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Technology and Sustainability: Contributing to the Future of Fabrics

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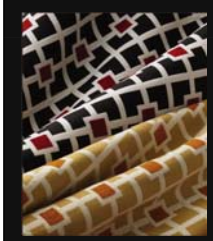
Chemical Fabric

- Definition: A polymeric material in a sheet form attached to a fabric.

- CFFA



Quad
ArcCom Image
www.arc-com.com

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Three types of chemical fabrics

1. Solid
2. Woven
3. Coated

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Chemical fabrics

Solid	Woven	Coating
-Vinyl	-Polyester	-Vinyl
-Polyurethane	-Xorel: polyethylene	-Polyurethane
-Polyester	-Nylon	-Polyester
	-Viscose/Rayon	-Crypton/ Incase
		-Nanotechnology
		-Silver technology
		-Teflon

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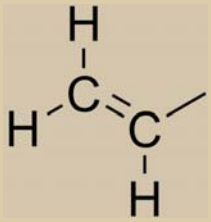
Vinyl

Vinyl – (PVC) a thermoplastic polymer constructed of repeating vinyl groups such as ethenyls having one hydrogen replaced by chloride.

- Plasticizers transform PVC to a soft, flexible material



-Chemical structure of the Vinyl Group
http://en.wikipedia.org/wiki/File:Vinyl_group.png

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Vinyl

Vinyl

- Two types: stretch and patent
- Patent Vinyl has little to no stretch properties
- Stretch vinyl – 2 way and 4 way stretch properties, best used in clothing
- Generally fused with other fabrics such as cotton and polyester to reinforce and add resistance to moisture
- Versatile

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Vinyl

Make Vinyl feel welcome

"Punch him in the nose the minute he comes through the door. Spill a Bloody Mary on him. Get him with a pie in the face. Smear chocolate on his chest. Kick him around."

- Naugahyde

Properties

- Durable
- Waterproof
- Weather or heat resistant
- Flame resistant
- Low maintenance
- Wide variety of color, pattern & texture options
- Affordable
- Rigid or flexible

Nauga Doll
http://www.nauga.com/promoitems_nauga.html

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Vinyl

Application

- Construction
- Clothing
- Electric wires
- Pipes
- Signs
- Trim
- Ceiling tiles
- Upholstery
- Automotive

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Vinyl

Aesthetic capabilities of vinyl fabrics

-Faux leather

-Printed

-Embossed

-(u)phoria printed vinyl
www.morbern.com/uphoria.php

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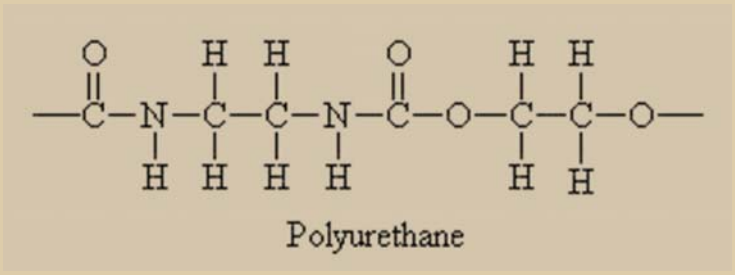
Polyurethane

Polyurethane: Any of various polymers that contain NHCOO linkages. Formed by reacting a polyol (an alcohol with more than 2 reactive hydroxyl groups per molecule) with a diisocyanate or a polymeric isocyanate



Polyurethane chemical structure
http://dwb4.unl.edu/Chem/CHEM869E/CHEM869ELinks/qlink.queensu.ca/~6jrt/chem210/Page5.html

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Polyurethane

Properties

- Resilient
- Flexible or rigid
- Durable
- Waterproof
- Abrasion resistant
- Aesthetically provides the most realistic faux leather look; soft hand, natural drape, multitude of color options

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Polyurethane

Application

Industry

- Flexible foam
- Rigid foam
- Thermoplastic polyurethane (highly elastic, flexible & resistant to abrasion, impact and weather. Can be colored or fabricated in a wide variety of methods)
- Coatings, adhesives, sealants and elastomers

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Polyurethane

Consumers

- Apparel – can be made into fine threads, can be combined with nylon to make lightweight stretchable garments.
- Appliance
- Automotive
- Building & construction
- Coatings, adhesives, sealants, elastomers
- Composite wood
- Electronics
- Flooring
- Furnishings
- Marine
- Medical
- Packaging

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Polyurethane

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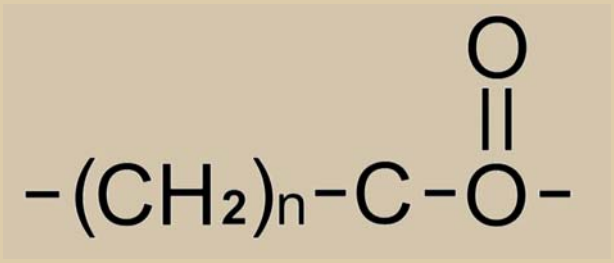
Polyester

Polyester: Polymer containing the ester functional group in their main chain.

- Includes naturally occurring chemicals
- Includes synthetics through step-growth polymerization
- Can be thermoplastic (more commonly used) or thermoset



Polyester chemical structure
http://commons.wikimedia.org/wiki/File:Polyester_chemical_structure.PNG

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Polyester

Properties

- Inexpensive
- Strength and resilience
- Lightweight
- Hydrophobic
- High melting point
- Resistant to dyes, solvents, and most chemicals
- Stain resistant
- Resists stretching or shrinking
- Quick drying
- Wrinkle, mildew, and abrasion resistant

JSR1

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Polyester

Application

- Thermoplastic
  - Apparel
  - Home furnishings.
  - Tire reinforcements
  - Conveyor belts
  - Safety belts
  - Coated fabrics and plastic reinforcements with high energy absorption.
  - Cushioning
  - Insulation material in pillows, comforters & upholstery

JSR3

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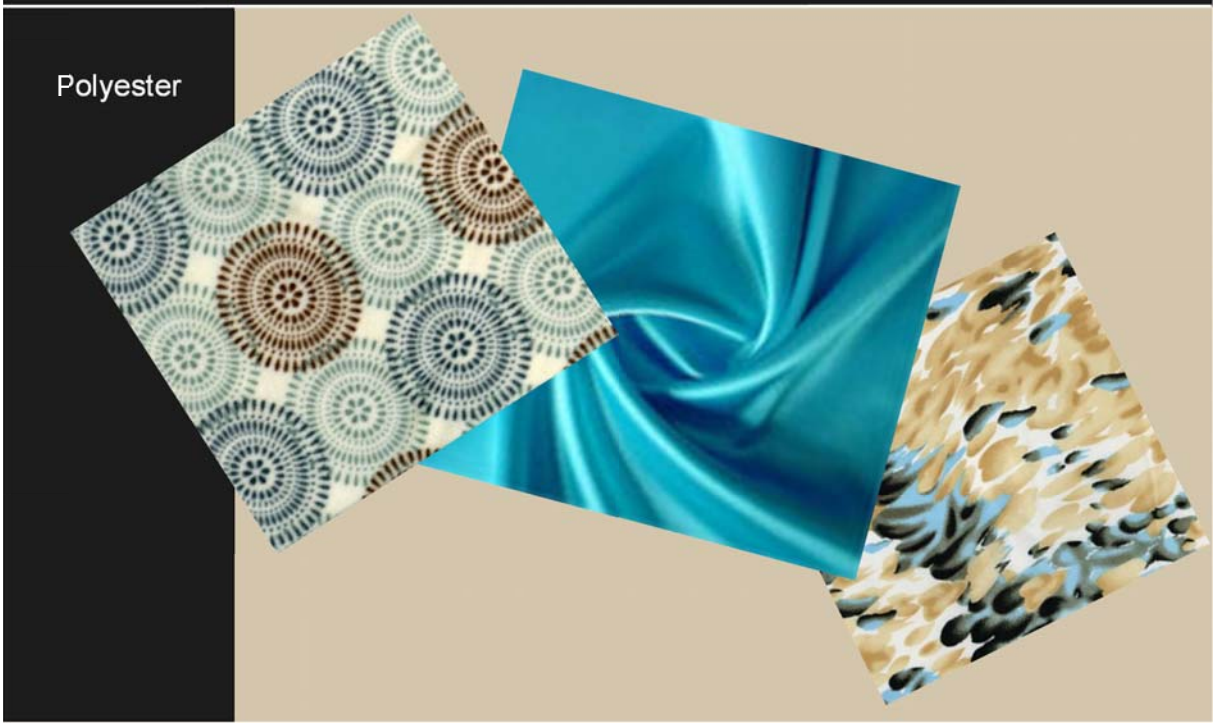

Slide 18

JSR3 Anjana, 9/23/2011

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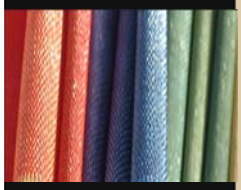
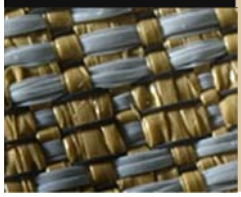
XOREL





- Xorel yarn is a 100% continuous monofilament of polyethelene.
  - Durable
  - Cleanable
  - Colorfast
  - Flame retardant
  - Anti-bacterial
  - Permanent properties of yarn
- Woven product

Xorel
http://www.carnegiefabrics.com/Xorel.aspx

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XOREL

Lily Embroider
www.carnegiefabrics.com

Application

Backing options

- No backing - upholstered walls, and panels (no glue down)
- Paper backed - for direct application wallcovering
- Acrylic backed - for upholstery

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XOREL

Application

- Directly applied wallcovering
- Wrapped panel
- Upholstery



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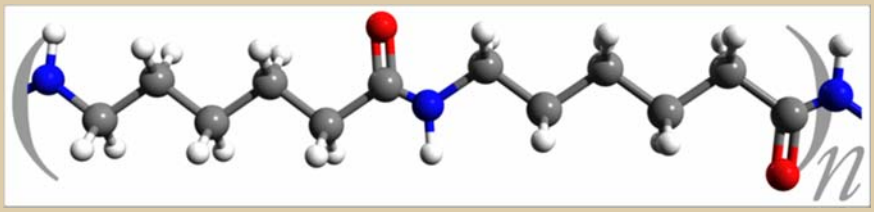
Nylon

Nylon: Nylon is a synthetic polymer known generically as polyamides.



Nylon chemical structure
http://en.wikipedia.org/wiki/File:Nylon_3D.png

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Nylon

Nylon

- First produced in 1935 by Wallace Carothers at Dupont.
- A thermoplastic
- First used as a nylon-bristled toothbrush followed by women's stockings.
- First commercial successful synthetic polymer.
- Intended to be a synthetic replacement for silk.
- Replaced silk in military applications when silk became scarce during WWII, such as parachutes and flak vests.
- Was also used in many types of vehicle tires.

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Nylon

Properties

- Inexpensive
- Superior strength and elastic
- Lightweight
- Easy to wash
- Dries quick
- Retains shape
- Responsive and resilient
- Relatively resistant to heat UV rays and chemicals

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Nylon

ArcCom: Salsa

ArcCom: Grand Central

Applications

- Stockings
- Apparel
- Draperies, cubicles, & drapery
- Life vests
- Tire reinforcements
- Luggage
- Netting
- Carpet fibers (broadloom & tile)

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Viscose/Rayon

Wood pulp

Viscose fibers

Viscose/Rayon: a manufactured regenerated cellulose fiber.

- Cellulose fiber: wood or cotton pulp
- Produced from naturally occurring polymers
- Neither truly synthetic fiber nor a natural fiber.
- It is a semi-synthetic fiber
- Generally a high luster fabric
- Also known by the names:
  - Viscose rayon
  - Art silk

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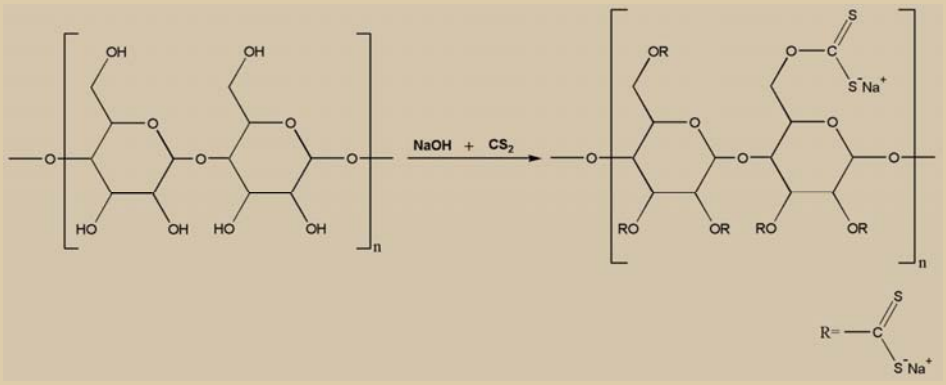
Viscose/Rayon

Viscose/Rayon: Cellulose treated with alkali and carbon disulfide to yield viscose



Rayon Synthesis
http://en.wikipedia.org/wiki/Rayon

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Viscose/Rayon

Properties

- Light weight
- Inexpensive
- Drapes well
- Imitates feel and texture of silk, wool, cotton and linen
- Easily dyed in a wide range of colors
- Soft and smooth
- Cool, breathable and comfortable
- Highly absorbent
- Does not insulate body heat

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Viscose/Rayon

Embroidery thread

Rayon Corduroy

Rayon Velvet

Rayon Silk

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Advances in Technology: Predominantly Focuses on Coatings

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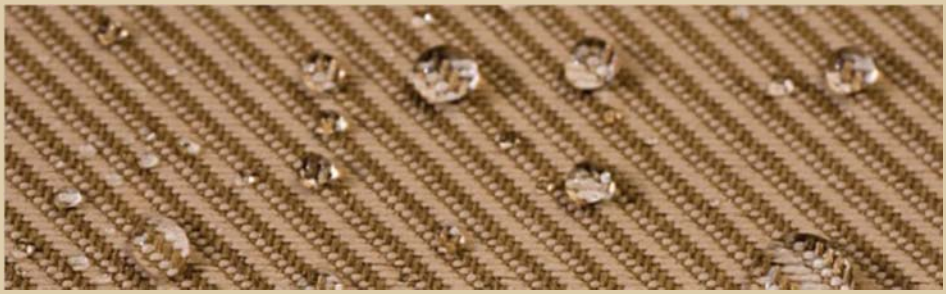
Crypton

Crypton: A chemical coating applied to fabric to provide stain, moisture, mildew, bacteria and odor resistant protection.



Crypton
http://www.cryptonfabric.com/waterproof-fabrics-durable.html

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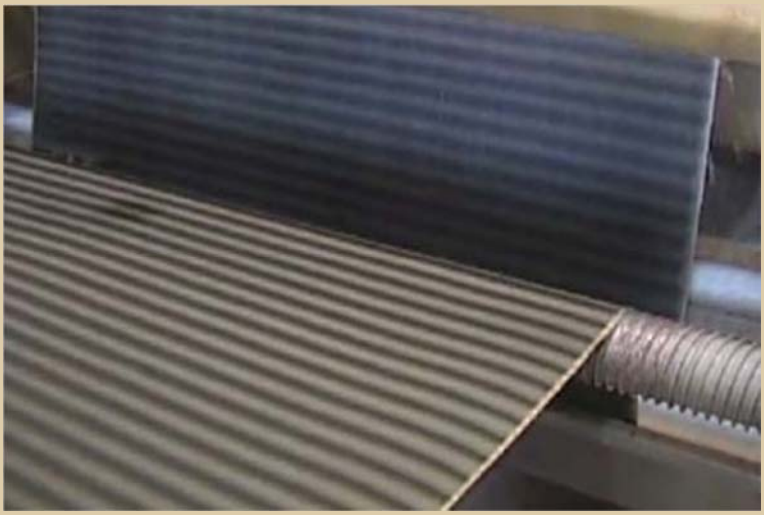
Crypton

Crypton Process



1. Immersion process

Crypton
http://www.cryptonfabric.com/technology-in-textiles.html

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Crypton

Crypton Process

2. Roller process

Crypton
http://www.cryptonfabric.com/technology-in-textiles.html

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Crypton

Crypton Process

3. Heat set

Crypton
http://www.cryptonfabric.com/technology-in-textiles.html

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Crypton

Crypton Process

4. Moisture barrier applied

Crypton
http://www.cryptonfabric.com/technology-in-textiles.html

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Crypton

Application

Crypton
http://www.cryptonfabric.com/commercial-fabric-products/

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Incase
(Crypton brand)

Incase: "Evergreen Technology": InCase is a chemical finish for fabrics that provide spill, stain, odor, and microbial growth (silver Ion technology) resistant properties without moisture barrier.

CF Stinson
Freehand & Arc
www..cfstinson.com

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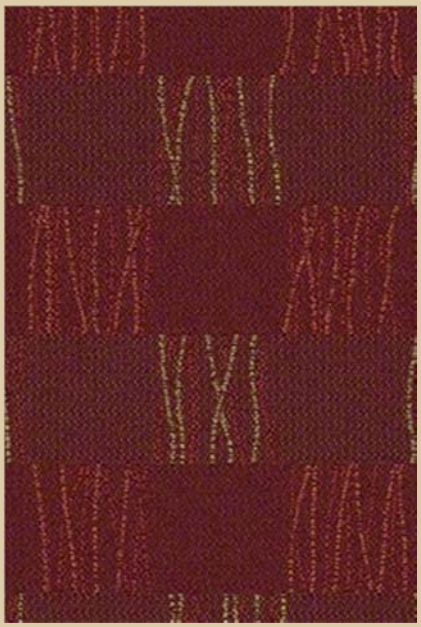
Incase
(Crypton brand)

Application

- Cubicle curtains
- Draperies
- Task seating
- Top of bed and panel fabrics



CF Stinson
Freehand
www..cfstinson.com

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Nanotechnology

Nanotechnology: science that manipulates actual molecules and atoms that make up our world.

- The properties of these molecules change in their smaller forms can become:
  - Stronger,
  - Lighter, or
  - More reactive
- Allows for a range of different uses versus when in larger form

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Nanotechnology

Application

- Computing
- Construction
- Cosmetics & sunscreen
- Energy
- Paints & coatings
- **Textiles & clothing**
- Electronics
- Food & drink
- Medical
- Packaging
- Sports & leisure
- Transport

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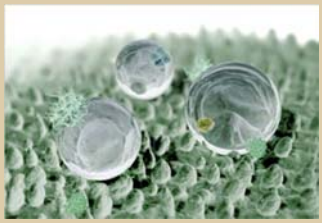
Nanotechnology

Nanotechnology in textiles

- Used mainly to provide stain resistance or anti-bacterial properties
- Creates “lotus effect” to repel water



- Provides anti-bacterial properties with silver nanoparticles
- Silver particles can either be incorporated into fibers or added as a coating to fabrics

Images: http://www.nanoandme.org/nano-products/textiles-and-clothing/

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Silver Technology

Silver Technology: AKA Silver Nano™, is a trademark name of an antibacterial technology.

- Naturally toxic to some bacteria, viruses, algae and fungi without being toxic to humans
- Germicidal effects kill many microbial organisms in vitro
- Water, wine & vinegar: Phoenicians
- Silver coins; 20th century

Milk bottles

Bandages

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Silver Technology

agion

AG Technologies

Silver Nano™ in Textiles: Silver is incorporated into textiles to help reduce odor causing bacteria. Silver ions attack microbes and inhibit their growth in three ways:

- Prevents respiration by inhibiting transport function in the cell wall
- Inhibits cell division (reproduction)
- Disrupts cell metabolism
- However; however direct impact on Infection Control has not been proven out through research

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Teflon

Teflon®: Is polytetrafluoroethylene (PTFE). PTFE is a synthetic fluoropolymer of tetrafluoroethylene. Teflon is the brand name for PTFE by DuPont.

- A thermoplastic polymer
- Coefficient of friction is .05 to .10, which is the third lowest of any solid material
- Heat resistant (withstand high level of heat)
- Made of a carbon backbone chain with each carbon attached with 2 fluorine atoms
- Slippery, non-corrosive and chemically stable making it useful in many industries

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Teflon

Cookware


Apparel

Application

- Cookware products
- Apparel & accessories
- Contract & technical fabrics
- Home & garden products
- Paint products & accessories
- Personal care products
- Recreation products
- Transportation products

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Teflon

Teflon® Fabric Protector:

- Fends off soil, stains, and spills on wool, cotton, and blends
  - Without impacting weight, look, feel, color or breathability
- Helps repel and release stains
- Reduces need for laundering

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Sustainability Characteristics & Selection of Product

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Environmental Innovations

Environmental innovations: Providing protection without compromising health, safety and the environment.

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Environmental innovations

Ebb & Flow
Anzea
www.anzea.com

Biomimicry Approach to Coatings

Greenshield® By BigSky Technologies, LLC is an example of combining technologies to creating effective stain-resistant, water-based fabric finish.

Combines the following to provide stain, water, and bacteria resistant finish:

- Nanotechnology
- Silver technology
- Reduced fluorocarbons (SCS Low Fluorocarbon Treatment third party certified)

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Environmental Innovations

Recycling & Take Back Programs

- Xorel® responsible return program
  - Will take back any material removed from a project for reuse or
  - Shipment to a Waste to Energy Facility
- Interface & Tandus
  - Recovering vinyl backed carpet and other products for recycled backing

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Environmental innovations

Recycling & Take Back Programs

- LSI: Second Look® Recycled Wallcovering
- Manufactured with 20% recycled content (minimum of 10% post-consumer material)
- Take back program including containers for shipping
- Utilizes wallcovering as well as vinyl base for recycled content

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Environmental Innovations

Manufacturers sustainably moving beyond production:

- Evaluating alternative energy sources; such as solar
- Recycling all packaging, pallets, etc. within manufacturing process
- Third party certifications & life cycle analysis
- Establishing habitats and eco-systems near their manufacturing operations
- Partnering with other manufacturers to utilize scraps as feedstocks for other products
- Off-sets for traveling employees

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Sustainable Product Selection

Manufacturers

Rating Systems, Standards, Codes, & Third Party Certifications

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Sustainable Product Selection

Selection of Products

- Moving away from single attribute evaluation: VOCs, recycled content, etc. (consistent with Green Globes® & LEED® 2012 building rating systems: Materials & Resource)
- Inappropriate to go with “de-selection” methodology
  - Often not evidenced based (‘marketing agent’)
  - May result in selecting inappropriate product
  - May result in more environmental impact
- Go to multiple-attribute evaluation & life cycle analysis approach

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Sustainable Product Selection

NSF

NSF Standards

- NSF is an ANSI Approved Standard Development Organization
- NSF is an EPA Licensed Certification Body (such as Water Sense™)
- NSF/ANSI 140 Sustainable Carpet Standard
- NSF/ANSI 332 Sustainability Assessment for Resilient Floor Coverings
- NSF/ANSI 342 Sustainability Assessment for Wallcovering Products
- ANSI/BIFMA e3-2010 Furniture Sustainability Standard

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Sustainable Product Selection

NSF

Draft NSF Standards

- Draft NSF 336 Sustainable Commercial Furnishings Fabric Assessment
- Draft NSF 347 Sustainability Assessment for Single Ply Roofing
- Draft NSF 373 Sustainability Assessment for Dimension Stone
- Draft NSF/GCI 355 Greener Chemicals & Processes Information (American Chemical Society)
- Draft NSF 391 Sustainability Assessment for Service Providers (GSA)

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Sustainable Product Selection

Environmental Product Declarations (EPD®s)

- Provide relevant, verified and comparable environmental data
- Product, system or service
- Based upon ISO 14025 & Life Cycle Assessment
- Environmental impacts
  - Raw Material/Feedstock acquisition
  - Energy Use & Efficiency
  - Water Use & Efficiency
  - Waste Generation
  - Content

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Sustainable Product Selection

Environmental Product Declarations

- Voluntary process
- Verification & Registration
- Swedish Environmental Management Council: http://www.environdec.com/
- Example: Econyl Nylon Textile Filament

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Sustainable Product Selection

Environmental Product Declarations

- Example: RH Ambio Task Chair

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Sustainable Product Information & Organization

GreenFormat™

- CSI MasterFormat™
- Free to Designers
- Manufacturers pay to provide product information and utilize the format
- Provides not only product information, but also information on manufacturing practices
- www.greenformat.com

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Sustainable Product Information & Organization

Achieve Green

- For complete information and links to NSF, GreenFormat, and other LCA information, go to www.achievegreen.net

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FGI
FACILITY GUIDELINES INSTITUTE

Healthcare Architectural Details, Surfaces, & Furnishing Characteristics

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FGI
FACILITY GUIDELINES INSTITUTE

FGI Characteristics/Criteria:

- Easy to maintain, repair, clean
- No microbial growth
- Nonporous and smooth
- Has acoustic properties
- Inflammable (Class 1/Class A fire rating – low smoke toxicity)
- Durable

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FGI
FACILITY GUIDELINES INSTITUTE

FGI Characteristics/Criteria:

- Sustainable, cost effective (initial & life cycle)
- Seamless
- Resilient, impact resistant
- Controls reflectivity/glare
- Aesthetic appeal
- Non-toxic/ non-allergenic materials

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FGI
FACILITY GUIDELINES INSTITUTE

2014 *Guidelines for Design & Construction of Health Care Facilities*:

- What to anticipate?
- Impact on design?
- Sustainability?
- Current proposal period: www.fgiguidelines.net/proposals
- October 31, 2011

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Questions & Answers!

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Thank You!

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