

**Rosin Based Tackifier
& resin dispersions from Eastman
Chemical Company**

Agenda

- Rosin Based Tackifier
- Resin dispersions
- Applications for waterborne adhesives

Rosin Based Tackifier

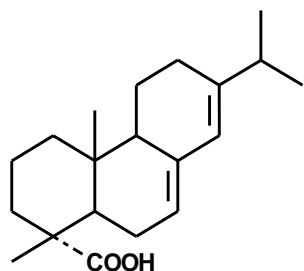
Rosin-based tackifiers



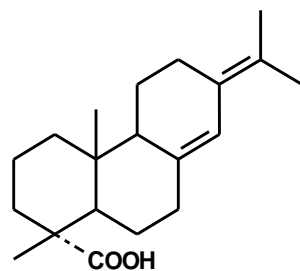
- Derived directly or indirectly from pine trees
- Three sources of rosin acids:
 - **Gum rosin:** harvested directly from a living tree; China is currently the largest supplier
 - **Wood rosin:** solvent extraction from aged tree roots; relatively expensive and limited supply
 - **Tall oil rosin:** collected as a by-product of wood fiber pulping for papermaking; crude tall oil can also be burned as fuel

Rosin-based tackifiers

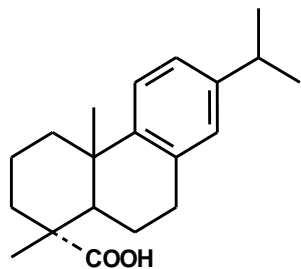
Rosin is a mixture of naturally occurring organic acids, including:



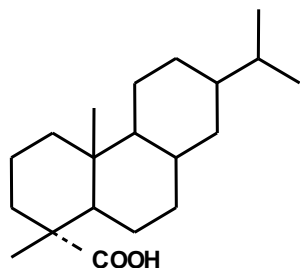
Abietic



Neoabietic

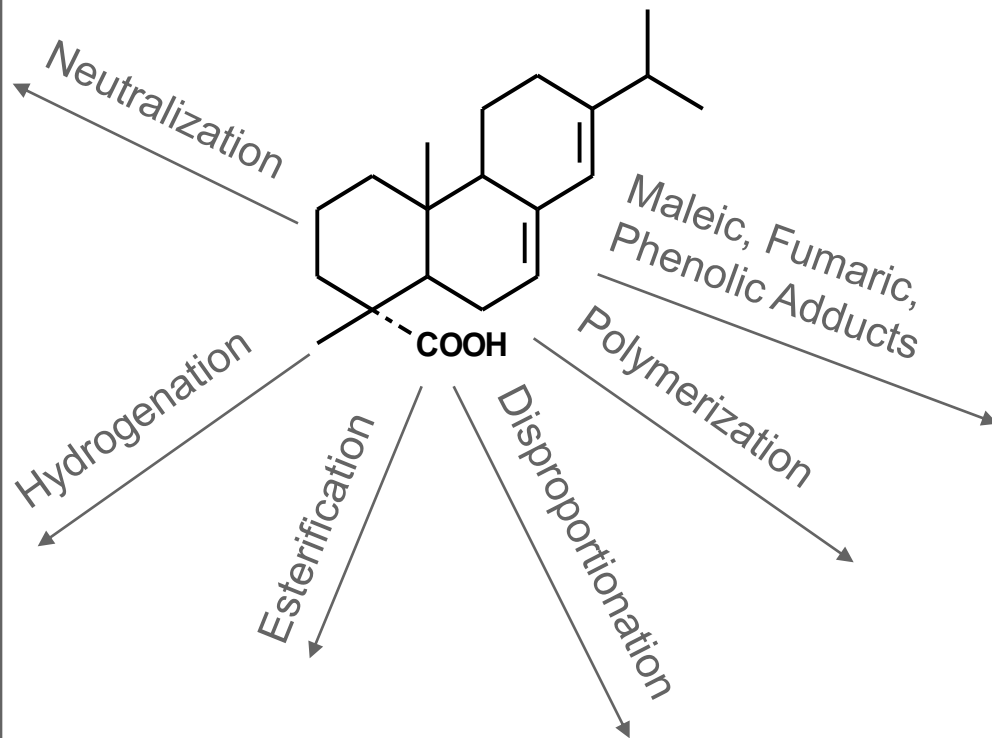


Dehydroabietic



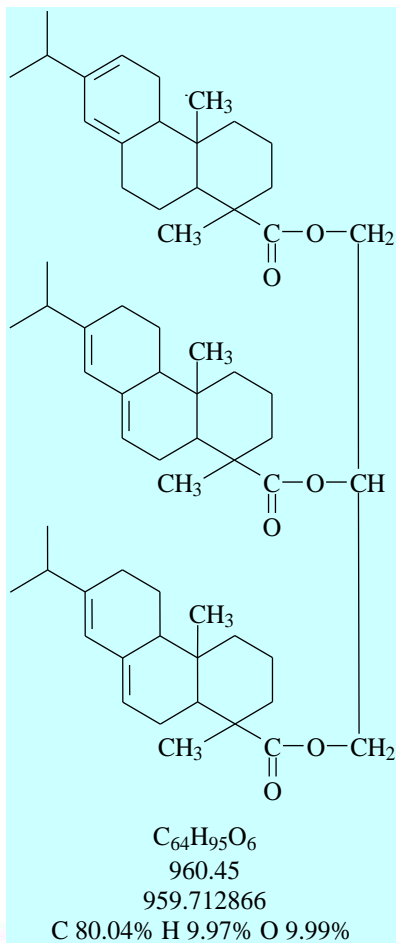
Tetrahydroabietic

Chemical modification of rosins

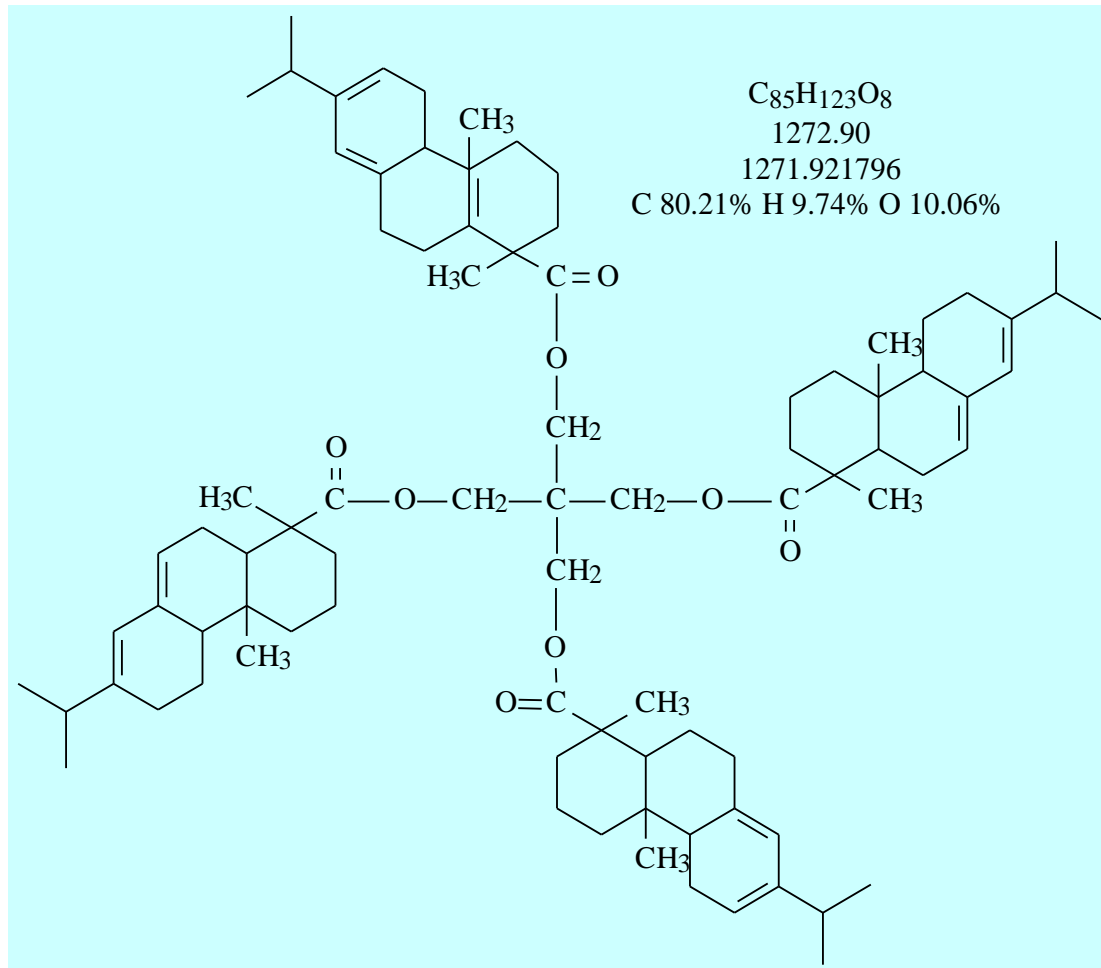


Typically rosins are modified to improve color, stability, and/or to expand usability

Esterification



Glycerol Ester
 E.g. : *Permalyn 5095-C*



Pentaerythritol Ester + 4H₂O
 E.g. : *Permalyn 5110-C*

Eastman Chemical Company – a key supplier of tackifying resins

- Permalyn™ Stabilized Rosin Esters
- Staybelite™E, Foral™E & Foralyn™ Hydrogenated Rosin/Esters
- Tacolyn™ Resin Dispersions

Rosin resins from Europe

Typical Properties

| Product | Softening Point, °C ^a | Color, Gardner ^b | Acid No. | End Use |
|------------------------|----------------------------------|-----------------------------|----------|--|
| Staybelite Resin-E™ | 79 | 5 | 162 | Hot melt adhesives, solder flux, pigment coating |
| Foralyn™-E | 81 | 2 | 168 | |
| Foral™ AX-E | 81 | <1 | 166 | |
| Permalyn™ 5095 | 92 | 3 | 8 | Hot melt adhesives |
| Eastman Ester Gum™ 8D | 93 | USRG WW | 7 | Chewing gum |
| Staybelite Ester™ 5-E | 85 | USRG X | 8 | Chewing gum |
| Staybelite Ester™ 10-E | 86 | 6 | 8 | Adhesives, cosmetics |
| Foral™ 85-E | 86 | 2 | 9 | Hot melt adhesives, solvent based adhesives |
| Foralyn™ 90 | 89 | 1 | 9 | |
| Permalyn™ 5110 | 106 | 6 | 14 | Hot melt adhesives |
| Permalyn™ 6110 | 110 | <1 | 13 | |
| Pentalyn™ H-E | 108 | 8 | 14 | Pressure sensitive adhesives |
| Foral™ 105-E | 106 | 5+ | 14 | Hot melt adhesives, solvent based adhesives |
| Foralyn™ 110 | 109 | 2 | 14 | |

Liquid & specialty rosin derivatives

Typical properties

| Product | Chemical Type | Softening Point, °C ^a | Color, Gardner | Acid No. | Melt Viscosity, mPa.s @ 25°C | End Use |
|--------------------------|------------------------------------|----------------------------------|----------------|----------|------------------------------|--|
| Liquid Rosins | | | | | | |
| Foralyn™ 5020-F | Partially hydrogenated rosin ester | Liquid | 3 | 6 | 5,400 | Cosmetics, perfumery, tackifier, plasticizer |
| Abitol™-E | Technical hydroabietyl alcohol | Liquid | Hunter 2 | 0.1 | 6,500 @ 50°C | Tackifier, plasticizer |
| Other Specialties | | | | | | |
| Cellolyn™ 21-E | | | | | | Tackifier for deep-freeze acrylic tape and label |

Advantages of rosin resins

- Broad compatibility with many polymers
 - Natural rubber, polyisoprene, polybutadiene, EVA, polychloroprene, acrylic
 - Simple esters all have similar solubility and compatibility
- Broad range of properties
 - Softening point: liquid to 180°C
 - Color: Gardner <1 to >10
- Hydrogenated rosin resins have low color and improved oxidative stability
- Produced from renewable resources

Resin dispersions

- Most tackifiers can be dispersed in water
 - Rosin esters, aliphatic hydrocarbons, aromatic hydrocarbons, and combinations
 - The tackifier must be combined with a surfactant to form a dispersion
- The resin to be dispersed must have softening point $<92^{\circ}\text{C}$
 - Needed if only ambient-pressure equipment is available
 - Softening point is reduced if necessary with oil or low softening point resins
- Additives affect the properties
 - Oils and surfactants reduce cohesion
 - Residual surfactant decreases water resistance

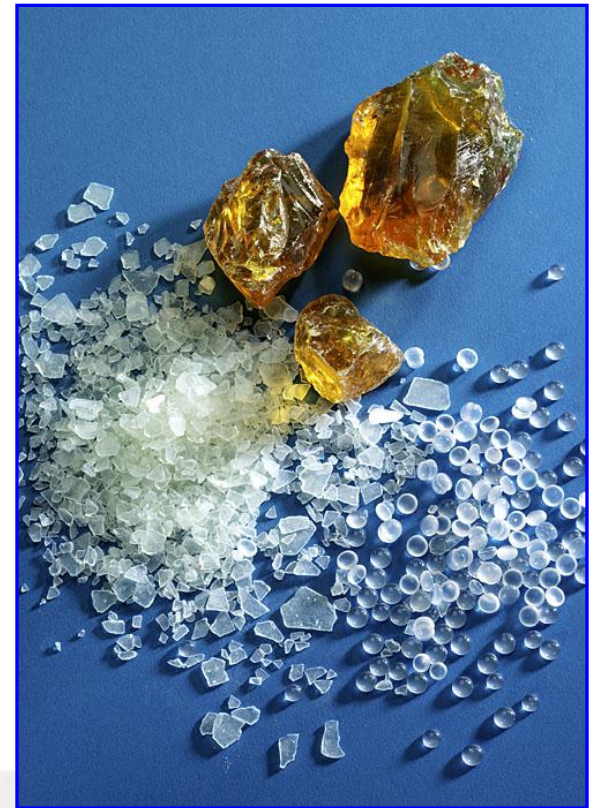
Resin Dispersion Formulation

■ Required

- Resin (40-60%)
- Emulsifier (2-10%)
- Water (40-60%)

■ Optional Additives

- Plasticizer (0-20%)
- Stabilizer / Ion Tolerance Agents (0-3%)
- Antioxidant (0-0.5%)
- Biocide (0-0.1%)



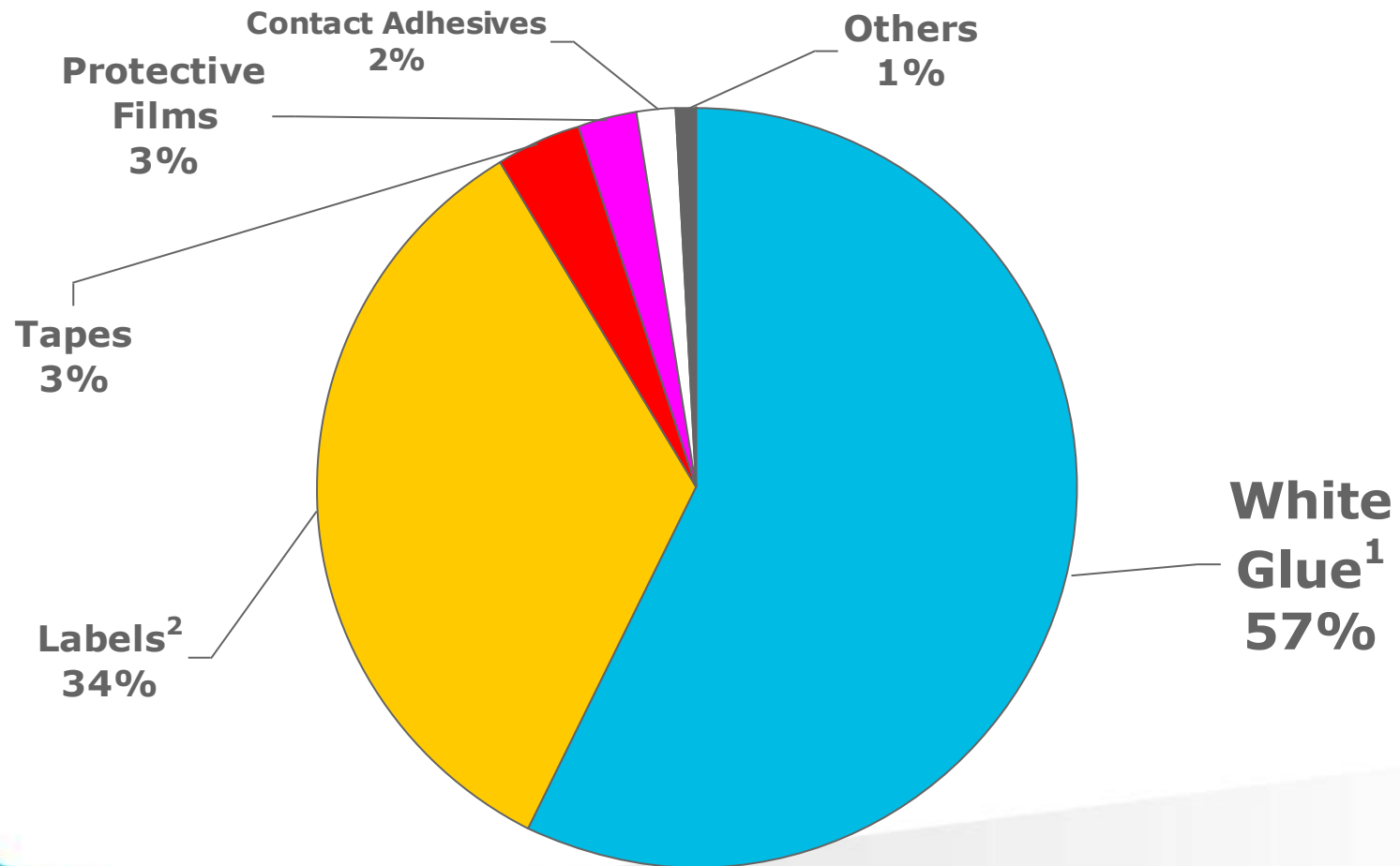
Adhesive applications using resin dispersions

- White glue
- Paper labels
- Transparent labels
- PSA tapes
- Protective films
- Contact adhesives
 - Foam assembly for furniture
 - Show construction
- Others



EASTMAN

Global structure of the waterborne adhesive market



¹ Source: SRI: Chemical Economics Handbook, 2004

¹⁴ Source: Adhesives and Sealants Industry, November 2003

Selecting *Tacolyn* Resin Dispersions for Specific Applications

| Tacolyn Dispersion | Latex | | | | |
|--|---------|-----|----|-----|----------|
| | Acrylic | SBR | NR | VAE | Neoprene |
| Hybrid Tacolyn 4603 | Y | Y | Y | Y | Y |
| Rosin Ester Tacolyn 3179HA, 3509 | Y | Y | Y | Y | Y |
| Hydrogenated Rosin Ester Tacolyn 3100, 3185, 3280, 3400 | Y | Y | Y | Y | Y |
| Aliphatic HCR (C5) Tacolyn 5070, 5085, 5095 | | | Y | | |
| Aromatic HCR (PMR) Tacolyn 5194 | Y | Y | | Y | Y |
| Aromatic Modified HCR (C5/C9) Tacolyn 1070, 5002, 5003 | Y | Y | Y | Y | Y |

EASTMAN



Thanks!