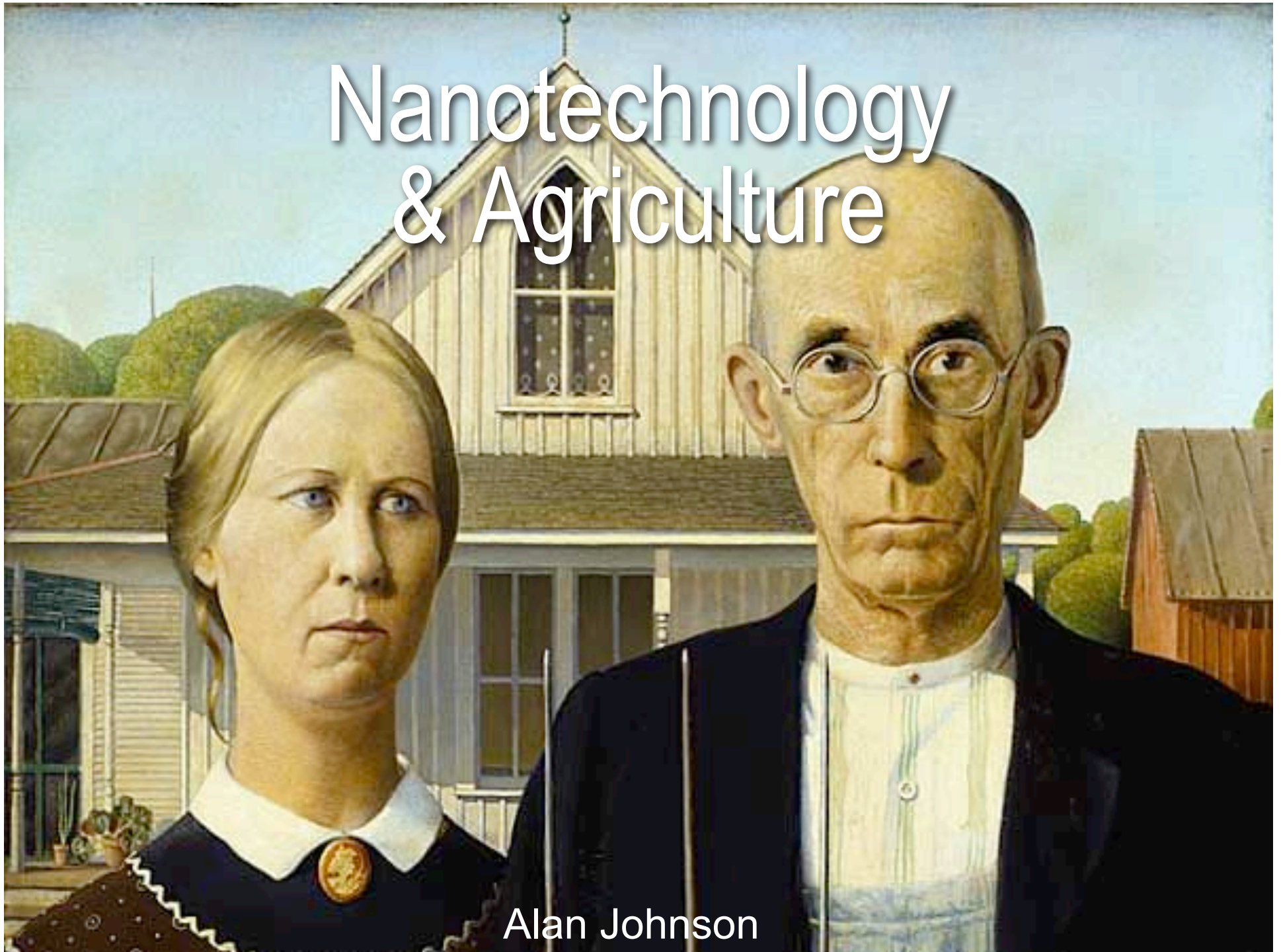


Nanotechnology & Agriculture



Alan Johnson

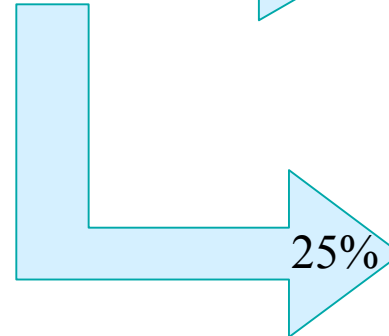


Food Industry: Main Areas

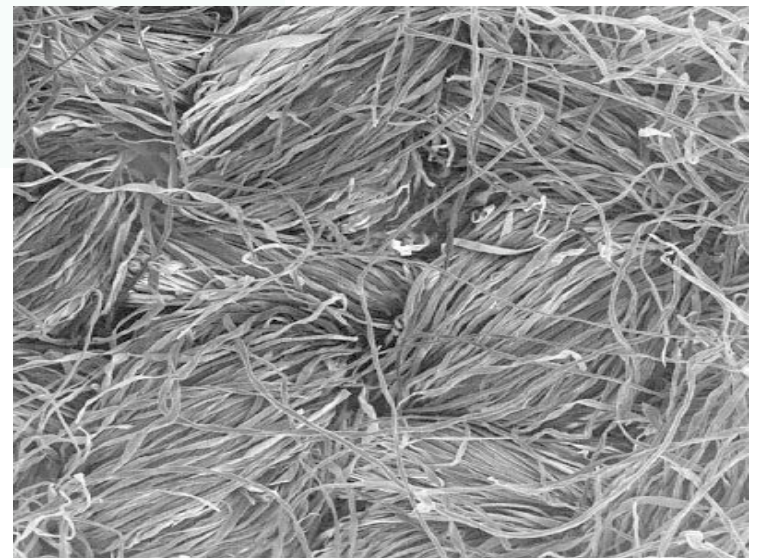
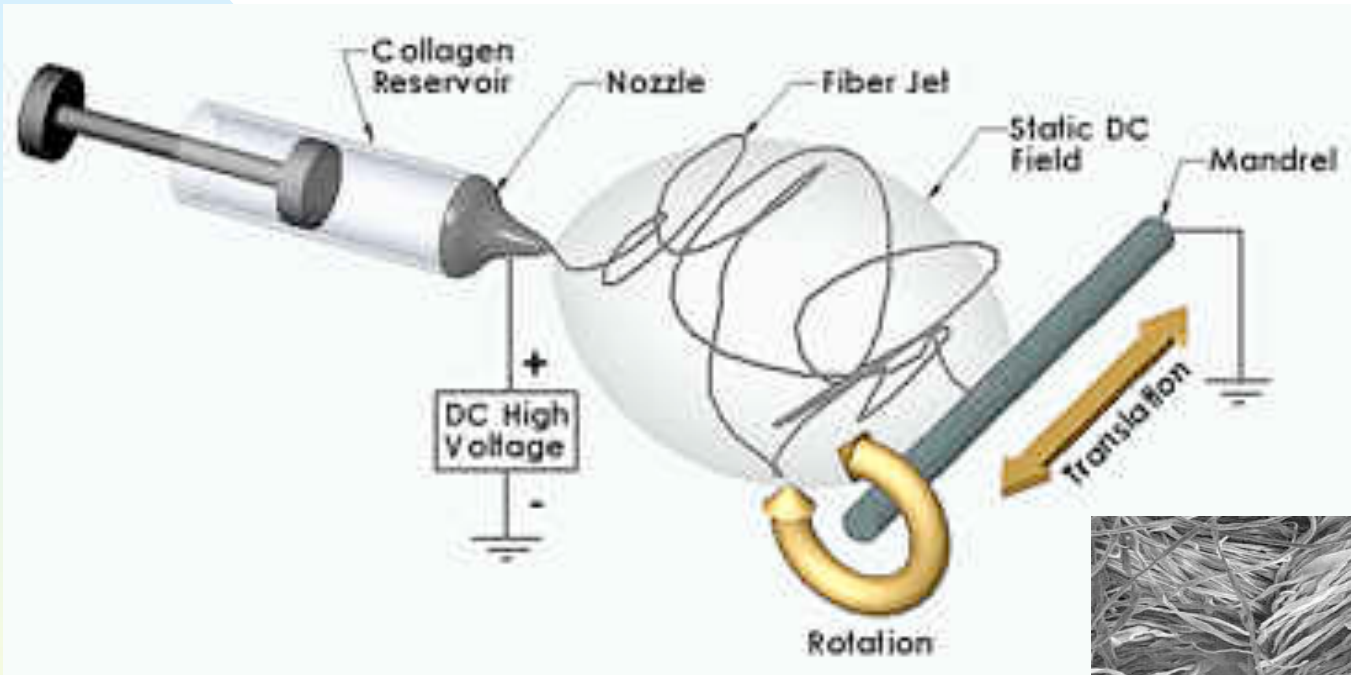
- Development of new functional materials
- Product development
- Design of methods and instrumentation for food safety and bio-security

1. Materials: Cotton

- About 25% of 9.6 billion pounds of cotton material is lost in converting cotton to finished products



Electrospinning



Potential Applications

- air filtration
- protective clothing
- biodegradable nanocomposites
- absorption fertilizers and pesticides



2. Products: Plastic

- Durethan KU 2-2601 by Bayer
- More airtight plastic packaging that will keep food fresher and longer than their previous plastics

The Process

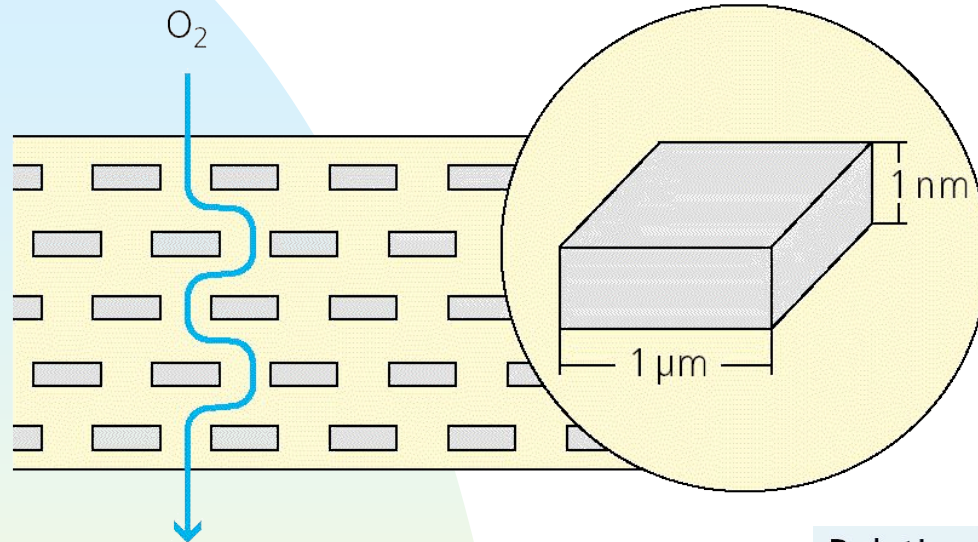
- Kneading doesn't work
- Instead mix the silicates in the polyamide base material, caprolactam
- Caprolactam is fluid and quickly penetrates the small spaces between the silicate particles in the stack
- The plastic goes through polymerization, the viscous polymer that forms scatters the individual platelets



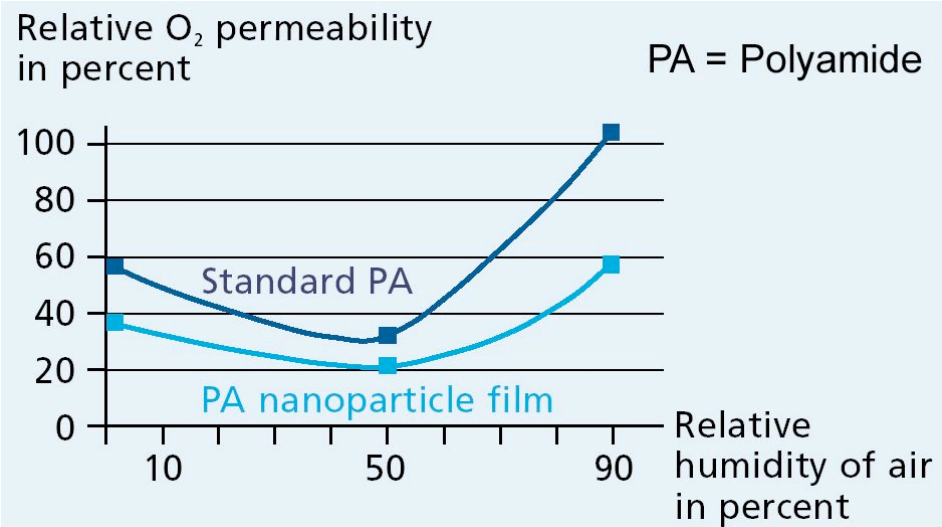
The Process cont.

- The silicate stacks are broken down almost completely and the individual platelets are distributed uniformly throughout the polyamide
- When the plastic is extruded into a film, the platelets orient themselves parallel to the surface

Finished Product



Durethan® film with nanoparticles





3. Biosecurity: Biosensors

- Still just on the drawing board
- Very little progress
- Nanoparticles could be made to emit light at varying frequencies
- Attaching these sensors onto food and reading the light frequency (color) could indicate the presence of viruses, bacteria, etc.

Glow in the Dark

- Clemson University
- Nanoparticles that attach themselves to pathogens and then combine with them to glow
- Longer term - nanoparticles in packaging

Concerns



- Economy: Countries opposed to GM foods also opposed to nanotech used on foods
- Action Group on Erosion, Technology, and Concentration (ETC) wants a protocol before nano is used in agriculture

ETC

- “the merger of nanotech and biotech has unknown consequences for health, biodiversity and the environment”
- We don't know how nanoparticles will affect us.
- Nanoparticles in food means heavy, consistent consumption of them

Nanoscopic Dimensions

Cellular

Microbial

Atomic

Molecular

Nanoscopic

Viral

American Gothic: The Art Institute of Chicago,
http://www.artic.edu/artaccess/AA_Modern/pages/MOD_5.shtml#

tshirt: Mike's Digital Laboratory
<http://www.mikeaxelrod.com/archives/tshirt.gif>

Cotton_Ball: Alibaba
http://img.alibaba.com/photo/50016446/Cotton_Ball.jpg

plastic roll 1: Team Logistics Corporation
<http://www.teamlogisticscorp.com/tlog114.htm>

News Item: Down on the Farm
http://www.etcgroup.org/documents/ETC_DOTFarm2004.pdf

Photo Credits

Nanoscopic Dimensions

Cellular

Microbial

Atomic

Molecular

Nanoscopic

Viral

Electrospinning: Virginia Commonwealth University

<http://www.people.vcu.edu/~glbowlin/electrospinning.htm>

digital cotton: Environmental Health Perspectives

<http://ehp.niehs.nih.gov/members/2004/112-13/innovhead.jpg>

durethan wrap: Bayer

<http://www.research.bayer.com/medien/pages/2999/polyamides.pdf>

durethan: Bayer

<http://www.research.bayer.com/medien/pages/2999/polyamides.pdf>

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Nanoscopic Dimensions

Cellular

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http://ciencia.nasa.gov/headlines/y2004/images/nanosensors/nanoscopic_large.jpg

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http://www.dailytimes.com.pk/default.asp?page=story_5-9-2004_pg5_5

bacteria: Stetson University

<http://www.stetson.edu/~kwork/images/NS-BACTERIA.jpg>

fibers: Environmental Health Perspectives

<http://ehp.niehs.nih.gov/members/2004/112-13/innovations.html>

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