Mirror, mirror on the wall –
Can these effects be measured at all?

Byk-Gardner User Meeting
Innsbruck, April 2013
Dr. Andrea Fetz
… and the mirror answered: Yes curious folks – but first you have to create these effects!

Agenda

1. **Product Portfolio for solvent borne & water borne systems**
2. Appearance - Formulation & Application & other influencing factors
3. Latest news
Ultra brilliant Aluminium Pigment Dispersions
For solvent based systems

**Metalure® L 55700**
standard PVD pigment, OD 2,0

**Metalure® A 41010 BG**
Chrome effect, darker than standard, OD 1,0

**Metalure® A 21010 BG**
Dark chrome effect, lower optical density, OD 0,8

**Metalure® A 61010 BG**
Darkest optical performance, OD 0,6
Ultra brilliant Aluminium Pigment Dispersions For water based systems

Two Possibilities for Stabilization

- Silica Encapsulation
- Additive Treatment
Ultra brilliant Aluminium Pigment Dispersions
Silica Encapsulated PVD's

Hydroshine® WS 3001
Standard product

Hydroshine® WS 3003
Developed for wheel rim finishes

Hydroshine ® WS 3004
Perfect intercoat adhesion
Ultra brilliant Aluminium Pigment Dispersions
Additive treated PVD's

Hydroshine® WS 1001 (BG)
Additive stabilized PVD pigment for WB systems

Hydroshine® WS 1011 (IL)
Different solvent

Hydroshine® WS 4021 (BG)
Currently darkest additive stabilized PVD pigment
Agenda

1. Product Portfolio for solvent borne & water borne systems
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3. Latest news
Formulation & Application

Main factors for best optical properties

**Substrate** as smooth and glossy as possible

**Base coat** as low solid as possible
Wetting & dispersing agents for de-flocculation and stabilization
Waxes for a good orientation
Balanced solvent composition

**Clear coat** well adjusted to base coat

**Dry application**
Max. 5µm dry film thickness
Solvent based grades in comparison

Optical density has no influence on the effect.
Solvent based grades in comparison

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<thead>
<tr>
<th>Parameter1</th>
<th>Parameter2</th>
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**Delta Lab-Graph**

<table>
<thead>
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<th>Start\End Date: 27.03.2013 - 27.03.2013</th>
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**Note:** Parameter2

**Note:** Parameter3

Lightness correlates with the optical density

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**Metalure A 41010 BG**

<table>
<thead>
<tr>
<th>L*</th>
<th>a*</th>
<th>b*</th>
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<tr>
<td>112.42</td>
<td>0.5</td>
<td>1.19</td>
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**Metalure A 61010 BG**

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**Metalure A 21010 BG**

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<tr>
<th>L*</th>
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<tbody>
<tr>
<td>26.39</td>
<td>0.04</td>
<td>0.67</td>
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**Lightness correlates with the optical density**
Solvent based grades in comparison

The lower the optical density → the higher the flop
Comparison of different substrates

Effect Graph

Start/End: 27.03.2013 - 28.03.2013

Parameter 1: All

Note: Parameter 2
Note: Parameter 3

The smoother the substrate → the better the orientation due to lower sparkling area
Hydroshine grades in comparison

**Effect_Graph**

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<td>D65/10</td>
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- Hydroshine WS 3001: $S_G = 0.17; S_i = 2.78; S_a = 2.75$
- Hydroshine WS 3001: $S_G = 2.45; S_i = 3.91; S_a = 22.12$
- Hydroshine WS 3001: $S_G = 2.38; S_i = 4.15; S_a = 19.85$

Graininess

$G = 2.35$

Variation of surface treatment does not influence the effect
Agenda

1. Product Portfolio for solvent borne & water borne systems
2. Appearance - Formulation & Application & other influencing factors
3. Latest news
METALURE Liquid Black - A World Premiere!

Its decisive characteristic is the “midnight black”, liquid metallic appearance.

METALURE Liquid Black is the only PVD product available on the market worldwide that guarantees this captivating deep, very dark metal colour shade.

In addition to the dark optical feature, the extremely high chemical resistance withstands any possible stresses.

METALURE Liquid Black is based on chromium oxide; it is chemically inert and free of any chrome-VI compounds. Thus, it is toxically safe.
METALURE Liquid Black

What are the advantages of METALURE Liquid Black?

• Darkest PVD available on the market worldwide
• Extremely high chemical resistance (passed Toyota test)
• Chemically inert
• Free of any chrome VI compounds -> toxically safe
• Perfectly suited for all common paint systems (solventborne, waterborne, UV curing)

What are the main application areas?

• Automotive and accessories coatings
• Exterior applications
• Industrial coatings
• Decorative purposes
Even the darkest Al-PVD is much lighter than Liquid Black
Liquid black – formulation and substrate in comparison

**Effect Graph**

- **Start/End Date:** 27.03.2013 - 28.03.2013
- **Parameter 1:** All
- **Parameter 2:** Note: Parameter2
- **Parameter 3:** Note: Parameter3

**III/Obs:** D65/10

- **Liquid Black in NC:**
  - $S_G = 0.86, S_i = 3.07, S_a = 7.28$
- **Liquid Black in WB system:**
  - $S_G = 1.16, S_i = 1.98, S_a = 15.84$
- **Liquid Black on foil:**
  - $S_G = 1.67, S_i = 3.59, S_a = 13.87$

**Graininess**

$G = 2.63$

**Difference in Sparkling area 75° as a result of different orientation**
Liquid black – formulation and substrate in comparison

**Delta Lab-Graph**

**Start/End Date:** 27.03.2013 - 28.03.2013

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**III/Obs** D65/10

- **Liquid Black in NC;** $L^*=109.13; a^*=-1.32; b^*=-0.3$
- **Liquid Black in NC;** $L^*=56.43; a^*=0; b^*=0.86$
- **Liquid Black in NC;** $L^*=46.43; a^*=0; b^*=0.86$
- **Liquid Black in NC;** $L^*=40.41; a^*=-0.3; b^*=0.14$
- **Liquid Black in NC;** $L^*=47; a^*=-0.05; b^*=-0.39$
- **Liquid Black in NC;** $L^*=15.2; a^*=0.02; b^*=0.87$

**Best orientation:** dark over all angles
**Worst orientation:** light over all angles

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**ECKART**

Effect Pigments
Can we get mirror-like effects?

... because we are closer to a real mirror!

Why does the better oriented film show less flop?
Can we get mirror-like effects?

**Delta Lab-Graph**

Start/End Date: 28.03.2013 - 28.03.2013

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- **-15°**
  - +db*
  - -dl*
  - -da*
  - -db*
  - +da*

- **15°**
  - +db*
  - +dl*
  - +da*
  - db*
  - -da*

- **25°**
  - -da*
  - db*
  - -dl*
  - +db*
  - +da*

- **45°**
  - +db*
  - +dl*
  - +da*
  - -db*
  - -da*

- **75°**
  - -da*
  - db*
  - -dl*
  - +db*
  - +da*

- **110°**
  - +db*
  - +dl*
  - +da*
  - -db*
  - -da*

- **15°**
  - Liquid black on foil; L* = 86.79; a* = -1.41; b* = 0.73

- **15°**
  - Liquid black on foil; L* = 69.84; a* = -0.29; b* = 0.95

- **15°**
  - Liquid black on foil; L* = 35.02; a* = 0.02; b* = 0.44

**Metalure A 41010BG on foil**

**Mirror**
Can we get mirror-like effects?

Effect_Graph

Start/End: 28.03.2013 - 28.03.2013
Parameter1: All
Note: Parameter2
Note: Parameter3

Ill/Obs: D65/10

Liquid black on foil; S_G = 0.94; S_i = 3.25; S_a = 7.62

Liquid black on foil; S_G = 0; S_i = 1.31; S_a = 3.15

Liquid black on foil; S_G = 0.05; S_i = 2.83; S_a = 2.1

Graininess
G = 1.64

Liquid black on foil; S_G = 0.94; S_i = 3.25; S_a = 7.62

Liquid black on foil; S_G = 0; S_i = 1.31; S_a = 3.15

Liquid black on foil; S_G = 0.05; S_i = 2.83; S_a = 2.1
... and the mirror answered:

These are great effects, but along the road and over the ocean is still a lot of potential …

Thank you for listening.