BRANDING BIOBASED MATERIALS FOR CONSUMER PRODUCTS

Rodolfo Manzone, PhD
Managing Director, International Yulex Corporation
Guayule (Parthenium Argentatum)
Yulex Corporation is revolutionizing the rubber industry and renewable energy market through sustainable, guayule-based, allergy-friendly biomaterial solutions.

Guayule — a new botanical source of rubber and energy
Sustainably produced, agricultural-based biomaterials for eco- and health-friendly rubber and energy solutions.
Yulex At a Glance

SCIENCE
- Sustainable Guayule Agriculture
- Zero-Waste, Closed Loop Bioprocessing
- Materials Science

MATERIALS
- Biorubber Emulsions
- Biorubber Solids
- Biomass

APPLICATIONS
- Medical, Consumer, Industrial, & Bioenergy Products
A Sustainable Rubber Source

Guayule shrub used for over a century for rubber.....

1900: First commercial use in North America producing millions of pounds

1940: $75 million invested ($928M, in 2011 $) in 45,000 acres (WWII project)

2000: Yulex grows 3,500 acres to prove agronomy and economics

2003: Develops strong IP portfolio to protect company and customers

2006: Builds pilot plant to validate aqueous extraction process

2008: Semi-industrial facility (Ceres) online. Exam glove FDA approval

2010: Yulex develops first biobased closed cell foam to replace neoprene

2011: Commercial facility (Demeter) launched at Chandler, AZ

2012: Yulex Partners with Cooper Tire, USDA-ARS to develop 100% guayule rubber tires and biofuels

2013: Yulex signs first international license with Versalis, for european market
Guayule Agriculture & Crop Science

- Guayule is a perennial, non-food crop
- 1-2 years to first harvest, then annual harvests (variety dependent)
- Grows successfully in marginal land
- Low water usage compared with cotton/alfalfa (~ 6 acre ft./yr)
- 18+ Tons of Residual Dry Biomass/Acre
- Tremendous upside through Agroscience development activities
- Aligns with existing agronomic practices (automated)
- High output=1 Ton Rubber/Acre/Year, already equal to SE Asian rubber plantations (per acre basis)
Yulex Know-How
Efficiency & Automation

- Greenhouse for Field Planting
- Traditional Row Farming
- Mechanized Harvesting
- Harvest Unload
- Transportation & Delivery
- Guayule Ready for Process
- Automated Guayule Feed
- Yulex Processing Facility: Demeter
- Yulex Emulsions & Solid Rubber
Yulex’s Integrated Biorefinery

100% Utilization = Sustainability

Guayule

To Extraction

Biopolymer Emulsion Extraction Process

Emulsion Portfolio
Dry Solid Portfolio

Intermediary Materials Portfolio

Residual Materials

Cellulose
Hemi-cellulose
Resin Lignin

Cellulose
Hemi-cellulose
Resin Lignin

Specialty Chemicals
BioEthanol
Resin Products
Bio Materials

Bioactives
Bio-Oils
Adhesives
Particle Board

Cosmetics
Biofuel
Methane

Customers

Direct Use

Further Processing

Multiple Customers, Multiple Products
Rubber

- Rubber exhibits unique physical and chemical properties
  - 40,000 products
- Most rubber comes from petroleum (synthetic)
- All other rubber is tropical rubber derived from the Brazilian Rubber Tree
- South East Asia produces >90% of the global natural rubber supply
Guayule Bark

Intracellular rubber particle formation
Guayule: A Global Industrial Crop

12 million acres of guayule would provide global rubber needs
Yulex’s Bio-Based Materials

- Emulsion
- Solid Biorubber
- BioResins
- Biomass
Biorubber Emulsions and Solids

Yulex’s natural, guayule-based, high-performing materials
Environmentally sustainable domestic materials with medical, consumer, industrial and bioenergy applications.
BioRubber Emulsion Applications

- Surgical Tubing
- Mattresses
- Medical Gloves
- Balloon Catheter
- Condoms
- Dental Dams
BioRubber Solid Applications

- Action Sports Apparel
- Yoga Mats
- Children’s Toys
- Footwear
- Gasketing
- Tires and Auto Parts
Yulex and Patagonia Partner to Produce Sustainable, Guayule-Based Wetsuits

The partnership represents a move toward the replacement of the industry standard fossil-based neoprene wetsuit.
Wetsuits made with Yulex biorubber look and feel just like regular suits, and they let you surf just as well as you always have. After 4.5 years of development and testing we’re introducing wetsuits made from guayule (why-YOO-lee), a sustainable plant grown here at home in the United States. Guayule is a renewable nonfood crop that uses no pesticides and requires very little water. The plant-based process used to produce guayule rubber is much less toxic than the chemically intensive manufacturing process required to make traditional neoprene. This is a decision that will help shape the direction of an entire industry.

We are releasing this proprietary, game-changing material to the rest of the wetsuit industry. Some people think we’re crazy, but there’s really no other way to go about it. It is our hope that a wider use of this material will allow every manufacturer to play a major part in decreasing the amount of nonrenewable, non-biodegradable wetsuit waste that ends up in landfills.

For more information, go to www.yulex.com/science

Take a stand. Make a choice. Choose the future.
Yulex Wetsuit Material

Cross Section (400X Microscope Picture)

Super Texturized Nylon Spandex Jersey Face Fabric

Closed-Cell Sponge
60% Yulex
40% Chloroprene

Polyester Loop-Knit Fabric
40% Hollow-core Polyester
25% Recycled Polyester
Yulex Branding
Yulex Wetsuit Material

- Outstanding Flexibility
- Instant dry
- Excellent abrasion and snagging resistance
- Excellent thermal value
- Excellent tensile and tearing strength
- Renewable Yulex bio-polymer based sponge
Yulex Branding