Durable decoration with UV inks

in daily use

Deco ´10, Nashville
April 18/19th 2010

Martin Hehl-Heinz, Product Management Glass

Marabu GmbH & Co. KG

Company Profile

- *1859 founded in Stuttgart by Albert Martz*
- *1909 trademark Marabu*
- *Since 1918 located in Tamm near Stuttgart*
- *440 employees worldwide*
- *13 affiliates and distribution partners in 70 countries*
- *development and production in Germany*
- *Screen Printing-, Pad Printing-, and Digital Printing Inks*
- *UV and solvent based*
- *sensitive handling with energy and raw materials*

Objective

- Table ware
- Required Resistance
- Expected Resistance

Overview

- Expectation
- Past – Now - Future
- Pre-treatment

Segments in Glass and Ceramic Decoration

Tableware

- Tumblers
- Kitchen glass
- Bowls
- Mugs

Expected Resistance

Tableware:

- Dish washer resistance
- Scratch Resistance (Fingernail)
- Abrasion Resistance (Cardboard)

Achievable Resistance

Requirements for Tableware

Dishwasher resistance

- Home appliance, 200 cycles at 150°F for 85 min
- Restaurant appliance, 1200 cycles at 195 °F for 3 min

Achievable Resistance

Requirements for Tableware

Dishwasher resistance

- Zero fading of the image
- No delamination of the image

Dishwasher resistance
UV inks vs ceramic inks

Achievable Resistance

Requirements for Tableware

Scratching Resistance

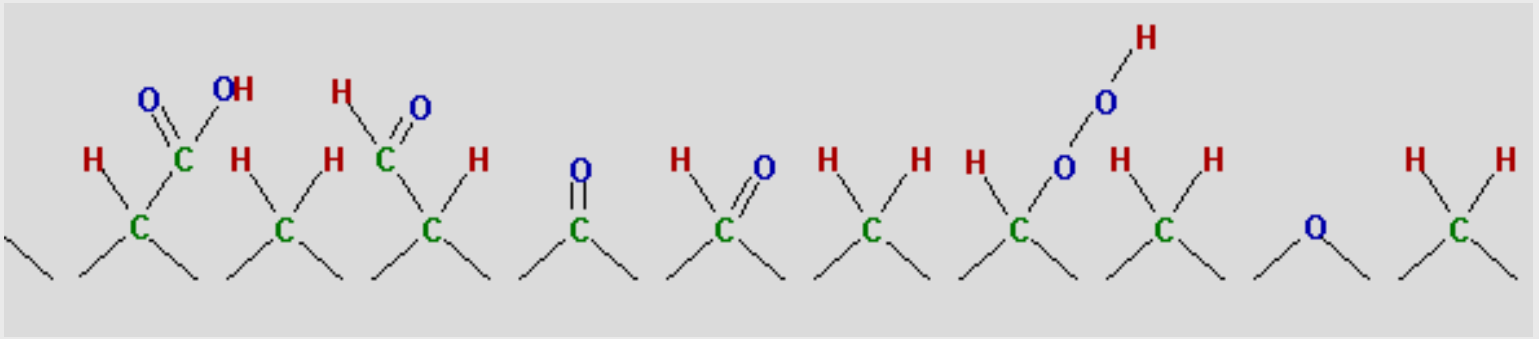
- Fingernail (wet and dry)
- Dishwasher basket (wet and dry)

Pre-treatment Flaming

The exposure to heat with gas flame pre-treatment breaks the molecule chain on the substrate surface

Oxygen atoms from the flame bond to these fissures

Inks adhere to the oxygen bridges



Pre-treatment

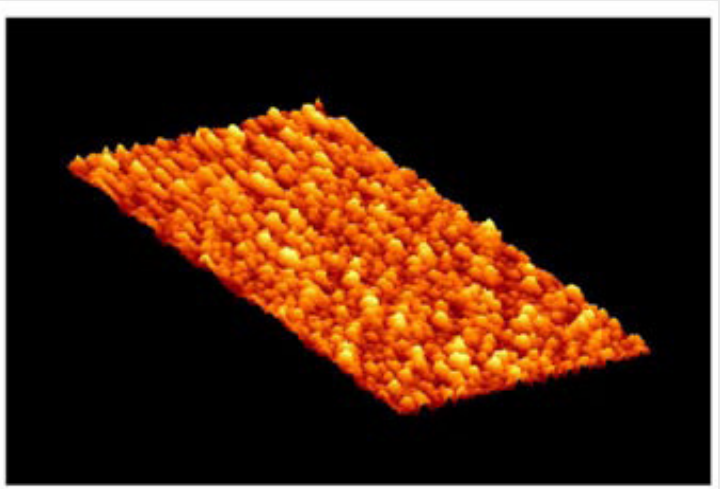
Pyrosil® treatment

- (pyro = flame; sil = silane -> silane-coating)
- Silane gas is injected into the flame and forms to a silane coating on the glass surface
- The silane coat provides a perfect anchor for UV glass inks

Pre-treatment

Silane coating appears in a thickness between 20 and 40 nm

Under a microscope we have a thin, very rough (high RZ value) glass coating on the surface



Pre-treatment Pyrosil

Benefits

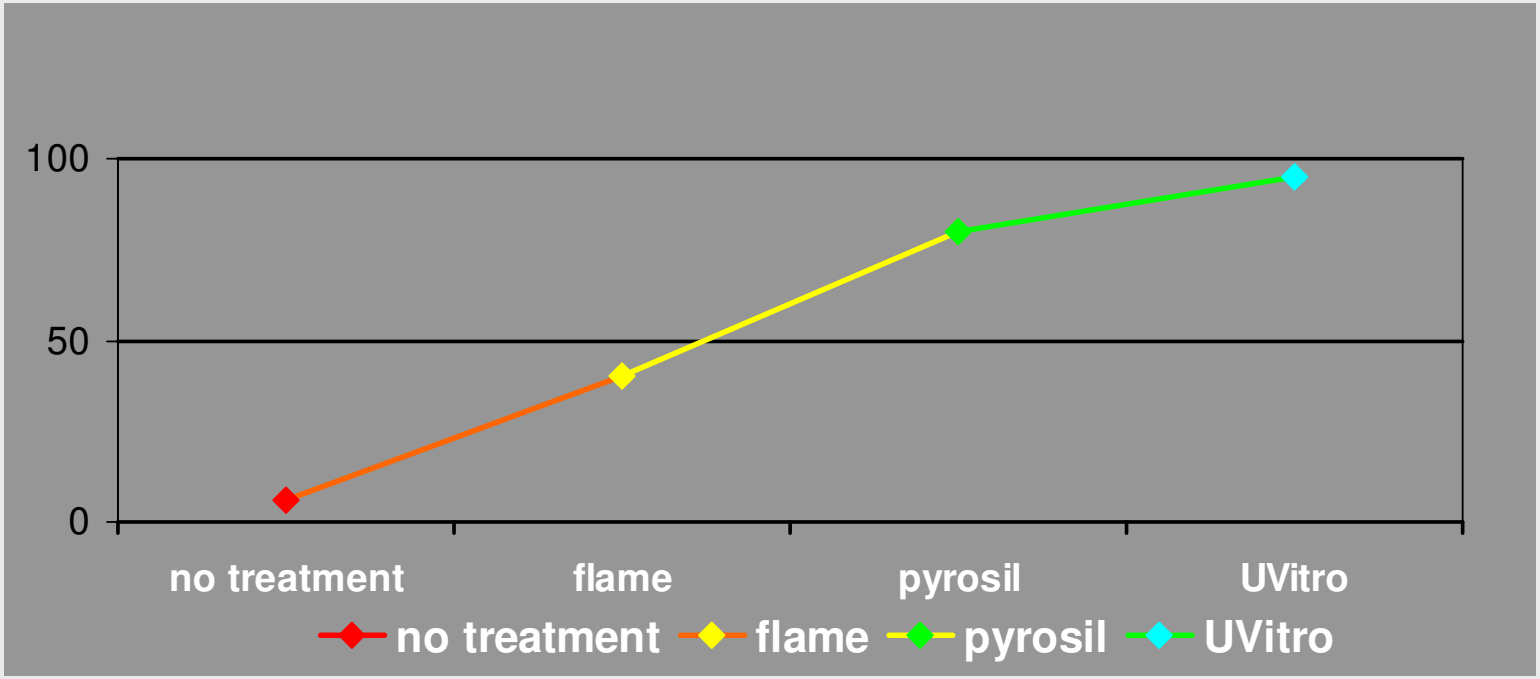
- Increased surface area (roughness)
- Increased adhesion
- Increased surface energy
- Short timeframe

Impact

- Increased mechanical adhesion
- Increased chemical resistance
- In-line application

Comparison of pre-treatment

Comparison of pre-treatment processes with regard to adhesion



Benefits of UV Inks

Benefits from UV Ink usage

- Significant energy savings
- Free of heavy metals
- Environment friendly, reduced CO2 emission
- Superior chemical resistance
- No color shade shift during production
- No degradation of the glass' physical properties

Benefits of UV Inks

Benefits from UV Ink usage

- Special color mixing and matching in house
- Reliable reproduction of Pantone and custom colors
- Intensive colors, especially reds and yellows

Future Expectation

- More tableware branding for beverages
- Demanding product safety regulation
- Long lasting bright images

Summary

- Brighter colors
- Longer Visual Branding
- Less Health and Safety impact
- Customer Satisfaction

Durable decoration with UV inks in daily use

Thank You for Your Attention

Your Glass Ink Team Marabu