Renewable Raw Materials for Coatings

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PATTON'S
Sun-Proof Liquid Paint
REG. U.S. PAT. OFF.
FIVE GALLONS U.S. MEASURE
PATTON PAINT COMPANY
MILWAUKEE, WIS. — NEWARK, N.J.
Bringing innovation to the surface.

Industrial Coatings
- Automotive Coatings
- Industrial Coatings
- Packaging Coatings

Performance Coatings
- Aerospace
- Architectural Coatings
- Automotive Refinish
- Marine & Protective Coatings
- Specialty Coatings and Materials

Glass
- Performance Glazing
- Fiber Glass
PPG Sustainability Goals 2012 – 2020

Sustainable Products
- Energy efficiency
- Natural resource conservation
- Emissions and waste reduction
- Product lifetime extension
- Welfare – people and planet

Renewable raw materials

* http://sustainability.ppg.com/
Why?

• **Renewable raw materials are already used in coatings**

• **Alternative to petroleum derived raw materials**
  
  ▪ **Environmental impact**
    ✷ Studies comparing petrochemical and biomass routes to bulk chemicals indicate typical reduction in greenhouse gas emission of 45%*
  
  ▪ **Security of supply and improved cost stability**
    ✷ Long term benefit
    ✷ Increase cost and risk likely in the short term
    ✷ Chemical de-selection

• **New properties from new raw materials**

* Hermann et al., Environmental Science and Technology 2007, 41, 7915
PPG Approach

- **Focus on key high volume raw materials**
  - Epoxy resins, Acrylics, Polyesters, UV cure oligomers
- **New building blocks, not biobased matches to existing raw materials**

![Diagram showing the PPG Approach process]

1. **Seeds/field** → **Farming/Forestry** → **Biomass** → **Processing** (Open Innovation)
2. **Formulating** → **Resin** → **Polymer chemistry** → **PPG Expertise** (Customer and consumer requirements)
3. **Paint** → **Application** → **Finished goods**
Traditionally considered as unreactive solvents

PPG proprietary polymerization technology
  - enables copolymerization with acrylics at high temperature and pressure

USDA funded project with North Dakota State University

Highly efficient waterborne pigment grind resins*

* US 7 608 676, US 7 776 959, US 7 776 960
Rosin

- New method developed for coupling rosin
- Cationic electrocoat resins developed containing 35% rosin
- Basic properties very similar to standard

US 8 057 592, US 7 812 101
Itaconic acid based oligomers for UV cure coatings

- Key component in new consumer electronics coatings
- 20% increase in abrasion resistance with no loss in other properties

Taber abrasion

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Other materials under evaluation

- Sugar derived monomers
- Lignin

- Cashew derived materials
- Natural polymers
Conclusions

• Technical feasibility demonstrated for several materials
• Optimization and testing continues
• Biobased raw materials increasingly available at realistic scale and cost
• Gradual measured adoption likely based on cost/performance
• Business case needs to be developed for accelerated adoption
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