WAXES FOR THE INK INDUSTRY
Why use waxes in inks?

Used as additive to

- Change surface tension
- Improve drying process
- Structure and cohesion
- Suppress migration

Waxes provide

- Good compatibility with most printing methods
- Temperature stability; sharp melting range
- Solubility in different solvent systems

Waxes are

- Renewable
- Sustainable
- Green
Inks applications / printing systems

- Thermal Transfer Ribbon
- Solvent Based
- Water Based (emulsions)
- Sheet Fed (carbon)
- Heat Set
- Hot Melt
- Off Set
- UV Curable
- Overprint varnish
RIBBONS / TONERS / INKS / HOT MELTS

Anhydrous, Solvents

Emulsions

Resin, Waxes, Glycol, Esters

Flowable Liquid / Thick Solids / Flowable Powders

Shear Thinning / Phase Transition

Image
Carnauba is a vegetable wax grown only in Brazil. Carnauba palm grows in the northern and northeastern part of Brazil where the soil is dark and fertile. Quality and color vary with the age of the leaves, with the younger leaves providing the prime #1 yellow color, and the older leaves provide the darker T-3 and T-4 wax. The composition is high molecular weight mono-esters. 100% Renewable

**CHEMICAL PROPERTIES:**
- Melting Point: 80 - 86ºC
- Acid Value: 2-9
- Saponification Value: 78 - 95

**USES:** Hot Melt, Thermal Transfer Ribbon, Solvent Based, Water Based (emulsions), Sheet Fed, Heat Set Off Set, UV Curable, Overprint Varnish

**USAGE LEVELS:** 0.5 – 40.0%

**REGULATORY INFORMATION:**
CHEMICAL NAME: Carnauba Wax
CAS#: 8015-86-9, EINECS # 232-399-4
TSCA LISTED
DSL LISTED
FDA Approved Under Regulation 21 CFR 184.1978

<table>
<thead>
<tr>
<th>SOLVENT</th>
<th>2% CARNAUBA WAX</th>
<th>10% CARNAUBA WAX</th>
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</thead>
<tbody>
<tr>
<td>Rhodia Solv-IRIS</td>
<td>Soluble @ 75°C</td>
<td>Soluble @ 85°C</td>
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<tr>
<td></td>
<td>Begins To Solidifying @ 65°C</td>
<td>Begins To Solidifying @ 75°C</td>
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<td></td>
<td>Flowing Opaque Liquid @ 25°C</td>
<td>Hard Gel @ 25°C</td>
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<tr>
<td>Odorless Mineral Spirits</td>
<td>Soluble @ 65°C</td>
<td>Soluble @ 75°C</td>
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<td>Begins To Solidifying @ 50°C</td>
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<td>Soft Paste @ 25°C</td>
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<tr>
<td>Soybean Oil</td>
<td>Soluble @ 70°C</td>
<td>Soluble @ 80°C</td>
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<td>Butyl Methacrylate</td>
<td>Soluble @ 70°C</td>
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<tr>
<td>Hexanediol Diacrylate</td>
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<td>Soluble @ 85°C</td>
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<td>Begins To Solidifying @ 55°C</td>
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</tr>
<tr>
<td></td>
<td>Soft Paste @ 25°C</td>
<td>Hard Gel @ 25°C</td>
</tr>
</tbody>
</table>
Carnauba

Disadvantage

• Resins in Carnauba: negative effect
  • influencing / shortening lifetime of printer heads

Solution: Kesterwax K-82H:

• Very hard, long chain ester wax
• Properties similar to Carnauba
• Contains no resins
• Excellent thermal stability
• Improves products homogeneity
Kester Wax K-82H is a very hard long chain synthetic ester wax with properties similar to carnauba wax. K-82H contains NO resins, has excellent thermal stability, also suppresses migration and improves products homogeneity of wax systems. Scuff Resistance 34% re-newable

**CHEMICAL PROPERTIES:**
Melting Point: 80-85 °C
Acid Value: <6
Saponification Value: 72-96

**USES:** Hot Melt, Solvent Based, Water Based (emulsions), Sheet Fed, Heat Set Off Set, Thermal Transfer Ribbon

**USAGE LEVELS:** 0.5 – 50.0%

**REGULATORY INFORMATION:**
CHEMICAL NAME: Synthetic Beeswax
CAS# 71243-51-1, EINECS # 275-286-5
TSCA LISTED
DSL LISTED
FDA Approved Under Regulation 21 CFR 175.105

<table>
<thead>
<tr>
<th>SOLVENT</th>
<th>2% KESTER WAX K-82H</th>
<th>10% KESTER WAX K-82H</th>
</tr>
</thead>
</table>
| Rhodia Solv-IRIS | Soluble @ 85°C  
Begins To Solidifying @ 70°C  
Soft Paste @ 25°C | Soluble @ 90°C  
Begins To Solidifying @ 80°C  
Hard Gel @ 25°C |
| Odorless Mineral Spirits | Soluble @ 75°C  
Begins To Solidifying @ 45°C  
Flowing Opaque Liquid @ 25°C | Soluble @ 80°C  
Begins To Solidifying @ 60°C  
Soft Gel @ 25°C |
| Isopropyl Alcohol | Soluble @ 70°C  
Begins To Solidifying @ 60°C  
Very Soft Paste @ 25°C | Soluble @ 85°C (Slightly Insoluble)  
Begins To Solidifying @ 60°C  
Hard Gel @ 25°C |
| Butyl Alcohol | Soluble @ 75°C  
Begins To Solidifying @ 60°C  
Flowing Opaque Paste @ 25°C | Soluble @ 85°C  
Begins To Solidifying @ 60°C  
Hard Gel @ 25°C |
| Soybean Oil | Soluble @ 80°C  
Begins To Solidifying @ 60°C  
Flowing Opaque Paste @ 25°C | Soluble @ 85°C  
Begins To Solidifying @ 70°C  
Hard Gel @ 25°C |
| Butyl Methacrylate | Soluble @ 70°C  
Begins To Solidifying @ 55°C  
Flowing Opaque Liquid @ 25°C | Soluble @ 80°C  
Begins To Solidifying @ 60°C  
Soft Paste @ 25°C |
| Hexanediol Diacrylate | Soluble @ 80°C  
Begins To Solidifying @ 75°C  
Soft Paste @ 25°C | Soluble @ 90°C  
Begins To Solidifying @ 85°C  
Hard Gel @ 25°C |
**Permulgin 4101**

*Permulgin 4101* is a narrow distillate cut of hydrocarbons which has a very sharp DSC phase transition. This hard wax can be used as a functional equivalent for more expensive molecular distilled hydrocarbons.

**CHEMICAL PROPERTIES:**
- Melting Point: 140/145°F (59.5-62.7°C)
- Acid Value: Nil
- Saponification Value: Nil

**USES:** Thermal Transfer Ribbon, Solvent Based, Water Based (emulsions), Sheet Fed, Heat Set, Hot Melt, Off Set

**USAGE LEVELS:** 0.5 – 50.0%

**REGULATORY INFORMATION:**
- CHEMICAL NAME: Paraffin
- CAS# 8002-74-2
- EINECS#: 232-315-6
- TSCA LISTED
- DSL LISTED
- FDA Approved Under Regulation 21 CFR 175.886

<table>
<thead>
<tr>
<th>SOLVENT</th>
<th>2% AR Permulgin 4101</th>
<th>10% AR Permulgin 4101</th>
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</thead>
<tbody>
<tr>
<td>Rhodia Solv-IRIS</td>
<td>Soluble @ 75°C (Some Insolubility) Begins To Solidifying @ 55°C</td>
<td>Soluble @ 80°C (Some Insolubility) Begins To Solidifying @ 65°C Soft Paste / 2 Phases @ 25°C</td>
</tr>
<tr>
<td>Odorless Mineral Spirits</td>
<td>Soluble @ 60°C Begins To Solidifying @ 25°C Solution @ 25°C</td>
<td>Soluble @ 65°C Begins To Solidifying @ 30°C Soft Paste @ 25°C</td>
</tr>
<tr>
<td>Isopropyl Alcohol</td>
<td>Soluble @ 60°C Begins To Solidifying @ 45°C Very Soft Paste @ 25°C</td>
<td>Soluble @ 65°C Begins To Solidifying @ 50°C Firm Gel @ 25°C</td>
</tr>
<tr>
<td>Butyl Alcohol</td>
<td>Soluble @ 70°C Begins To Solidifying @ 45°C Flowing Paste @ 25°C</td>
<td>Soluble @ 70°C Begins To Solidifying @ 55°C Hard Gel @ 25°C</td>
</tr>
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<td>Soluble @ 85°C Begins To Solidifying @ 60°C Soft Gel @ 25°C</td>
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**SILICONYL POLYETHYLENE**

**Siliconyl Polyethylene** is a wax with low surface tension, contains NO resins, excellent thermal stability, a sharp DSC phase change. **Reduce Roller Buildup**

**CHEMICAL PROPERTIES:**
Congealing Point: 65-75°C
Acid Value: Nil
Saponification Value: Nil

**USES:** Solvent Based, Heat Set, Hot Melt, Off Set, Thermal Transfer Ribbon

**USAGE LEVELS:** 0.5 – 10.0%

**REGULATORY INFORMATION:**
CHEMICAL NAME: Polyethylene & Stearoxy Dimethicone
CAS# 9002-88-4 & 68554-53-0, EINECS # Polymers
TSCA LISTED
DSL / NDSL LISTED
FDA Approved Under Regulation 21 CFR 175.300

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<tr>
<th>SOLVENT</th>
<th>2% SILICONYL POLYETHYLENE</th>
<th>10% SILICONYL POLYETHYLENE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rhodia Solv-IRIS</td>
<td>Soluble @ 80°C Begins To Solidifying @ 70°C Flowing Opaque Liquid @ 25°C</td>
<td>Soluble @ 80°C (Some Insolubility) Begins To Solidifying @ 75°C Multi Phase Separation @ 25°C</td>
</tr>
<tr>
<td>Odorless Mineral Spirits</td>
<td>Soluble @ 65°C Begins To Solidifying @ 40°C Simi-Transparent Solution @ 25°C</td>
<td>Soluble @ 70°C Begins To Solidifying @ 50°C Soft Gel @ 25°C</td>
</tr>
<tr>
<td>Isopropyl Alcohol</td>
<td>Soluble @ 70°C (Some Insolubility) Begins To Solidifying @ 65°C Very Soft Paste @ 25°C</td>
<td>Soluble @ 70°C (Slightly Insoluble) Begins To Solidifying @ 65°C Hard Paste @ 25°C</td>
</tr>
<tr>
<td>Butyl Alcohol</td>
<td>Soluble @ 75°C (Some Insolubility) Begins To Solidifying @ 70°C Soft Paste @ 25°C</td>
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<td>Soybean Oil</td>
<td>Soluble @ 80°C Begins To Solidifying @ 40°C Soft Paste @ 25°C</td>
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<td>Soluble @ 85°C (Some Insolubility) Begins To Solidifying @ 70°C Firm Gel @ 25°C</td>
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</table>
Kester Wax K-62 is a hard, medium chain ester wax from naturally derived feed stock. K-62 has good thermal stability, very narrow thermal phase change when measured by DSC, good film forming properties and wide compatibility in ink systems. 100% Renewable and Sustainable, Green, Scuff Resistance

**CHEMICAL PROPERTIES:**
Melting Point: 60-65°C
Acid Value: <5
Saponification Value: 85-97

**USES:** Solvent Based, Water Based (emulsions), Sheet Fed, Heat Set, Hot Melt, Off Set, Thermal Transfer Ribbon

**USAGE LEVELS:** 0.5 – 50.0%

**REGULATORY INFORMATION:**
CHEMICAL NAME: Octadecanyl Docasanoate (Docasanoic Acid Octadecyl Ester)
CAS# 24271-12-3  EINECS # 246-115-1
TSCA LISTED
DSL LISTED
FDA Approved Under Regulation 21 CFR 178.3450

### SOLVENTS

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<td>Rhodia Solv-IRIS</td>
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UV Curable Wax

This unique wax has been designed to have cross-linking properties for UV curable inks. Wax helps to impart adhesion and improves imaging of inks. By designing a molecule that has a high degree of unsaturation it now possible to incorporate the benefits of a wax into a UV ink matrix. 100% re-newable

**CHEMICAL PROPERTIES:**
Melting Point: 40-60°C
Acid Value: < 5.0
Saponification Value: 80-95
Iodine Value: > 65.0

**USES:** UV Curable, Solvent Based, Water Based (emulsions)

**USAGE LEVELS:** 0.5 – 6.0%

**REGULATORY:**
Chemical Name: Oleyl Arachidate
CAS#: 22393-96-3
EINECS#: 244-952-7
TSCA Listed
KOSTER MILK 302
40% (Carnauba) wax

Koster Milk 302 is a stable 40% Wax dispersion with an particle size around 300nm. Koster Milk 302 allows a formulator to utilize the desirable properties of Carnauba Wax without having to apply heat to the formulation. This creates a way to improve surface adhesion, mar resistance, film forming and barrier properties with no more energy than measuring, pouring and mixing. 98% re-newable

PROPERTIES:
Percent Solids: 39-41
pH: 6,0-7,5
Specific Gravity: 0.970 - 1.1
Particle Size: 100-400 nm
Appearance: Yellowish Liquid
Color: Off White to Tan
Microbiology: <100 organisms/g

DISPEROSABILITY: (Typically Not Affected By Surfactants and Ionic Strength)
Water, Alcohols, Glycols

USES & USAGE LEVELS: 1-10%
Water Based Systems

REGULATORY:
Chemical Name: Water (aqua), Copernica Cerafera Wax, Beeswax, Laureth 23, Glycerin, Trideceth-6 Phosphat, Phenoxy Ethanol, Sodium Hydroxid

Shelf life: 2 years after production date
• **Companies: Many are Japanese**
  – Brother, Canon, Centronics, Hitachi (Data Products), Konica, Samsong, Seiko

• **Some US Based Research:**
  – Eastman Kodak (Rochester, NY; Toners) & Div of Solid Ink; Palo Alto Res. Center (Irvine CA)
  – Genicom (Waynesboro, VA; Printer Ribbon)
  – Lexmark (Lexington, KY; Toners)
  – Printronix (Irvine, CA; Printer Ribbon)
  – Xerox (Toronto, Toner) & Wilsonville, OR; Solid Ink
  – Zebra / Ricoh (Bolder, CO; Ink, Esters for dispersion media)

• **Waxes Offer:**
  – Good compatibility with most systems
    • Temperature, Solubility, Functionality
  – Renewable, Sustainable, Many are Green
  – Safety