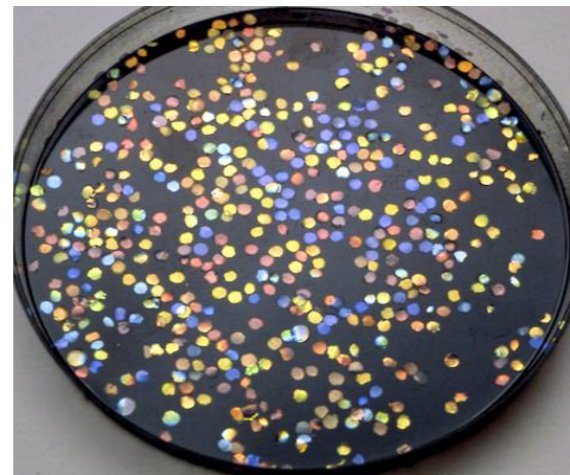
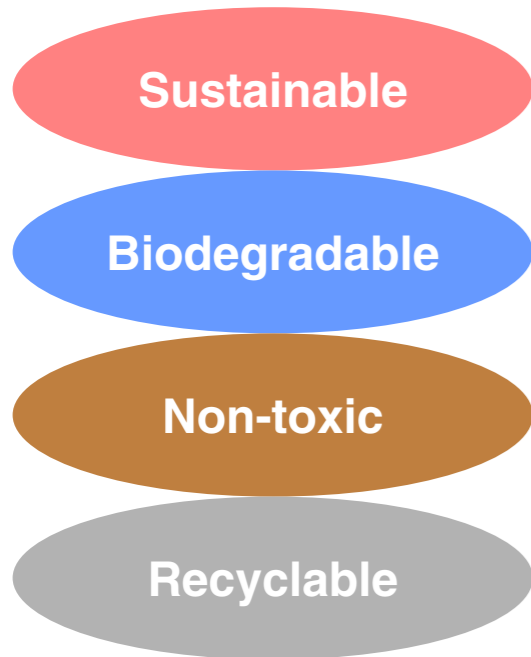




NCC – “Green” Nanoparticles

Anticipated applications

- Reinforced polymers
- High-strength spun fibres and textiles
- Advanced composite materials
- Films for barrier and other properties
- Additive for coatings, paints, lacquers and adhesives
- Switchable optical devices
- Pharmaceuticals and drug delivery
- Bone replacement and tooth repair
- Improved paper, packaging and building products
- Additive for foods, cosmetics
- Aerospace and transportation



Confetti-sized discs of chiral nematic cellulose film

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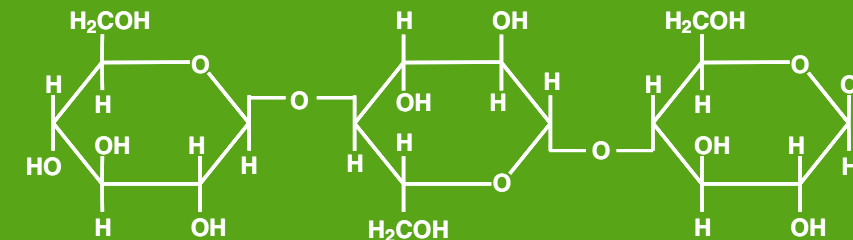


NanoCrystalline Cellulose

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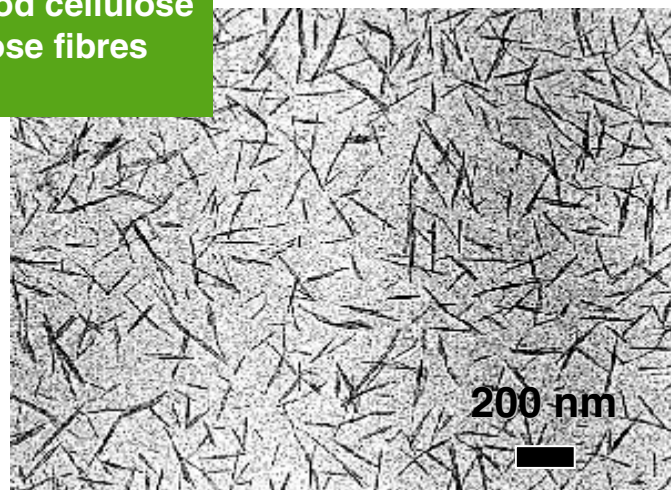


NanoCrystalline Cellulose



What is it?

- Fundamental physical building block of wood cellulose
- Obtained from crystalline regions in cellulose fibres
- Uniform, redispersible natural nanoparticle



What are its properties?

- Typical crystallite is 200nm long and 10nm wide
- Has unique optical, electrical, magnetic and strength properties
- Forms stable suspensions which self-assemble into oriented films upon drying



1% NCC in solution



7% NCC gel



100% NCC powder

Properties of Cellulose Nanofibrils Relative to Metallic and Polymeric Materials		
MATERIAL	Tensile Strength (MPa)	Elasticity Modulus (GPa)
Cellulose nanofibrils	10 000	150
302 stainless steel	1280	210
Aluminium alloys 380 and LM6	330	71
Zirconia	240	150
Aluminium with 20% particulate SiC	593	121
Low-density polyethylene	9	0.25
Nylon 6/6 30% glass-filled	186	9
0/90/ ±45 carbon in epoxy	503	65

How is it made?

- Cellulose is milled, then hydrolyzed to remove amorphous regions
- NanoCrystalline Cellulose (NCC) is separated and concentrated
- Can be treated chemically to customize for many uses

FPIinnovations scientists working at McGill University have been using NCC in gram quantities for optical applications in the laboratory for 10 years.



FPIinnovations engineers have recently developed pilot plant procedures to produce NCC in kilogram quantities.



Plans for industrial production

- Working with NORAM Engineering to design a 1 ton/day facility
- Expected to be operational within 1 year

NORAM
Engineering and Constructors Ltd.



NanoCrystalline Cellulose will be a cost-effective nanoparticle available from an abundant renewable resource – Canadian forests.