Achieving premium product appeal
Metasheen® – Superior mirror and liquid metal effects
Agenda

Metasheen® at a glance

Performance highlights

Our global portfolio

Guide formulations
Metasheen® is a vacuum metallized pigment (VMP) for unique mirror and liquid metal effects. It allows formulators in printing & packaging, industrial coatings & interior automotive and 3C to create premium product appeal.
# Overview Metasheen® series properties

<table>
<thead>
<tr>
<th>Metasheen® series</th>
<th>Shade</th>
<th>Particle size d50</th>
<th>Appearance</th>
<th>Flake thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metasheen® 11</td>
<td>Dark 8–12 µm</td>
<td>Ultra-dark chrome effect with the highest coverage combined with maximum brilliance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metasheen® 41</td>
<td>Dark 8.5–11.5 µm</td>
<td>Dark chrome effect with high coverage and excellent brilliance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metasheen® 71</td>
<td>Dark 11–13 µm</td>
<td>Mid-shade silver effect with high coverage and brilliance, considered a standard shade</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metasheen® passivated 72/42</td>
<td>Same as associated series</td>
<td>Similar to its associated series, but less reflective due to passivation process</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

7/11/2017
Agenda

Metasheen® at a glance

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Guide formulations
Integrated manufacturing process for consistent high quality

Resin coating
Vacuum metallizing
Stripping in solvent bath
Particle size reduction
Final blend

QC monitoring of all batches
We conduct process and quality controls to ensure consistent high quality product.
Optimized technical properties and logistics for consistent high quality

- Tighter roll specification
- Better viscosity control
- Optimized quality control methods
- New, centralized standardization and sampling concept
Exceptionally smooth surface delivers superior reflectivity for unique effects

Conventional aluminum

Silver Dollar aluminum

Metasheen®
Metasheen®
gets closest to metallized paper effect

Comparative brilliance of metallic products

Metallized paper: 100
Metasheen®: 90
Silver Dollar: 75
Cornflake pigment: 60
Cleaner reflection than conventional pigments

**Schematic pigment comparison**

**Conventional ‘cornflake’ pigment**
scatters light from irregular surface

**Optically flat VMP type**
reflects cleanly
Agenda

- Metasheen® at a glance
- Performance highlights
- Our global portfolio
- Guide formulations
Metasheen® nomenclature

**Series grade**
- 1 = Ultra-dark chrome
- 4 = Dark chrome
- 7 = Mid-shade silver

**Surface chemistry**
- 1 = Solvent
- 2 = Water passivated

**Carrier solvent**
- 00 = Ethyl Acetate/ Iso Propyl Acetate
- 03 = Methoxy Propyl Acetate
- 04 = Ethyl Acetate
- 07 = Methoxy Propanol
- 11 = Butyl Glycol
- 13 = Methoxy Methyl Butanol

**Metal solids in slurry**
- 10 = 10% Metal

Example code: Metasheen® 7 1 - 00 10
## Core product portfolio across industries

<table>
<thead>
<tr>
<th>11 series</th>
<th>Printing</th>
<th>Coatings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Metasheen® 11-0010</td>
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</tr>
<tr>
<td></td>
<td>Metasheen® 11-0310</td>
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</tr>
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<td>41/42 series</td>
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Please talk to your local account manager for more information on customized solutions
Gravure & flexo printing

Examples of applications

- Labels for high value beverages
- Candy packaging
- Cosmetic packaging
- Tablets & laptops
Benefits

- Can print in-line unlike some alternative technologies
- Lower cost alternative comparing to metallized substrates with coverage of design area less than 25%
- Lower evaporation rate comparing to pure ethyl acetate positively impacts product storage stability
<table>
<thead>
<tr>
<th>Printing</th>
<th>Solvent</th>
<th>Particle size $d_{50}$</th>
<th>Solid content</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>41 series</td>
<td>Metasheen® 41-0010 50/50 Ethyl Acetate/Iso-Propyl Acetate</td>
<td>8.5–11.5 µm</td>
<td>10%</td>
<td>Gravure/flexo</td>
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<tr>
<td></td>
<td>Metasheen® 41-0710 Methoxy Propanol</td>
<td>8.5–11.5 µm</td>
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<td>Screen</td>
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<tr>
<td></td>
<td>Metasheen® 41-1110 Butyl Glycol</td>
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<td></td>
<td>Metasheen® 41-1310 MMB (Methoxy Methyl Butanol)</td>
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Industrial coatings

Examples of applications

Interior automotive in the dashboard
Exterior automotive rear-view mirror
Wheel rims
Mobile phone corpus & loudspeaker
Industrial coatings
Metasheen® 71-0310
Versus alternative technologies

Benefits
- Smoother aesthetic appearance
- Sparkle free
- Higher optical flop
- Superior hiding power

... at lower pigment loading
Industrial coatings

Metasheen® 71-0310

Our primary offer

Benefits

- Matching current color trend for lighter shades
- Better intercoat adhesion than thinner flakes
- High compatibility with application systems
Plastics coatings

**Metasheen® 41-0710**

For premium mirror effect & colored mirrors

**Benefits**

- Compatible with all substrates
- No etch into polycarbonate substrates
- Standard solvent & shade for mobile phone and tablet
### Industrial coatings

#### Core product portfolio for solvent based applications

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Industrial coatings

Core product portfolio for water based applications

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<thead>
<tr>
<th>Series</th>
<th>Industrial coatings</th>
<th>Solvent</th>
<th>Particle size d50</th>
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</tr>
</thead>
<tbody>
<tr>
<td>42 series</td>
<td>Metasheen® 42-1110</td>
<td>Butyl Glycol</td>
<td>8.5–11.5 µm</td>
<td>10%</td>
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Metasheen® at a glance

Performance highlights

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Guide formulations
Flakes are dragged into flat alignment during drying

Film shrinks during drying

Flakes are dragged into flat alignment

Substrate  Binder/varnish  Metasheen® flake
Surface has to be smooth

<table>
<thead>
<tr>
<th>Rough surface</th>
<th>Smooth surface</th>
</tr>
</thead>
</table>

- Substrate
- Binder/varnish
- Metasheen® flake
- Topcoat/overprint varnish
High resin solid hinders orientation of flakes

High resin solids

Low resin solids

Substrate  Binder/varnish  Metasheen® flake  Topcoat/overprint varnish
Evaporation time has to be optimized

Fast evaporation

Optimized evaporation

- Substrate
- Binder/varnish
- Metasheen® flake
- Topcoat/overprint varnish
Topcoat thickness influences reflectivity

Topcoat/overprint varnish too thick

Topcoat/overprint varnish with optimized thickness

Substrate  Binder/varnish  Metasheen® flake  Topcoat/overprint varnish
**Strike-in caused by re-solubilisation of basecoat**

Topcoat/overprint varnish
strike in

Topcoat/overprint varnish
with optimized compatibility

- **Substrate**
- **Binder/varnish**
- **Metasheen® flake**
- **Topcoat/overprint varnish**
General formulation principle to add color

There are three possible ways of producing colored effects with Metasheen®

1. Metasheen® silver with a transparent colored lacquer
   - Transparent colored wash option provides the cleanest and purest metallic effect
   - Best overall effect is on film where Metasheen® is printed on the reverse and the colored wash on the substrate surface, this avoids any rewetting issues, applies to printing applications only

2. Tone Metasheen® with solvent soluble dyestuffs e.g. Orasol®
   - Solvent soluble dyes provide the cleanest and purest metallic polychromatic effect
   - The color observed through the film will tend to be weaker in color strength than the color observed from surface viewing

3. Tone Metasheen® with transparent pigments e.g. Microlith®
   - Polychromatic colors made with transparent pigment are not as clean and pure as with the dyes
Coatings formulation principle (1/3)

Spray paint application guidelines

Basecoat

- Low solids, typical P:B of 1:7.5 to 1:18.5 depending on series being used
- Low dry film thickness (2–5 micron)
- 2K basecoat ideal to lock the pigment in place before topcoat application
- Viscosity too low to measure – solvent

Topcoat

- Minimum thickness for protection performance (30 micron)
- Contains solvents which are incompatible with the basecoat resin (prevent resolubilisation)
**Coatings formulation principle (2/3)**

**Two effects, one pigment**

**Liquid metal effect**

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**High chrome, mirror effect**

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Guideline only, recommended for customers to carry out a ladder study
Recommended: low solids, high viscosity resins
- Nitrocellulose, Vinyl, Acrylic, Propionate, PU (PVB)
- High viscosity grades enable high P:B ratios and low resin solids
- Ester-rich solvent combinations are desirable for ink stability
- Typical pigment loading 2–4% for gravure inks, screen inks typically higher (4–7%)
- Over-pigmentation leads to loss of brilliance as flakes overlap
- Use only low shear mixing to avoid damaging flakes
- Inclusion of unnecessary additives leads to loss of brilliance
Printing formulation principle (2/2)

Pigment:Binder recommendations for ink

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Pigment:Binder ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gravure, surface and reverse</td>
<td>4:1.0 – 1:1</td>
</tr>
<tr>
<td>Screen surface</td>
<td>1:1.5 – 1:4</td>
</tr>
<tr>
<td>Screen reverse</td>
<td>1:0.8 – 1:1</td>
</tr>
</tbody>
</table>
Please get in touch

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Please also visit our website at www.basf.com/metasheen