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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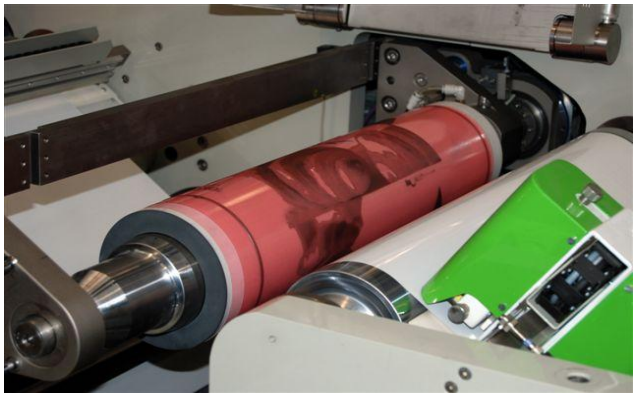
Attractiveness of Shrink Sleeves

- 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



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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

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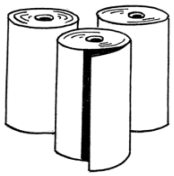
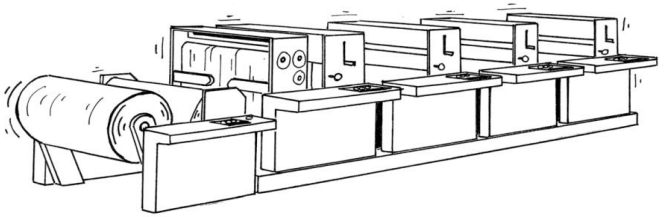
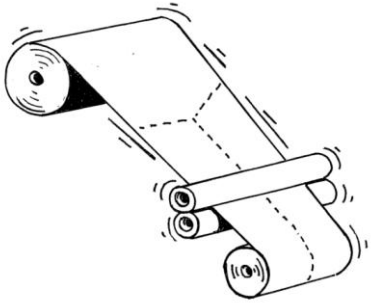
EBECRYL®571: Shrink Sleeve Conversion Process



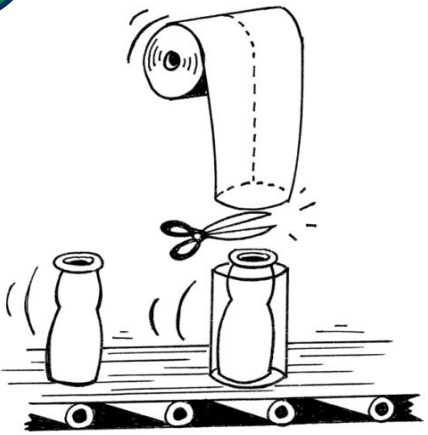
Substrate



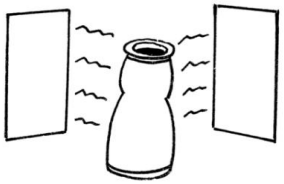
Flexo printing



Seaming



Sleeving + cutting



Shrinking

Final result

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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

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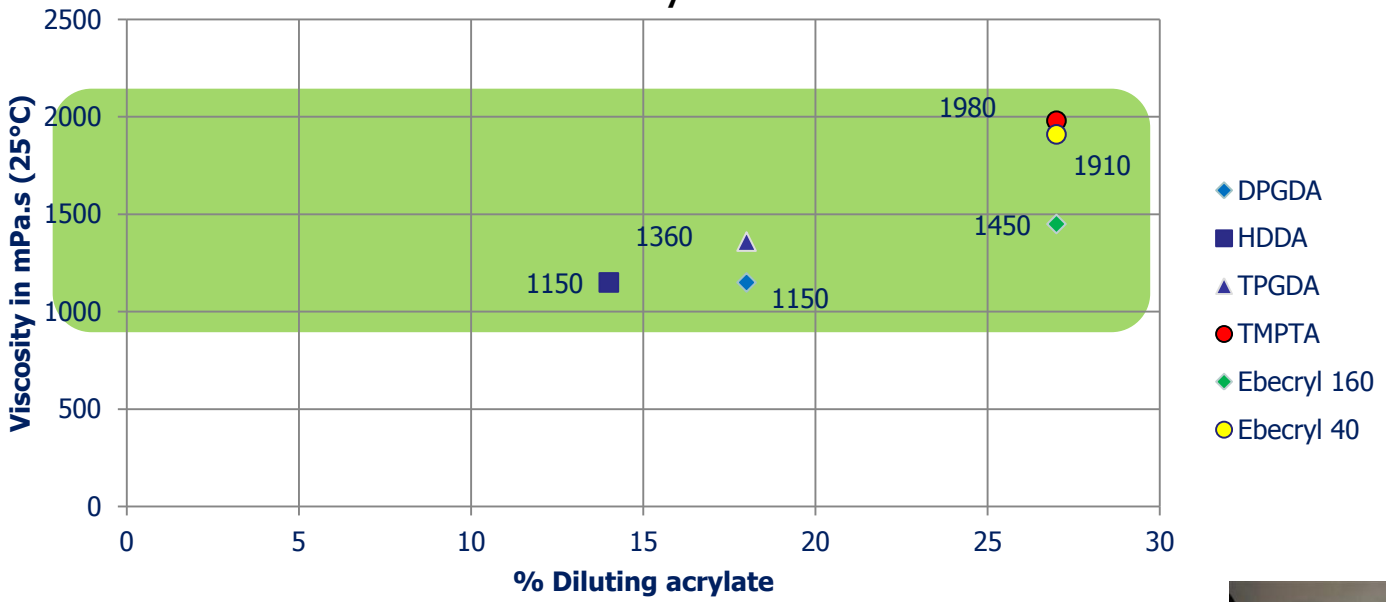
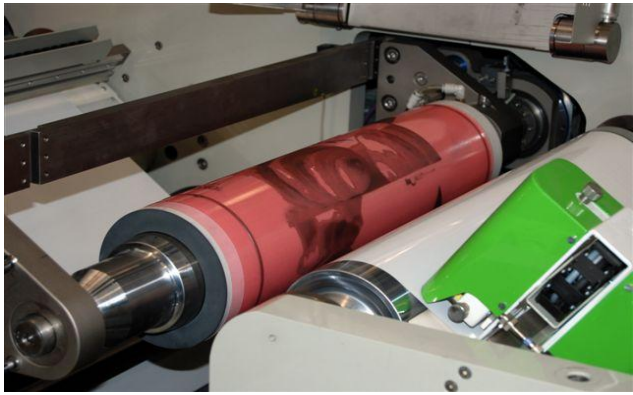
Viscosity Reduction

- 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



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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)**

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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

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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

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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
TiO_2	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

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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)**

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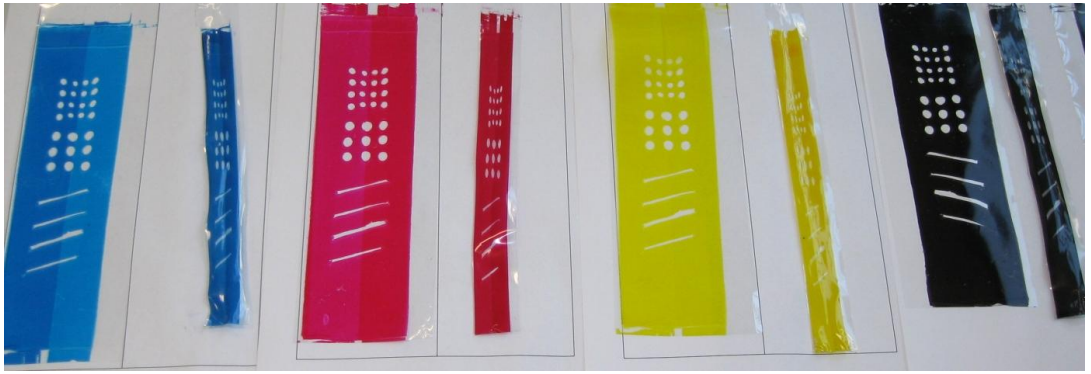
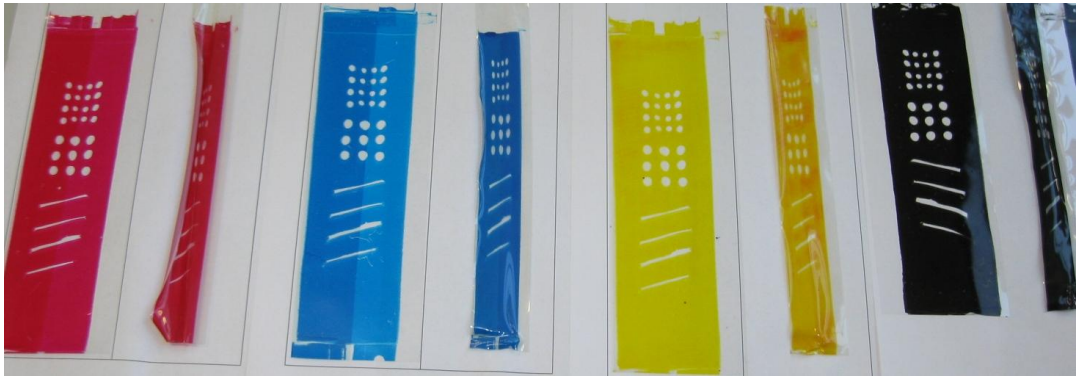
Testing in Shrink Applications

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

Thermodur: PET-G

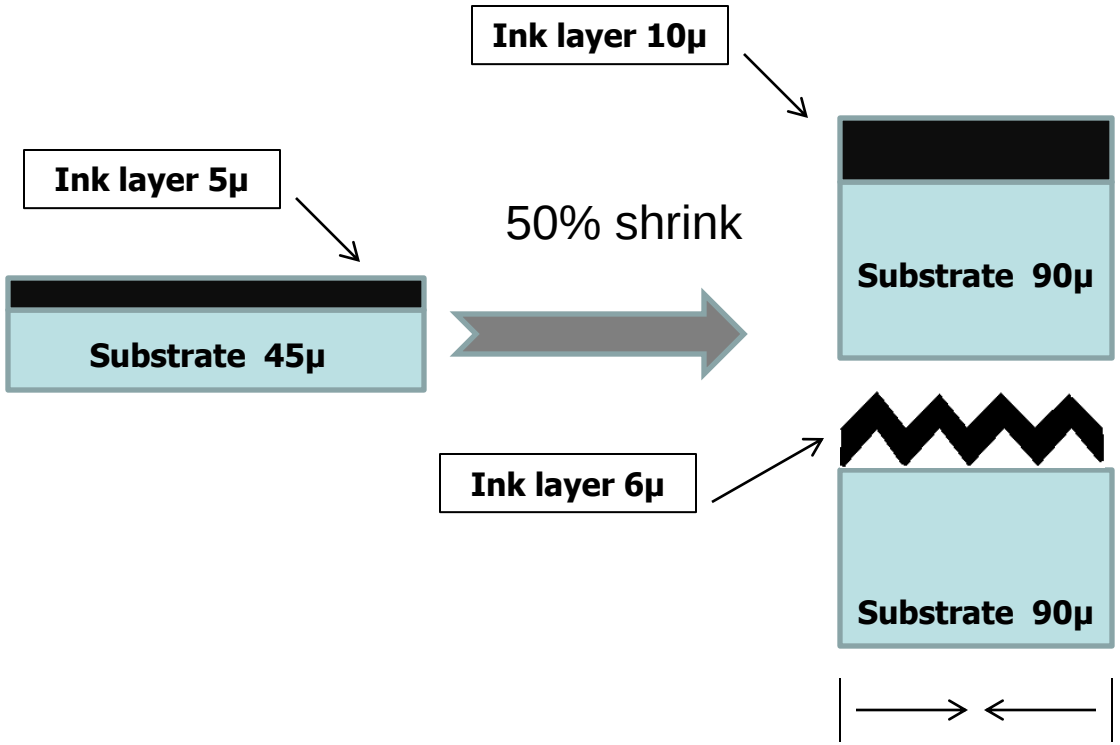


Genotherm: PVC



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.



Post shrinkage color of EBECRYL 571 based ink.

Post shrinkage color of conventional UV ink.

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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.

For further information on our products, please contact your Cytec Sales Representative or the Product Referral Team at:

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