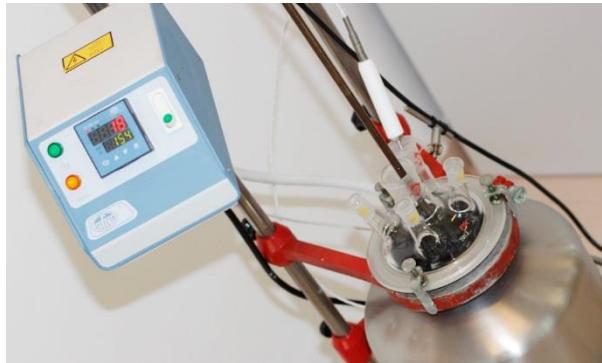
~~SYNTHETIC~~ATIONS: 0.1 to 10-50 kg and beyond.

- Huge solvent quantities management
- Process development by solution synthesis.

Process optimization, including
• Slow processes

Strategies in polymer synthesis as:

- Control polymer morphology (structure of polymers (copolymers))
 - Ionic polymerization.
 - Coordination.
- Batch processes (regeneration, Polycondensation, cleaning times, discharge)
 - Ring opening polymerization





The Valley of the Death!!!!

* SOURCE: CERN



Federal Ministry
Republic of Austria
Transport, Innovation
and Technology

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 767162.

REACTIVE EXTRUSION (REX)!!!

It is a continuous process in which an extruder is used as a chemical reactor, to carry out polymer synthesis





Classic synthesis in reactor.

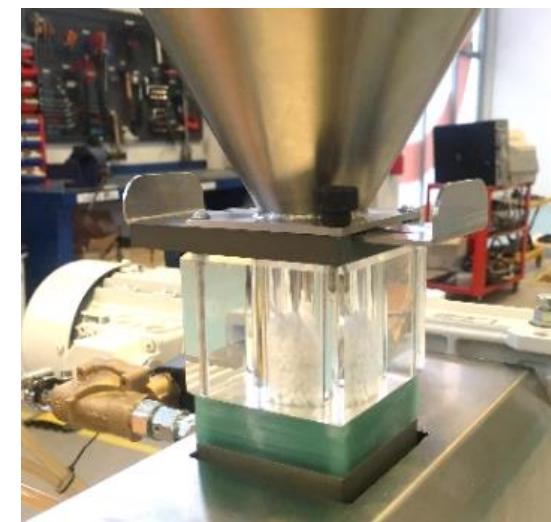
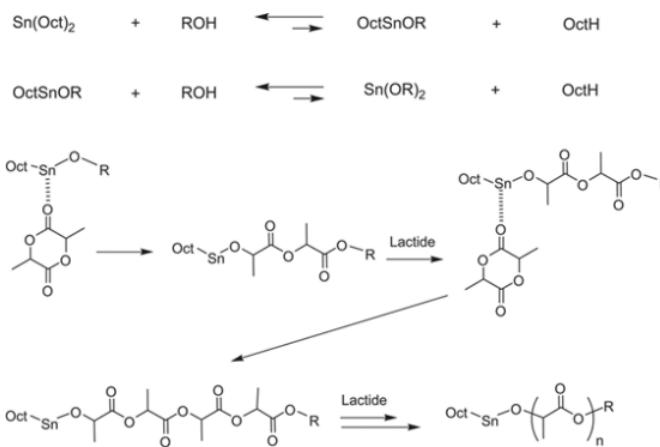
- In solution: better homogenization, but you have to remove the solvent to obtain the polymer (it requires a lot of energy).
- Molecular weight limited by viscosity and agitation.
- They require further processing of graining, addition additives, fillers, fibers, etc.
- For the production of large volumes of polymers
- Batch Processes

Synthesis by reactive extrusion.

- Continuous horizontal reactor.
- Absence or minimal presence of solvent as a reaction medium (more sustainable).
- Good handling of high viscosities.
- Devolatilization to remove / recover unreacted monomer.
- High flexibility of process design.
- Possible integration of the synthesis and compounding process (additivation, loading / reinforcement, etc.).



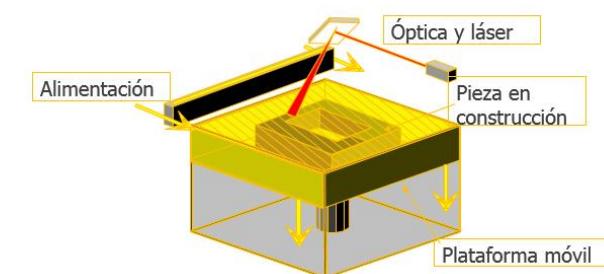
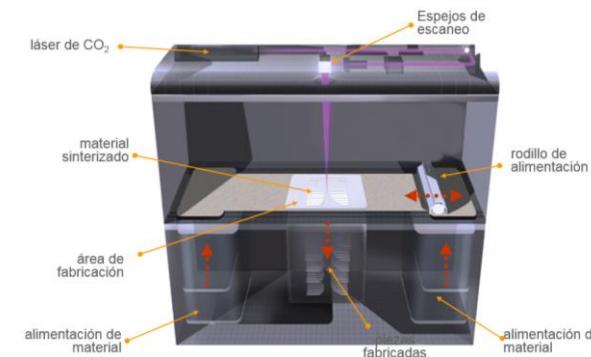
SUCCESSFUL POLYMERIZATION OF PLA





Other Technologies that bridge the gap between science and industry are the **ADDITIVE MANUFACTURING TECHNOLOGIES**

The mantra is "Need few units, complex geometry, small size".





Thanks for your attention

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