

Nano-Biotech - Challenges for Trainees in a Multidisciplinary Research Program

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Education

- B.S. in Food Chemistry, University of Erlangen – Nuremberg, Germany
- PhD in Food Science, University of Massachusetts, Amherst
 - Food scientists' training must be truly interdisciplinary in order to provide the nation and the world with a nutritious, safe, and wholesome food supply”

- Department Website

Food Science Graduate Program

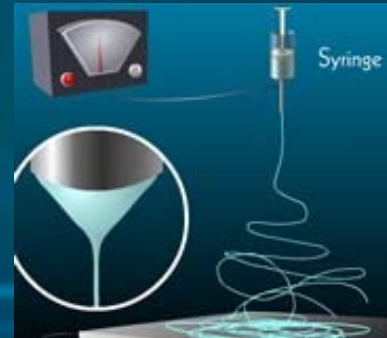


At UMass, Amherst:

- Graduate students have their own advisor
 - Special cases: two professors co-advising
- Graduate level courses outside of the department
 - Students are free to choose the type of course

My Research

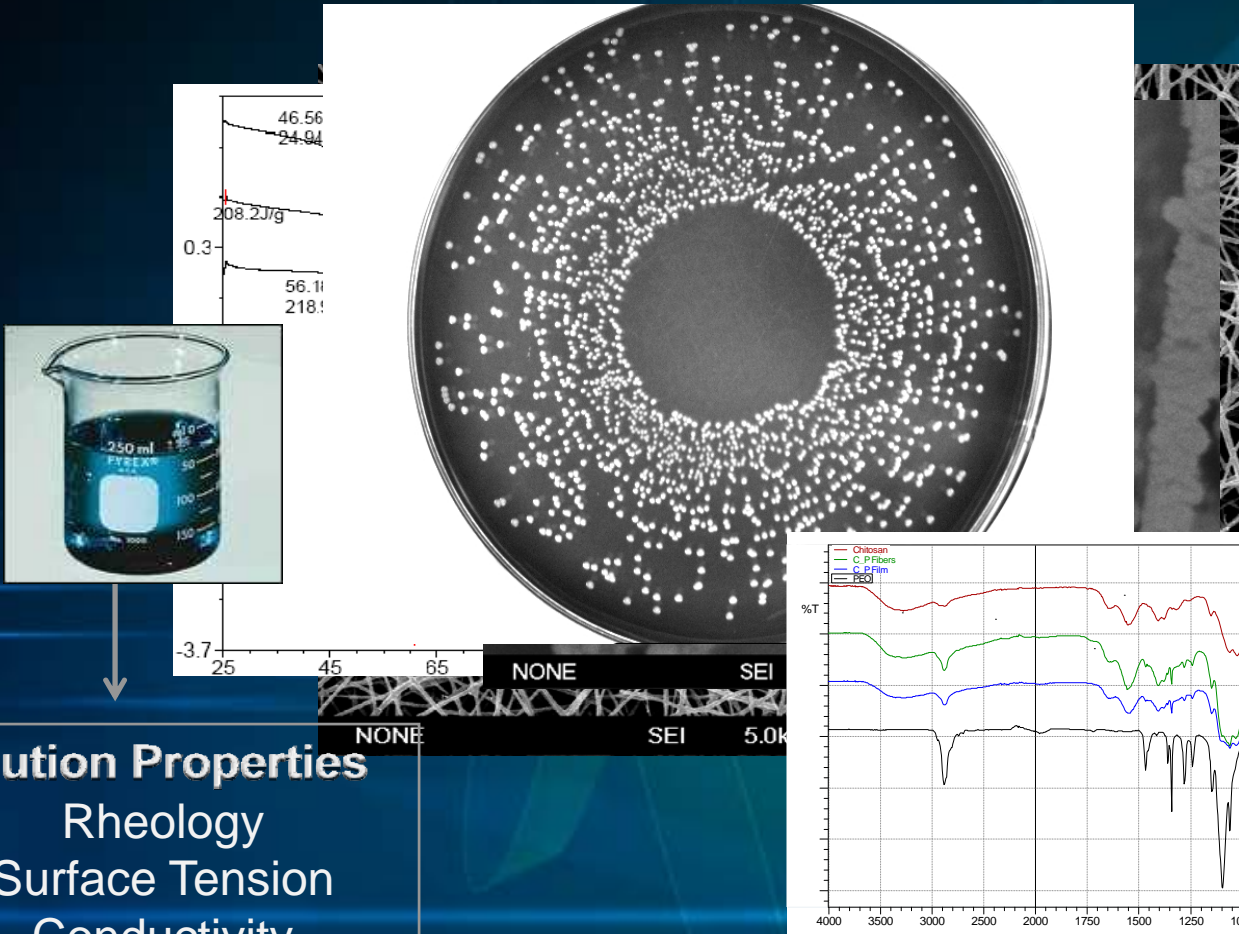
- **Electrospinning of (Bio)polymeric Nanofibers in the Presence of Surfactants and Surfactant Aggregates**
- Polymer solution is accelerated from a capillary towards a grounded target by an electric field (~ 100 kV/m) producing fibers with diameters as small as 10 nanometers



Motivation of Research

- New scientific and technological problems
- Increased interest in use of food biopolymers
 - Waste or by-products
- Production of new materials for use in the food industry

My Research Steps



Microscopy

Solution Properties

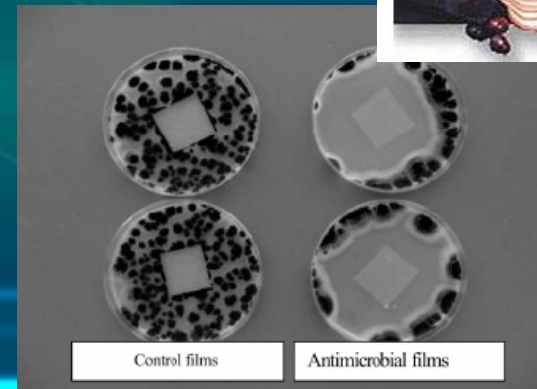
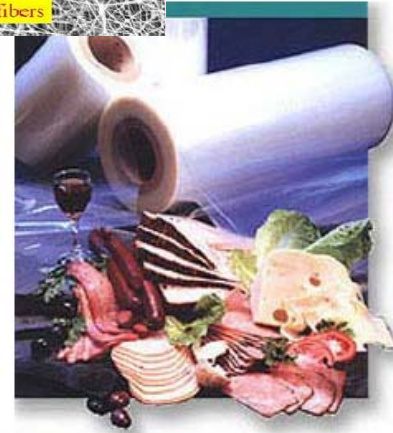
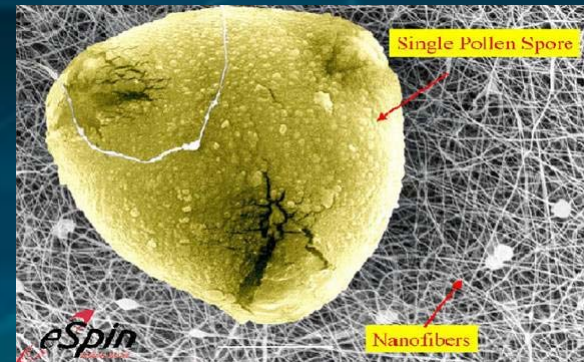
Rheology
Surface Tension
Conductivity

Physicochemical Properties

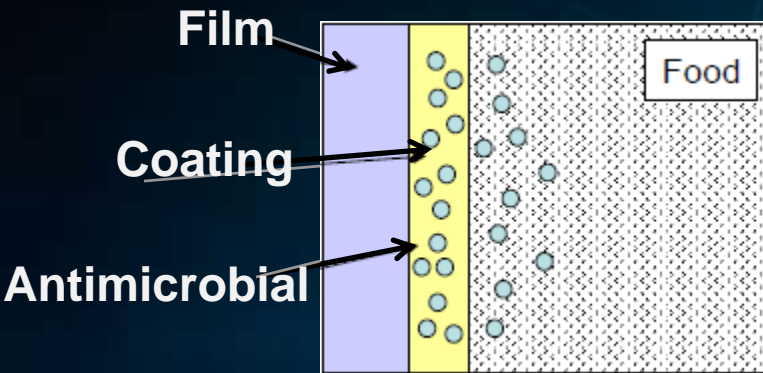
Composition
Thermal properties
Crystallinity

Food Nanotechnology - Applications

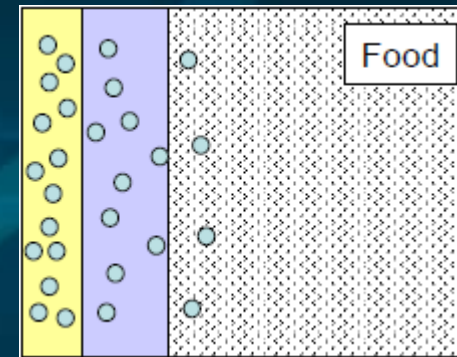
- **Filtration technologies**
 - Removal of microorganisms
 - Recovery of volatile components
- **Biosensors**
- **Carrier systems**
 - Controlled release
 - Flavor and color carrier
 - Functional (bioactive) ingredients
- **Packaging Technologies**
 - Edible packages with improved mechanical properties
 - Antimicrobial active



“Active” Food Packaging



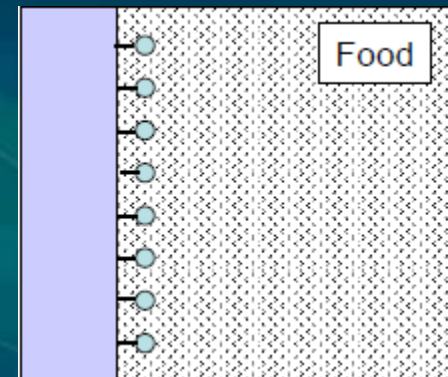
**Spraycoating of foods
prior to packaging**



**Spraycoating of foods
after packaging**



**Incorporation in film
or membrane**



**Bound to film
or membrane**

Challenges of IDR at UMass

- Research based:
 - Languages, research methods, and cultures of different disciplines
 - Professors from different departments focus on differing aspects of research subject
 - Willingness to learn from other disciplines
 - Limited access/ response to inquiries from other departments
 - Limited exchange of ideas



Challenges of IDR cont...

- Course based:
 - Program requires student to take courses offered outside of the department
 - Limited support from professors
 - Some courses only offered to students from the own department not University wide
 - In certain cases not interdisciplinary enough



Possibilities at UMass

- IGERT program
- Center for Hierarchical Manufacturing
- Issue: only limited fields of study are involved
- MassNanoTech
 - Includes over 50 faculty members from nine science and engineering departments

Impact of IDR training

- Impacts the job opportunities in different directions
- Positive impact:
 - Broader background and knowledge
 - More skills in different research areas
 - Networking
- Negative impact:
 - Some might find the background too broad, not focused enough

Acknowledgements

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- Rod Hill
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- Andrew Maynard



THANK YOU!