

Novel Applications of Nano-Technology

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by

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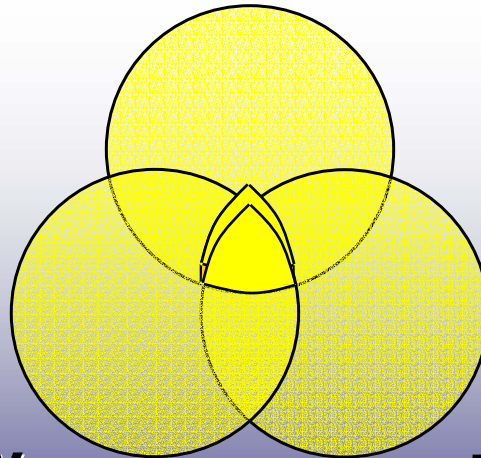
Common Theme

Applying *nanotechnology* to solve problems for mature industries with mass markets.

Combination of High Tech and Rust Belt

Nanotechnology

**Polymer
Chemistry**



**Precision
Engineering**

Nano-Technology and Everyday Life

- Apparel
- Buildings
- Medicine
- Bio-Protection
- Cosmetics
- Food and Beverage

Soane Labs, LLC

ZMS, LLC. Contact lens and precision optics

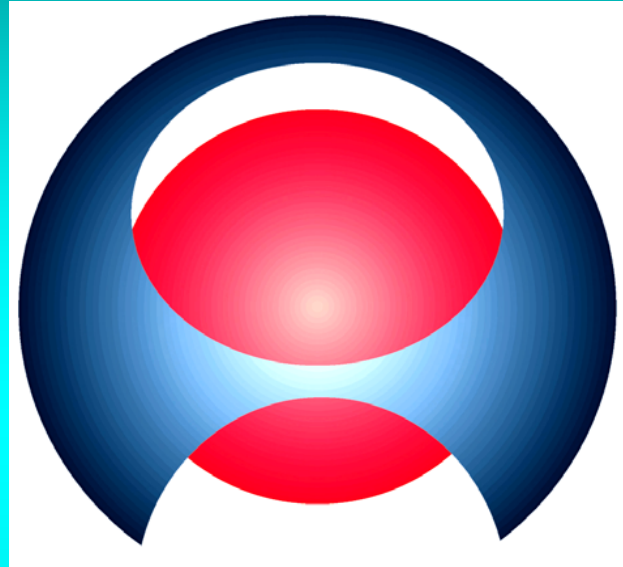
Alnis BioSciences, Inc. Engineered therapeutics and diagnostics

NanoTex, LLC. Nano-fabrics for easy care and daily wear

ICBM, LLC. Innovative Construction and Building Materials

Cosmetica, Inc. Personal care products

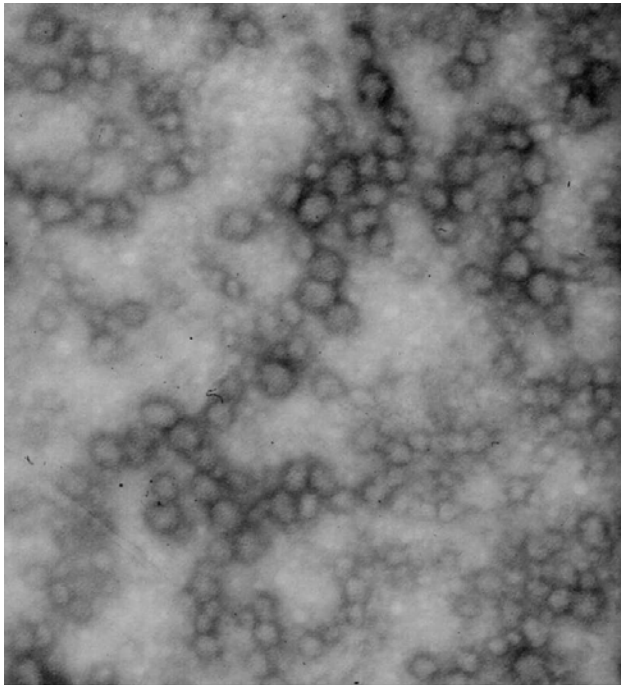
DuraFizz, LLC. Powdered beverages



Alnis BioSciences, Inc.
Engineered Therapeutics

Alnis BioSciences, Inc.

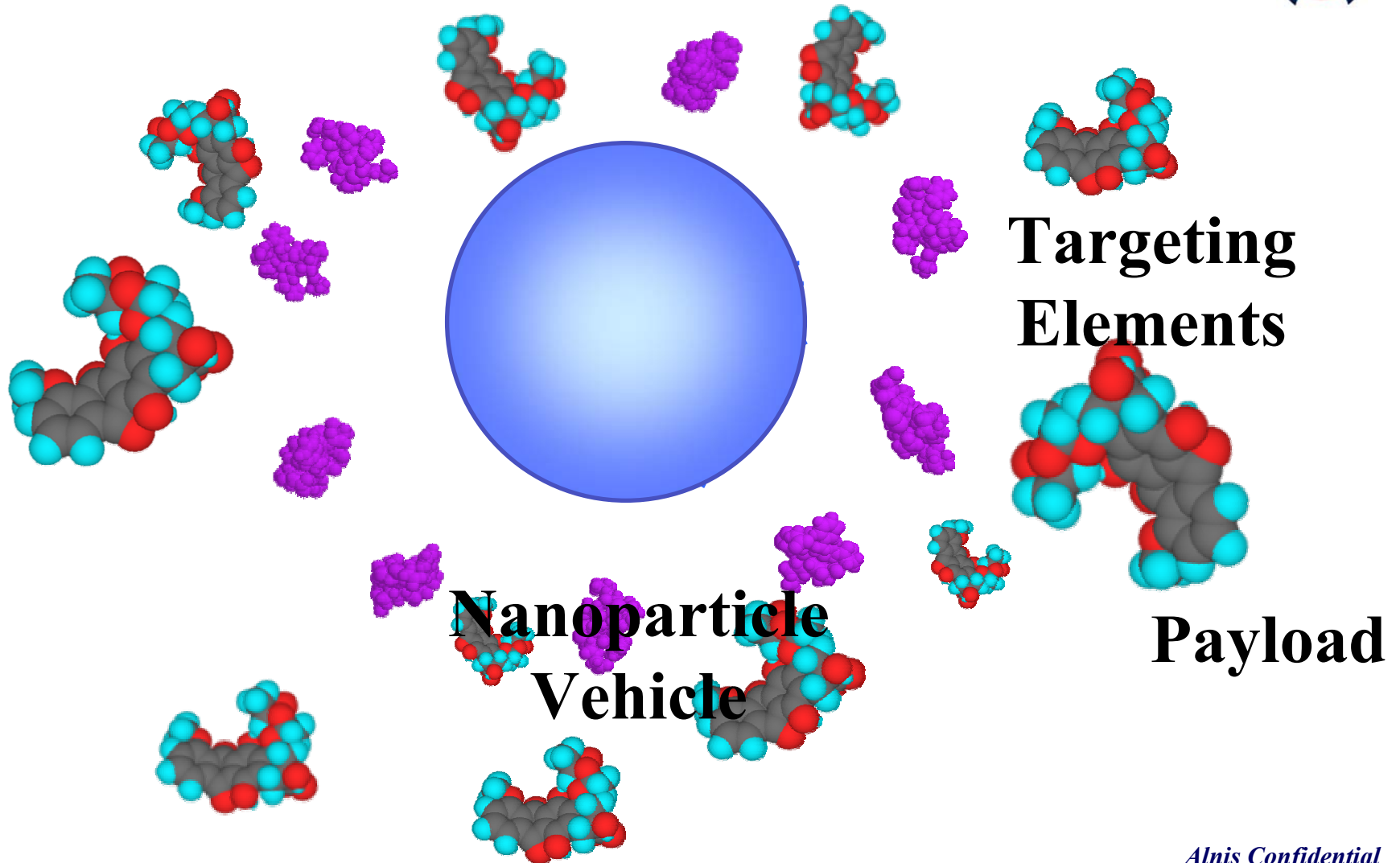
Alnis BioSciences



Multifunctional Nanoparticle Therapeutics Platform

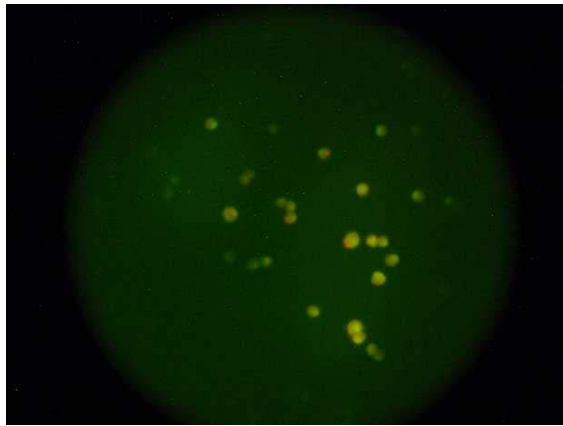
Poly-Functional Nanoparticles

Alnis BioSciences

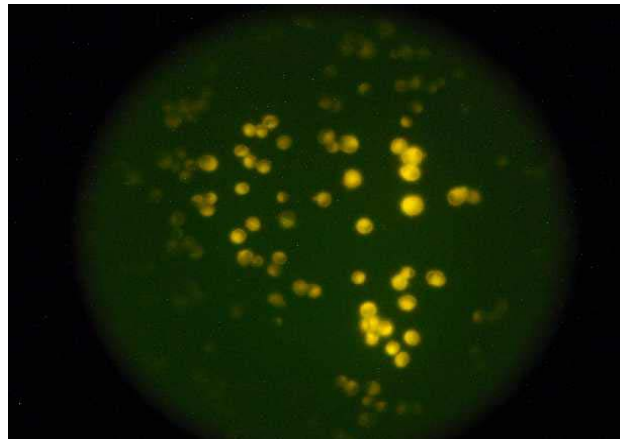


Cancer Cell Uptake of Dox-Loaded Hydrogel NPs

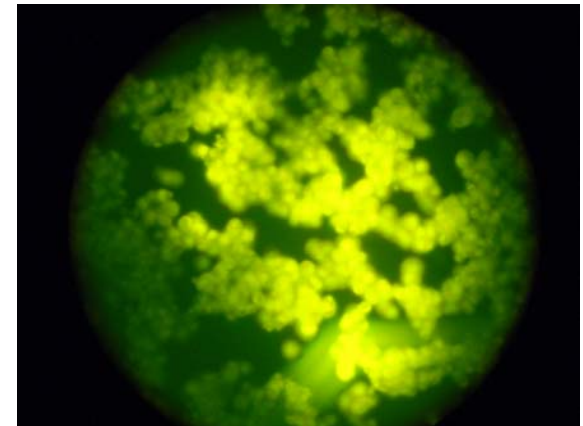
Alnis BioSciences



Dox



Dox-Dextran



Dox-Hydrogel NPs

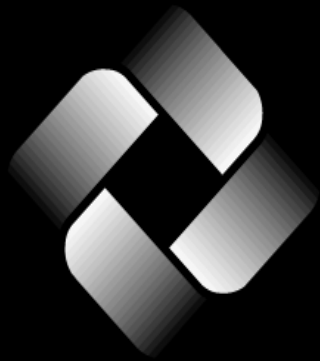
- ▶ **C-32 Skin Melanoma**
- ▶ **Dox at same concentration in all examples**

RGD-Dox NP Efficacy



- ▶ **No necrosis in Control, Doxil, and untargeted Dox-NP groups**
- ▶ **Massive central necrosis in RGD-Dox NP groups, especially those with large tumors**

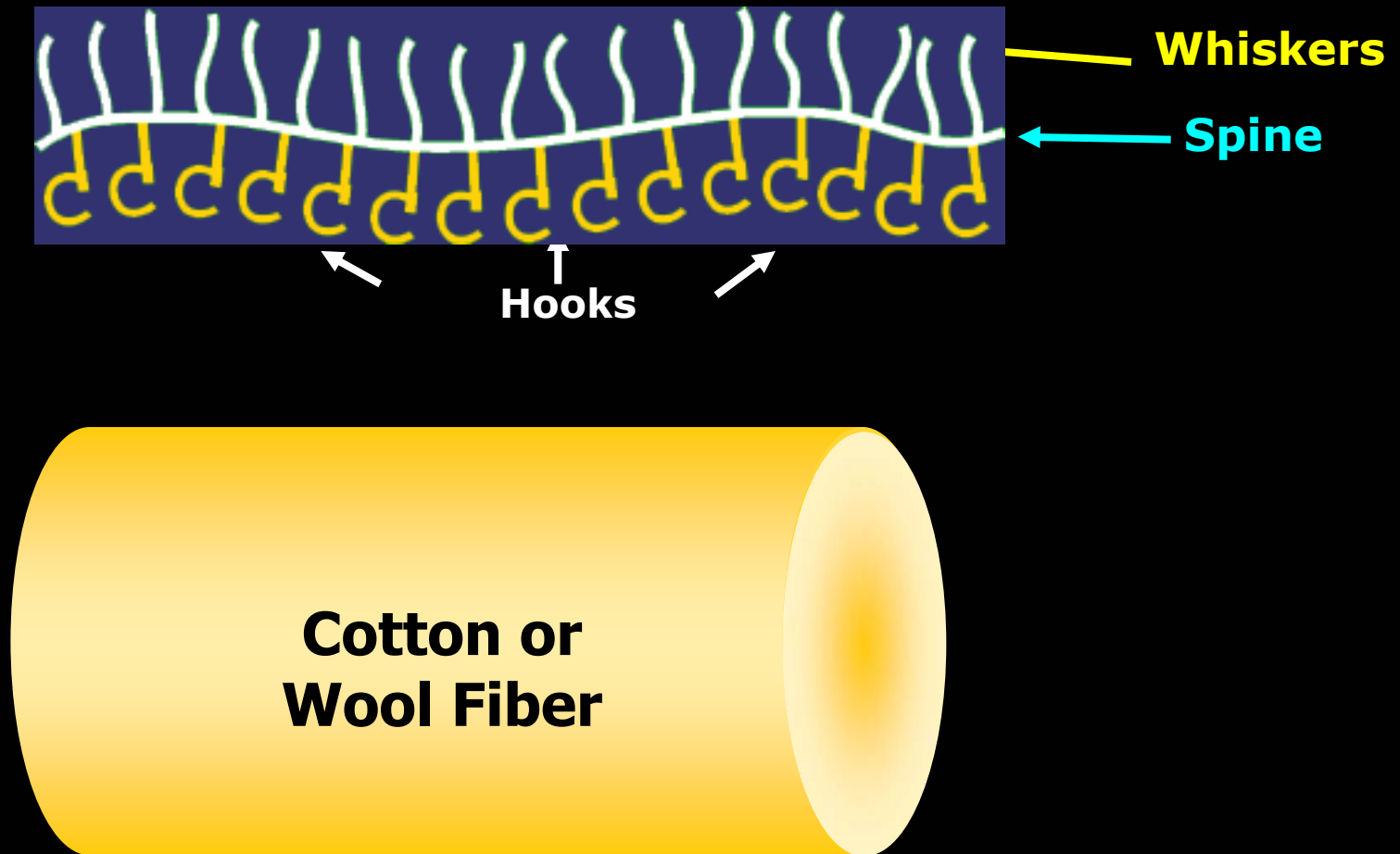




nano~tex™

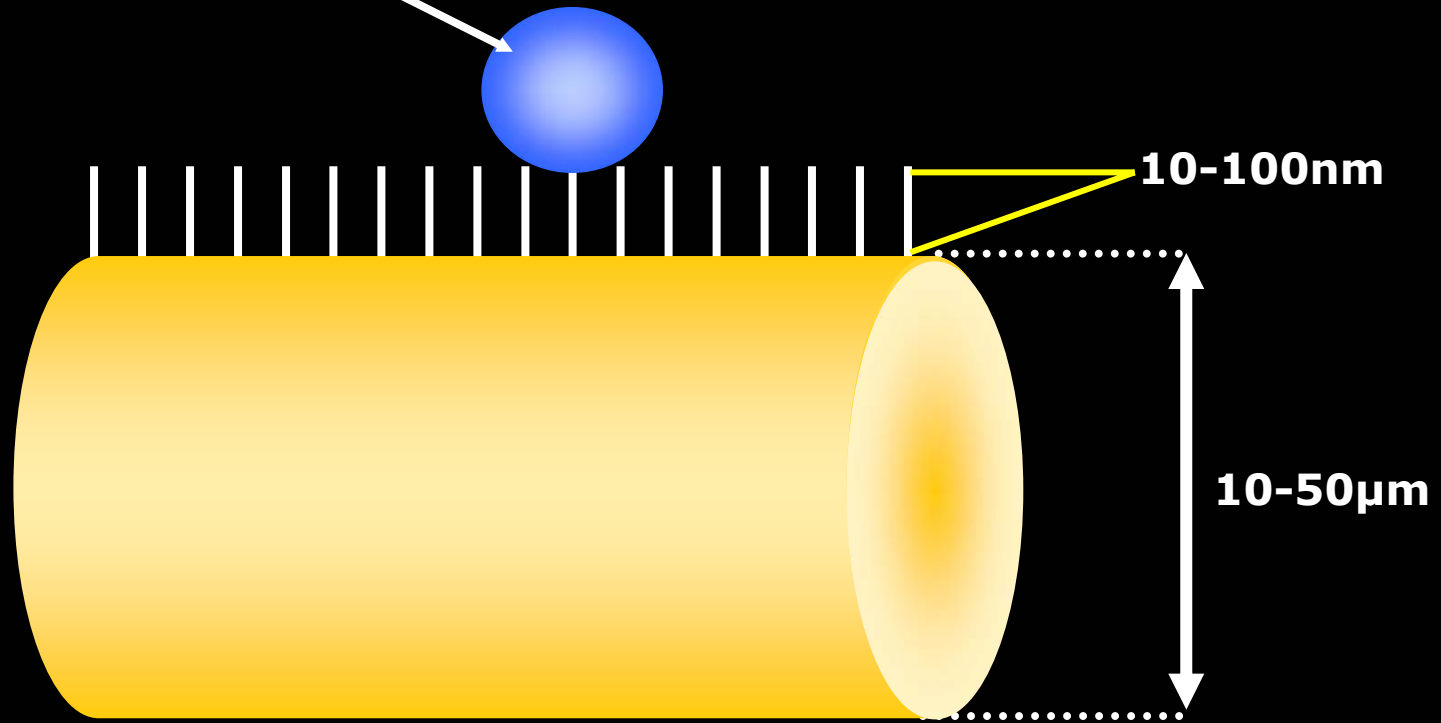
INTELLIGENT FABRICS. BETTER LIVING.

Nano-Whiskers™



Nano-Whiskers™

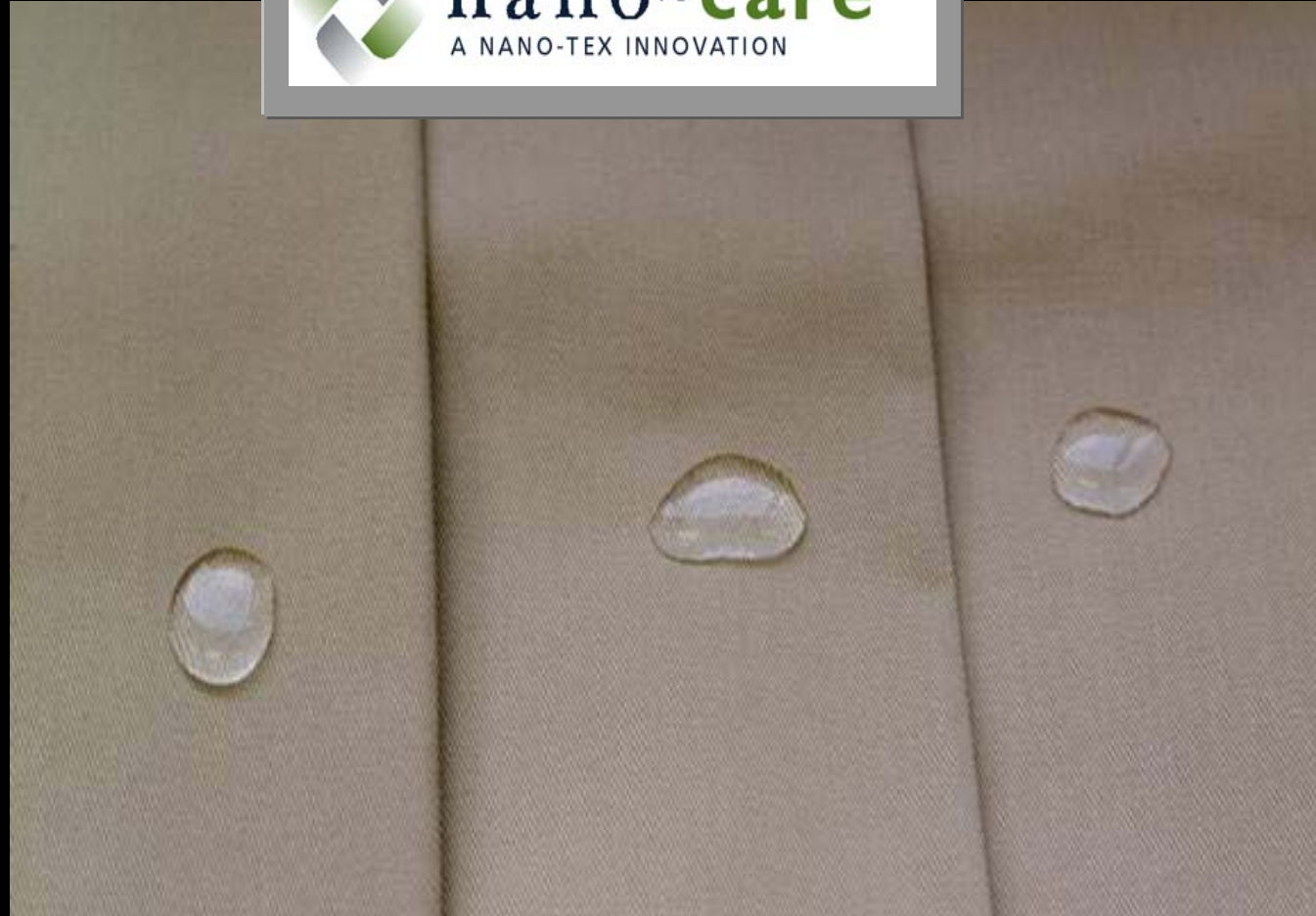
Water Droplet



Water Repellency - 100% Cotton



Untreated



New

20 Washings

50 Washings

Branding Today

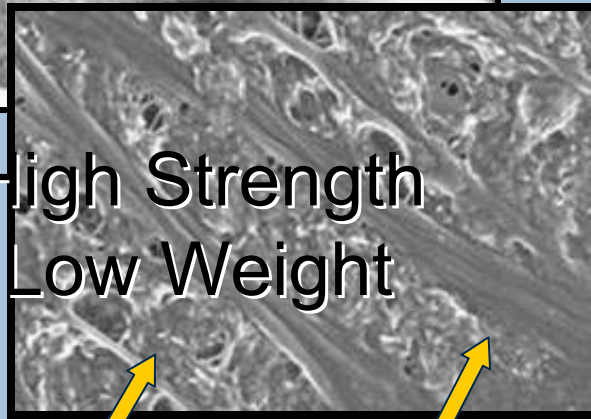
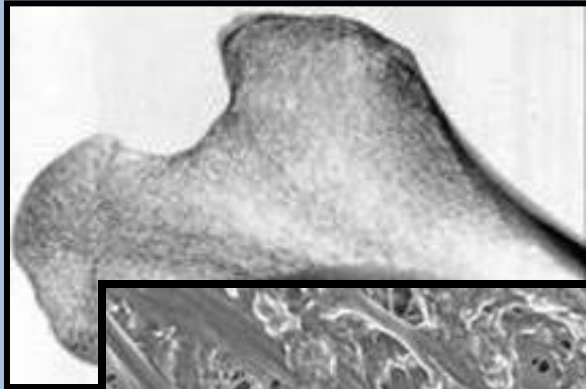


ICBM

Innovative Construction and Building Materials

Comparison of Structural Materials

Bone

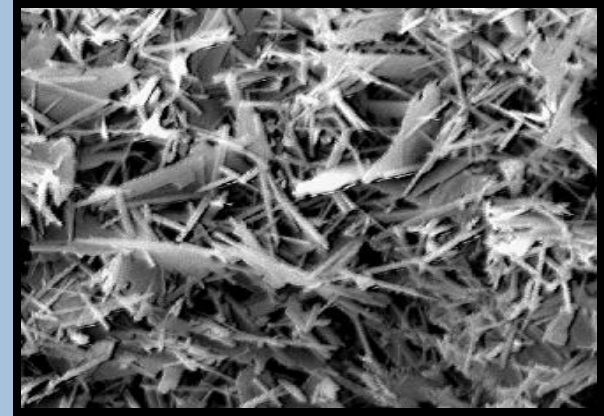
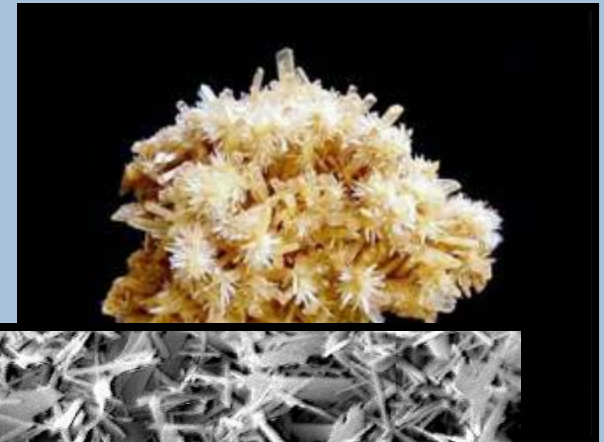


High Strength
Low Weight

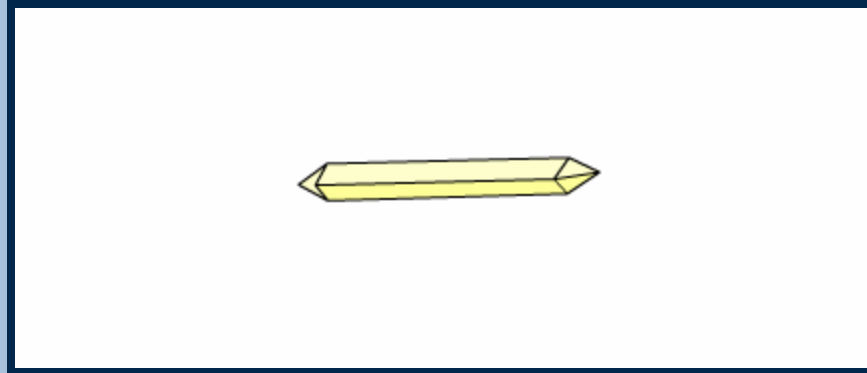


Inorganic/Organic Composite
Calcium Hydroxyapatite Collagen Fibril

Gypsum

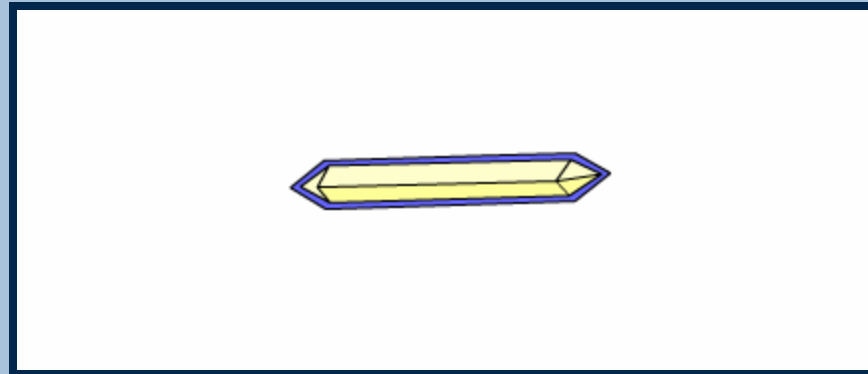


Brittle Inorganic Material



Chalk

Organic Reinforced Brittle Inorganic Material



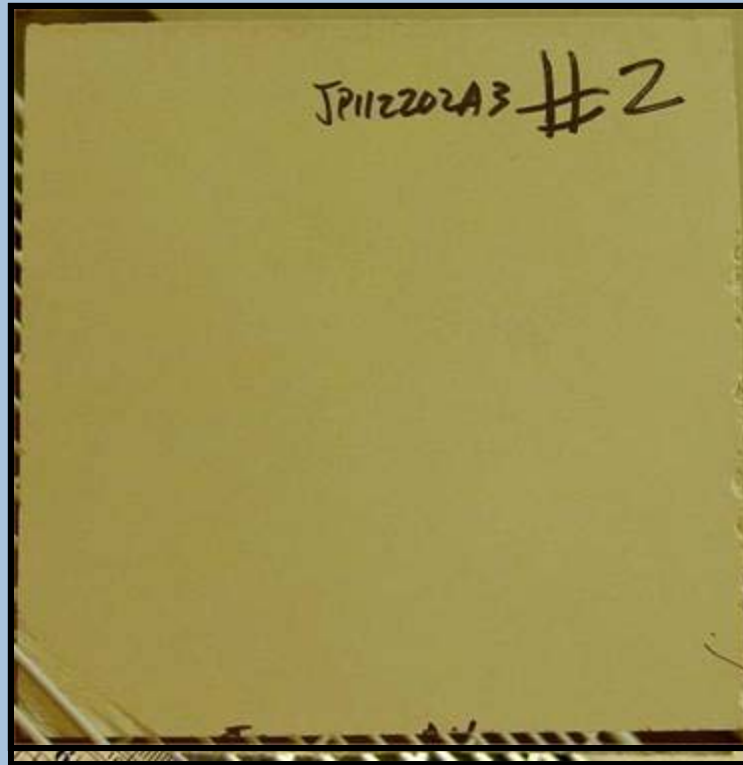
Chalk in Plastic Wrap

Mold Resistance

**Gen 4 Mold Resistant:
Starch, no paper: 24 days
42 days**

**US Gypsum:
7 days**

**Starch, no paper:
24 days**

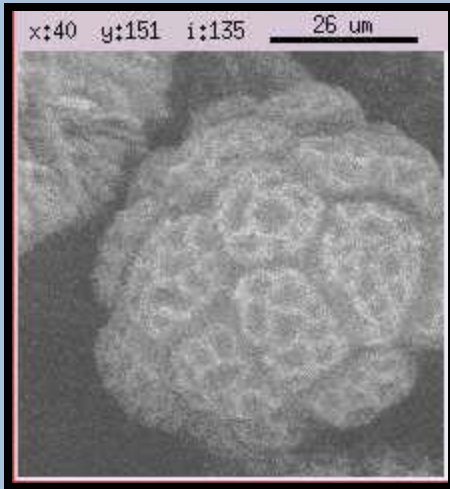


**National Gypsum:
7 days**

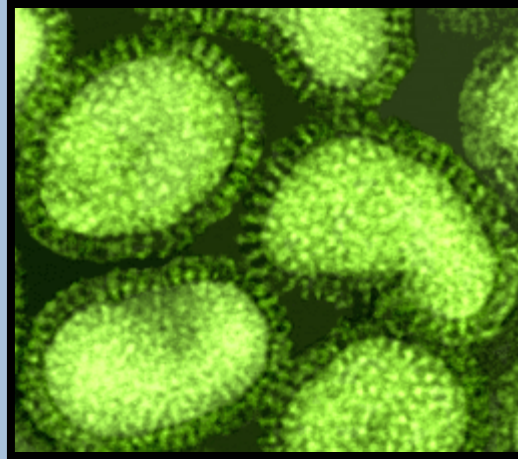
**Gen 4
Mold Resistant:
42 days**

**Novel Air Filters with Protective
Capabilities against a Broad Spectrum of
Pathogens and Toxic VOCs**

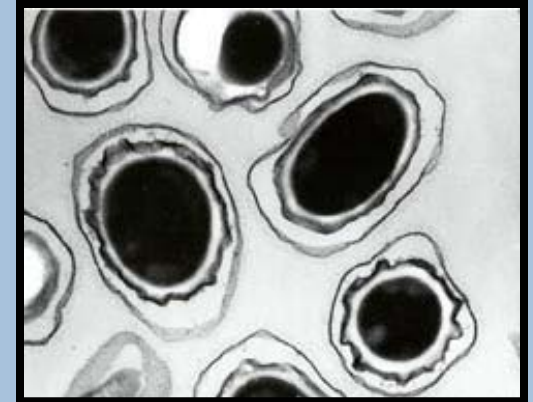
Spectrum of Pathogens



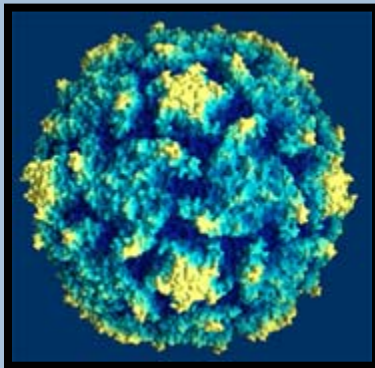
Mold spore
(10-100 microns)



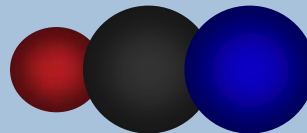
Influenza virus
(0.1 microns)



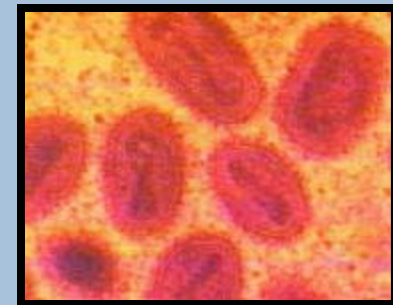
Anthrax spore
(0.2-0.3 microns)



Polio virus
(0.03 microns)



Cyanide gas
(0.0002 microns)



Smallpox
(0.2 microns)

Cosmetica Inc.
personal care products

Commercial Hair Dyes

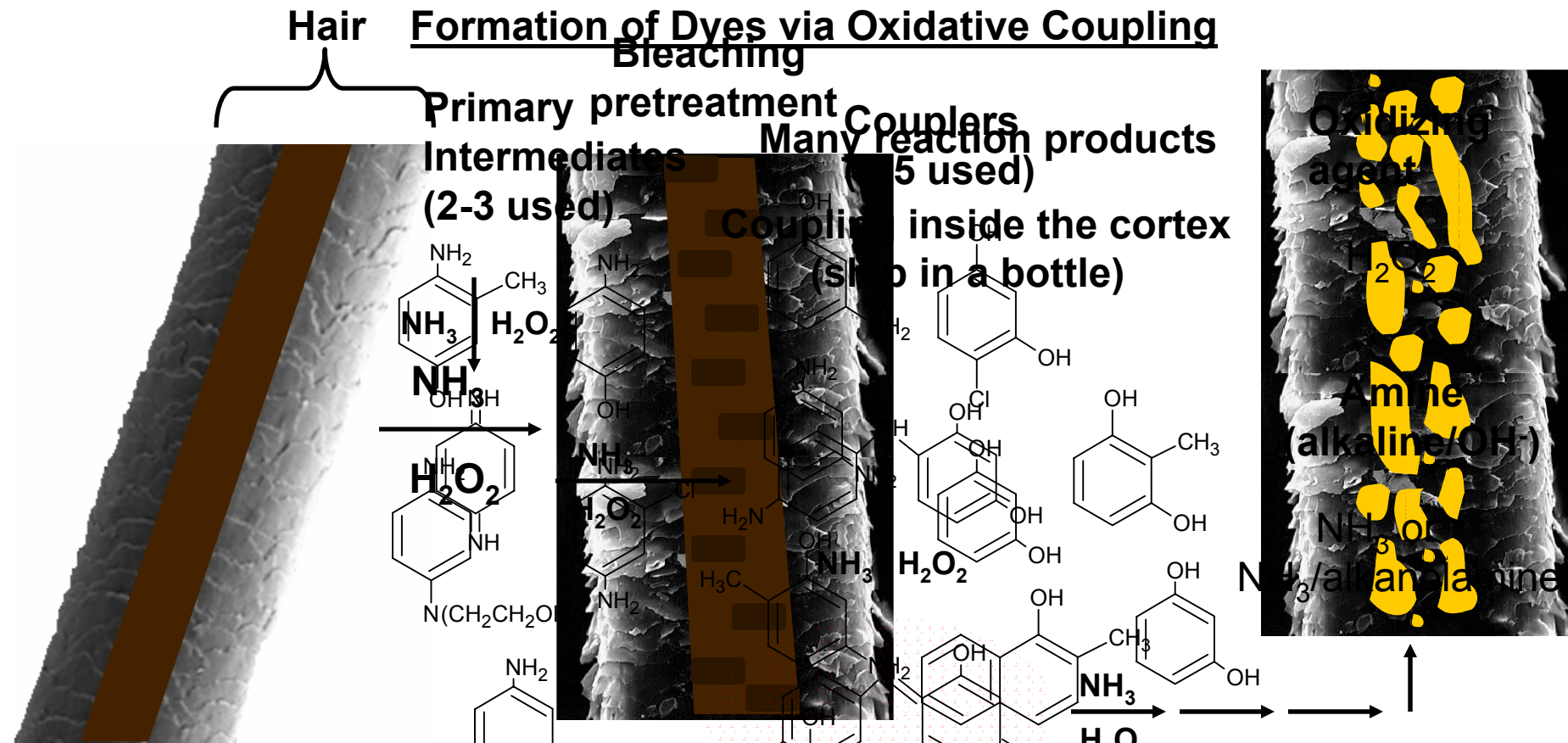
Consumer Perceptions

- Extensive hair damage; drying; weakening; split ends
- Foul odor; chemical treatment; burning; irritation; gloves
- Time consuming; tedious; expensive
- Permanent and irreversible; cannot change color
- Reluctant necessity

Q: Why use these products?

A: There are no viable alternatives

Permanent Hair Dyes: Chemistry



Severe structural damage

Destruction of melanin

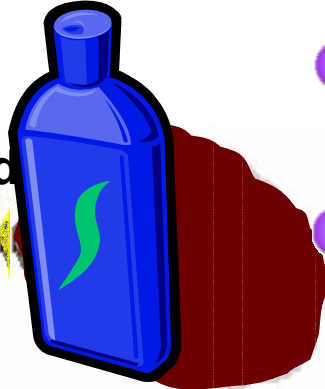
2-3 primary intermediates + 5-5 couplers in each commercial dye

Mequinol (natural pigment) → a variety of new chemicals are formed

in the cortex only

Some potential toxins/carcinogens; long-term effects largely unknown

Cosmetica Hair Dyes



● All chemistry is performed off-line

● Safe and easy to use
 no hair damage
 no exposure to toxic chemicals
 environmentally friendly

● Completely reversible
 color can be changed at will

● Conditioning and strengthening
 colored and colorless

● Scented, fixative, etc. (if desired)
 or suspension

● Original hair restored
 after multiple treatments



Nano-Technology and Everyday Life

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- Buildings
- Medicine
- Bio-Protection
- Cosmetics
- Food and Beverage
- ???