Capa® -
Polycaprolactone polyols
Reactive diluents for 2K PU
**Capa® - Polycaprolactones**

- Aliphatic, liquid, low viscosity polyols suitable as reactive diluents in 2K PU formulations

By adding Capa® - polycaprolactones to an 2K solvent borne formulation following benefits can be obtained:

- Decreased VOC with maintained viscosity
- High gloss and excellent aspect due to perfect compatibility between Capa and the acrylic
- Improved drying time and increased flexibility
- Improved scratch and abrasion resistance
- Improved outdoor durability
Products and formulations

All formulations are identical apart from the polyol part

- **A - Reference system - with polyester, f = 4**
  - Commercial high solids formulation based on acrylic polyol with 10% of polyester polyol

- **B - Acrylic with Capa 3050, MW=540g/mol, f = 3**
  - The polyester in the reference formulation is replaced on OH basis. The amount of Capa 3050 has been adjusted to match the OH content of the polyester.

- **C - Acrylic with 2*Capa 3050, MW=540g/mol, f = 3**
  - Twice the amount needed to match the OH content of the polyester polyol has been added to the formulation

- Tolonate HDT LV 2 at a ratio of NCO/OH=1.05 for all the systems
- All formulations have been cured at room temperature
In formulation B Capa® is added to match the OH content of the polyester reference. Formulation C contains twice that amount while keeping an equal OH molar ratio.

* Solvent ratio 8:67:25  ** BYK-315, BYK-322. BYK-358

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
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<tbody>
<tr>
<td><strong>Part A</strong></td>
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<tr>
<td>Reference</td>
<td>71.43</td>
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<td>61.5</td>
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<tr>
<td>Acrylic polyol</td>
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<td>Capa 3050</td>
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<tr>
<td>Capa 3050</td>
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<tr>
<td>Solvent mixture</td>
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<tr>
<td>(BuAc+Solvesso 100+MAK)*</td>
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<td>Additive package**</td>
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<tr>
<td>DBTL (1 % in BuAc)</td>
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<tr>
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<tr>
<td><strong>Part B NCO/OH 1.05</strong></td>
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<tr>
<td>(BuAc+Solvesso 100+MAK)*</td>
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</table>
| to adjust viscosity to 22 sec in DIN cup 4 at 23 C | 16.6 | 10.4 | 0
Effect on VOC

VOC in g/l to obtain 22 sec in DIN cup 4 at 23 C

By addition of Capa® to the formulation it is possible to further decrease the VOC content without compromising the viscosity.
Pot life

- A - Reference system
- B - Acrylic/Capa 3050
- C - Acrylic/2*Capa 3050

Capa® - polycaprolactones are very reactive

The pot life can be adjusted by the amount of catalyst used in the formulation
Addition of Capa®-polycaprolactones decreases the drying time of the coatings

Measure performed Erichsen coatmaster 509 MC
Capa® - polycaprolactones are fully compatible with acrylic resins and do not affect the aspect or appearance of the coatings.
Addition of Capa® - polycaprolactones increases the scratch resistance of the coating.
Scratch resistance

Scratch resistance was performed on Taber Model 550 (rotation speed 0.5 tr/min) Applied on Taber glass panels (hole in the center) at RT

The resistance of the coatings towards permanent scratches is largely increased with the addition of Capa® - polycaprolactones
Abrasión resistencia

**Taber abrasión on steel**
CS10 wheels, 500 g load, 1000 cycles

- A - Reference system
- B - Acrylic/Capa 3050
- C - Acrylic/2*Capa 3050

The coating formulations containing Capa® - polycaprolactones show a superior abrasion resistance compared to the reference formulation containing a conventional polyester.
Chemical resistance

Chemical spot test

- Ethanol (48%) 5min
- Xylene (5 min)
- Sulfuric acid 10%(1h)
- Skydrol (5 min)
- Acetic acid 10% (1h)
- Ammoniacal solution 10% (1h)

5 = no mark, 0 = destroyed surface

- A - Reference system
- B - Acrylic/Capa 3050
- C - Acrylic/2*Capa 3050

5 = no mark and 0 = destruction of the film

- All coatings show very good chemical resistance
- Slight improvement of Xylene resistance was observed for form. B

Layer thicknesses of 150µm wet which corresponds to 40 µm dry on Q-panel
Flexibility

- Addition of Capa largely increases the flexibility of the system
- Proportional to the amount of Capa
AFNOR impact resistance
Evaluated on coatings heated during 24h at 80°C and then cooled to -25°C for 3h

The high flexibility of Capa® - polycaprolactones offers improved flexibility even at – 25 °C
Pendulum hardness

Capa® - polycaprolactones offer increased flexibility without any significant impact on the final hardness of the coatings.

Pendulum Koenig hardness (in s) of coatings cured at RT

Measured on glass, layer thicknesses of 150µm wet which corresponds to 45µm dry.
QUV-B exposure
Decrease in gloss at 20°

Accelerated weathering (QUV-B)

- Measured on Al panels: 45µm dry of clearcoat over white basecoat,
- Cycle: succession of 4 hours periods of UV-B exposure at 60°C each followed by 4 hours periods of condensation at 40°C

Coatings containing Capa® - polycaprolactones are more resistant to UV-B exposure in terms of gloss retention
Conclusions

By replacing a standard polyester reactive diluent in a 2K solvent borne formulation with Capa® - polycaprolactones the following benefits are obtained:

- Lower VOC content at comparative viscosity
- A decreased drying time of the coating
- Highly improved scratch and abrasion resistance
- Improved outdoor durability and humidity resistance
- Increased flexibility, even at low temperatures
- No compromise on final hardness
- Excellent coating properties with less amount of polyol:
  - comparing the amount of Capa® needed in the formulation vs the standard polyester