



PACKAGING COATINGS & INKS SEGMENT TEAM

EBECRYL[®]571

UV curable resin for flexographic narrow web printed shrink sleeve applications

LAUNCH PRESENTATION

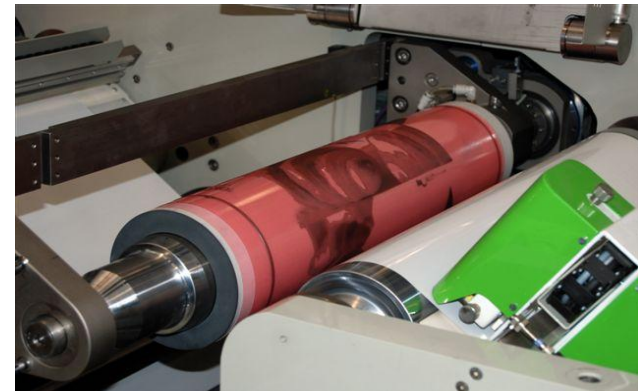
EBECRYL®571: Presentation Overview

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Attractiveness of Shrink Sleeves

- For the consumer
 - Attractive packaging
- Marketing
 - Possibility for differentiation against competition
 - 360° information – 100% surface covered
 - Special forms are possible
 - Brand recognition
- Graphics industry – Flexo printing
 - High quality printing
 - Shorter runs – Narrow web



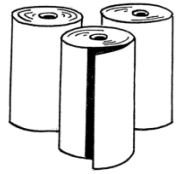
Attractiveness of Shrink Sleeves

- Packaging industry
 - Printed on the inside: protection against scratch
 - Labels are moisture resistant
- Food safety
 - Sealing band to protect against opening of the lid
 - Protection against UV light when used on clear bottles

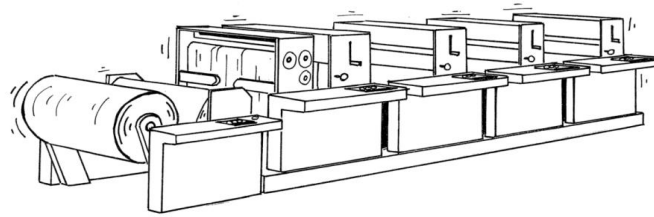


- Sustainability
 - Recycling: label can be same material as bottle
 - No glue between label and bottle
 - PLA: renewable sources based + biodegradable

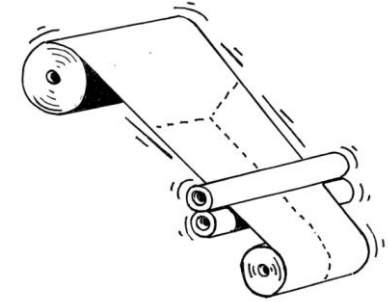
EBECRYL® 571: Shrink Sleeve Conversion Process



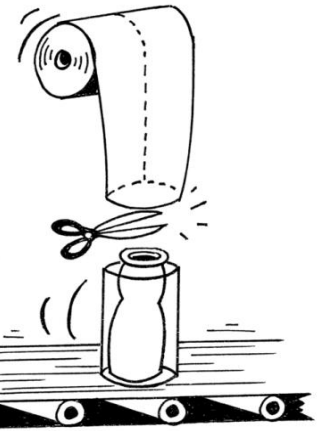
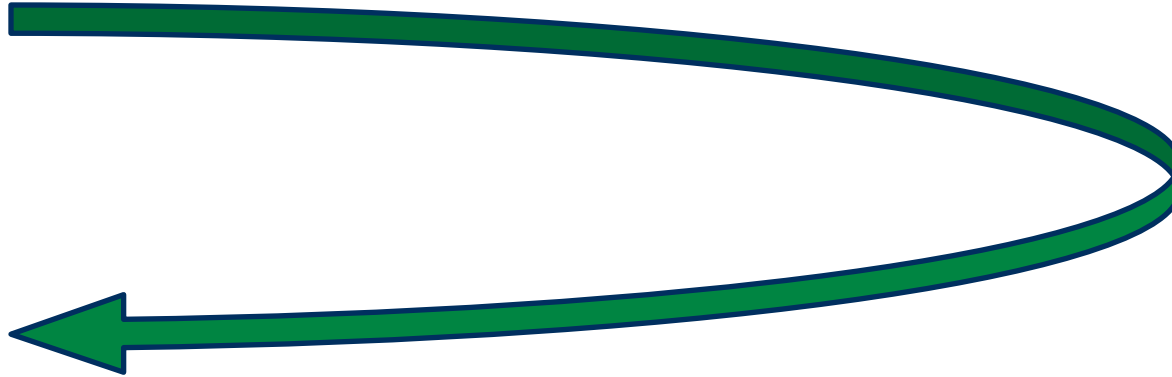
Substrate



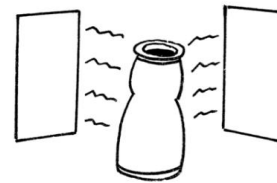
Flexo printing



Seaming



Sleeving + cutting



Shrinking



Final result



EBECRYL®571: Product Introduction

- EBECRYL®571 is specially developed for use in flexo printed shrink sleeve applications
- EBECRYL 571 is a modified polyester resin diluted with 40% of dipropyleneglycol diacrylate (DPGDA) which exhibits good pigment wetting properties

Performance highlights

- UV/EB cured formulations based on EBECRYL 571:
 - exhibit good pigment wetting properties
 - have good adhesion to the filmic substrates which are typically used in heat shrink sleeve applications: PVC, PET-G, OPS
 - demonstrate high flexibility and good printability
 - show excellent wrinkle resistance during transverse directional shrinkage

Typical Values – Physical Properties

• Dynamic viscosity	± 9000	mPa.s at 25°C
• Colour	max. 3	Gardner
• Density	1.14	g/cm ³
• Polymer solids	60	% by weight
• DPGDA	40	% by weight

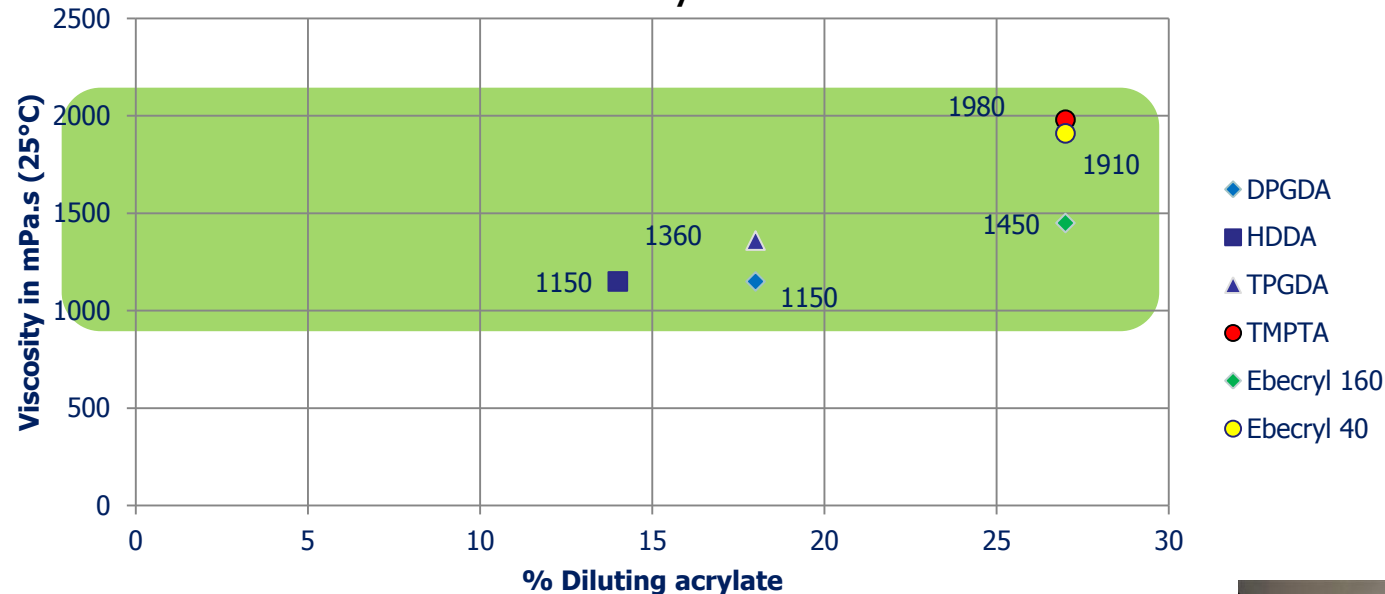
Typical Cured Properties

• Tensile strength ⁽¹⁾	8	MPa
• Tensile elongation ⁽¹⁾	20	%
• Young Modulus, ⁽¹⁾	551	MPa
• Tg (by DHTA- max tg δ)	44	°C
• Surface tension	39	dynes/cm
• Refractive index @ 25°C	1.5069	

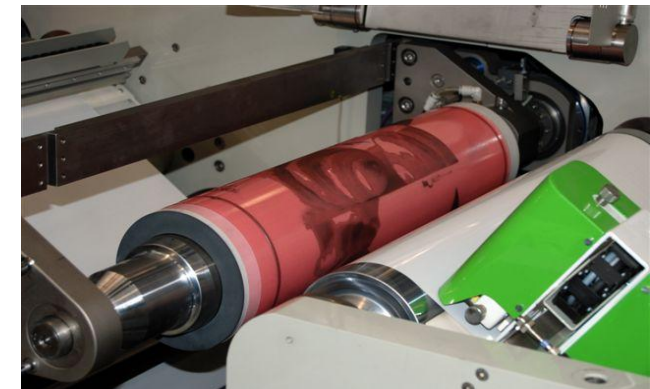
⁽¹⁾ Measured on a 125µ UV cured film at 21°C

Viscosity Reduction

- EBECRYL®571 can be further diluted with reactive monomers
- The specific reactive diluent(s) used will influence performance properties such as hardness and flexibility.



EBECRYL®571 +	%	Viscosity (25°C, in mPa.s)
DPGDA	18	1150
HDDA	14	1150
TPGDA	18	1360
TMPTA	27	1980
EBECRYL®160	27	1450
EBECRYL®40	27	1910



Start Point Formulations – Process Color Inks

Pigment Pastes

- EBECRYL®571 is very effective in concentrations from 40 to 60 % in the final concentration.

Pigment paste	YELLOW	MAGENTA	CYAN	BLACK
EBECRYL®571	65	60	54.5	50
ADDITOL®S130	1	1	1	1
Pigment wetting additives	4	4	3.5	4
Pigment DGR	30			
Pigment 4BY		35		
Pigment GLO			40	
Pigment SB250				45

- **Pigments:**
 - Permanent Yellow DGR (Clariant)
 - Sunbrite 219-0203 (4BY) (SUN)
 - Irgalite blue GLO (Ciba)
 - Special black 250 (Degussa)

Start Point Formulations – Process Color Inks

Ink preparation	YELLOW	MAGENTA	CYAN	BLACK 1	BLACK 2
Pigment paste	47	47	40	40	40
EBECRYL [®] 571 / DPGDA (82/18)	33	33	36	40	35
DPGDA	11.5	12	16	10	
EBECRYL [®] 40					15
PI-MIX	8.5	8.5	8.5	10	10

Pigment concentration	14 %	16 %	16 %	18 %	18 %
EBECRYL 571 concentration	58 %	55 %	51 %	53 %	49 %
Viscosity range (25°C, in mPa.s)	1500	1400	960	1250	1800
Optical density	1.64	1.42	1.91	2.10	2.01

Start Point Formulations – Process Color Inks

- The ink letdown is prepared with DPGDA as diluting monomer. For high levels of shrinkage we recommend the use of di-acrylate products as DPGDA, HDDA or TPGDA
- Depending on the requirements of the ink, other diluting acrylates can be used as well. See black ink 2 as example: partially replacing DPGDA with EBECRYL[®]40 results in higher reactivity and higher hardness, but at the cost of some loss in shrinkage properties



Starting Point Formulation for White Ink

- EBECRYL® 571 can also be used in white ink for shrink sleeve applications

Ink preparation	WHITE
EBECRYL® 571 / DPGDA (75/25)	53
ADDITOL® S130	1
Pigment wetting additives	1
PI-mix	5
TiO₂	40

EBECRYL 571 concentration	40 %
Viscosity (25°C, in mPa.s)	± 1500

- Remark: in none of the proposed formulations slip additives are used
- A certain amount of slipping additives can be necessary to facilitate the production process of the shrink sleeves
- Typical products that are suitable to obtain these properties are EBECRYL 350 and EBECRYL 1360

Start Point Formulations – Metallic Inks

- The nature of EBECRYL® 571 makes this resin suitable for metallic pigments.

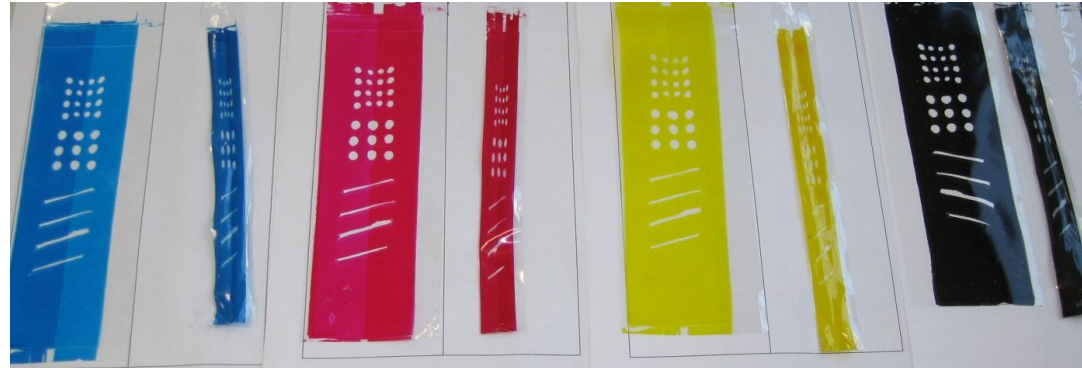
Ink preparation	Gold	Silver
EBECRYL® 571	29.5	34.5
DPGDA	30.0	35.0
ADDITOL® S130	2.0	2.0
PI-mix	8.5	8.5
Rich Gold C82	30.0	
Miral 80000A		20.0

- **Rich Gold C82 (Eckart)**
- **Miral 80000A (AVL metal powders)**

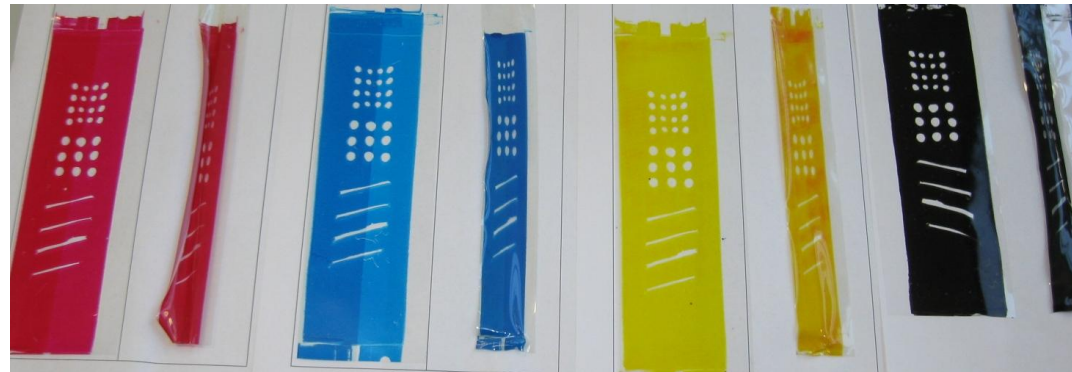
Testing in Shrink Applications

Shrink properties are intensively tested for all colors on different substrates:

Thermodur: PET-G

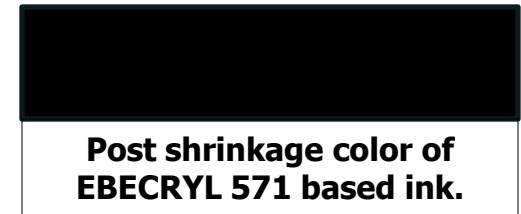
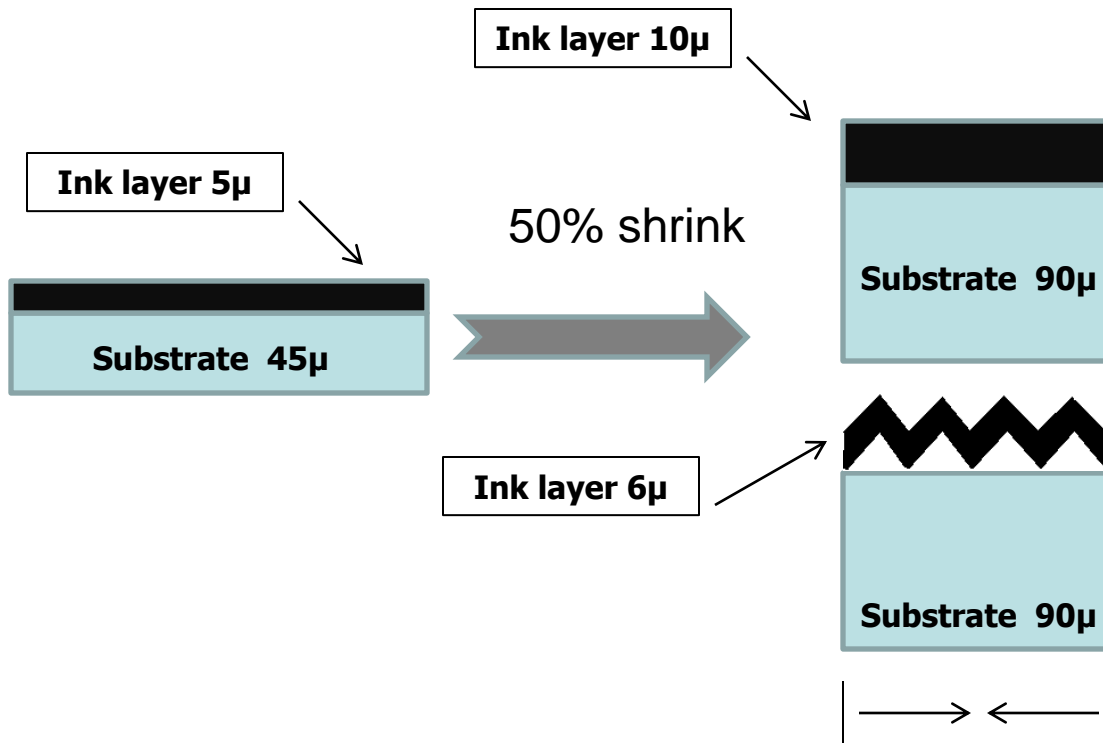


Genotherm: PVC



Testing in Shrink Applications

- Special attention was given to keep the colour strength in areas with high degree of shrinkage with special attention given to black pigments.



Conclusion:

Developed for adhesion to PVC, PET-G and OPS specifically with Flexo narrow web printed heat shrink sleeve application in mind EBECRYL[®] 571 has:

- excellent pigment wetting: suitable for process colors and is compatible with metallic and white pigments.
- shows excellent wrinkle resistance during transverse directional shrinkage.
- demonstrates high flexibility and good printability
- has REACH, TSCA, ENCS, ECL regulatory status
- and is available for sampling and commercial ordering on a global basis.

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