Pure Monomer Resins Application

Content

- Product range and families of pure monomer resins
- Decision factors in using pure monomer resins
- PMR application in SBC and EVA polymer
- Regalrez™ hydrogenated hydrocarbon resins
- FDA compliance of pure monomer resins

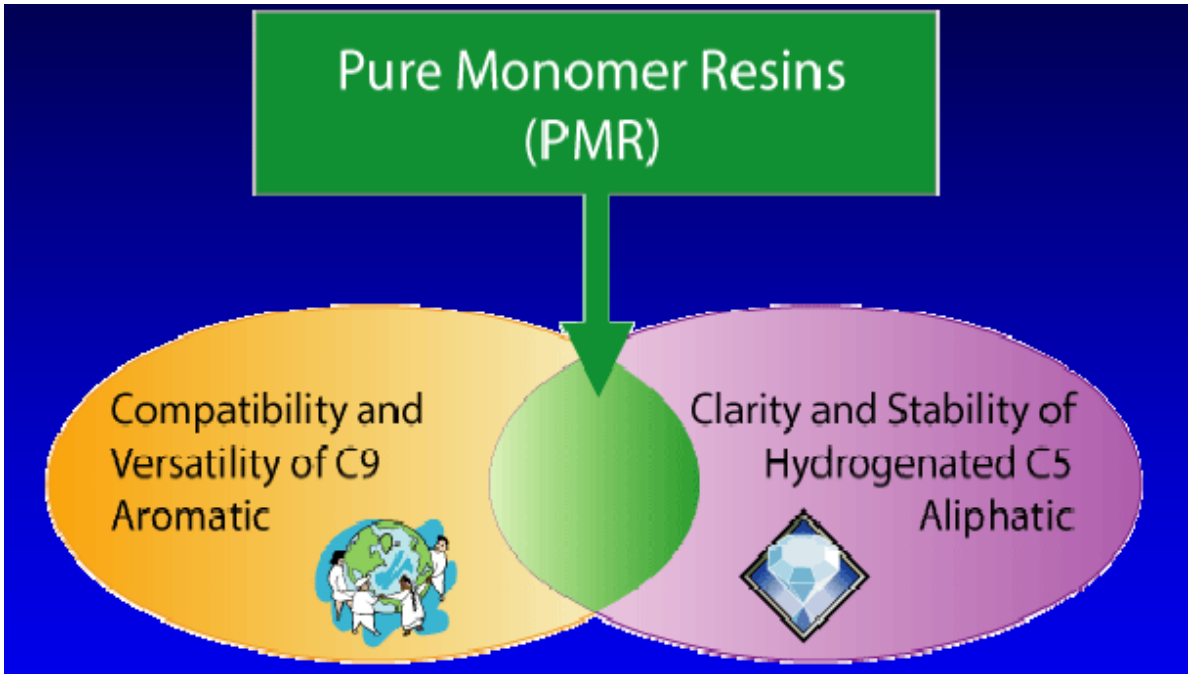
What are pure monomer resins (PMRs)?

- Made from purified aromatic starting materials
- Water white resins with excellent thermal and UV stability
- Amorphous, usually low molecular weight compounds
- Softening point & physical form: liquid -160°C
- FDA direct food contact approval

The solution for low color, excellent thermally stable resins with broad compatibility

EASTMAN

Why Pure Monomer Resins?



Pure Monomer Resins (PMR)

The solution for low color, thermally stable resins with broad compatibility

EASTMAN

Pure Monomer Resin Selection

- Polymer Compatibility
  - Solubility parameters/cloud points
  - Molecular weight
  - Hydrogenation
- Physical Properties
  - Softening point
  - Glass transition temperature
- Other Factors
  - FDA compliance

Pure monomer resins product introduction

Product Name	RBSP°C	Color, 50%	MMAP	DACP	OMS	HMDA	Tg, °C	Mz
***Endex*™ Resins**		**YID**						
***Endex*™ 155**	152	7	16	-23	115	123	100	14300
***Endex*™ 160**	160	7	18	-15	138	130	105	19500
***Kristalex*™ Resins**		**YID**						
***Kristalex*™ F 85**	86	<1 G			46	45		1950
***Kristalex*™ F 100**	99	< 1 G			73	57		2200
***Kristalex*™ F 115**	116	< 1 G						4150
***Kristalex*™ 1120**	120	7	5	-35	> 180		56	7300
***Kristalex*™ 3070**	70	8	0.4	<-50	9/7	18	27	1300
***Kristalex*™ 3085**	85	8	1.5	<-50	44/39	42	36	1990
***Kristalex*™ 3100**	100	5	4	<-50	60/55	60	46	2700
***Kristalex*™3115**	115	5	3	<-50	107	81	64	4100
***Kristalex*™ 5140**	140	7	9	-48	>175	111	88	9590
***Piccolastic*™ Reins**		**Gardner**						
***Piccolastic*™ A5**	5	2	-4	<-50	140/-5			510
***Piccolastic*™ A75**	75	1	6	<-50	93/72		28	2450
***Piccolastic*™ D125**	125	2	13	-32	>180		60	207000
***Piccotex*™ Resins**		**YID**						
***Piccotex*™ 75**	75	10	1	<-50	-12	57	29	1700
***Piccotex*™ LC**	90	10	2	<-50	-13	62	43	2400
***Piccotex*™ 100**	98	8	6	<-50	18	83	42	4300
***Piccotex*™ 120**	118	7	10	-35	51	105	68	6400
***Plastolyn*™ Resins**		**Gardner**						
***Plastolyn*™ 240**	120	1	8	<-50	> 180	8	74	14985
***Plastolyn*™ 290**	140	1	9	-44	> 180	9	91	20130

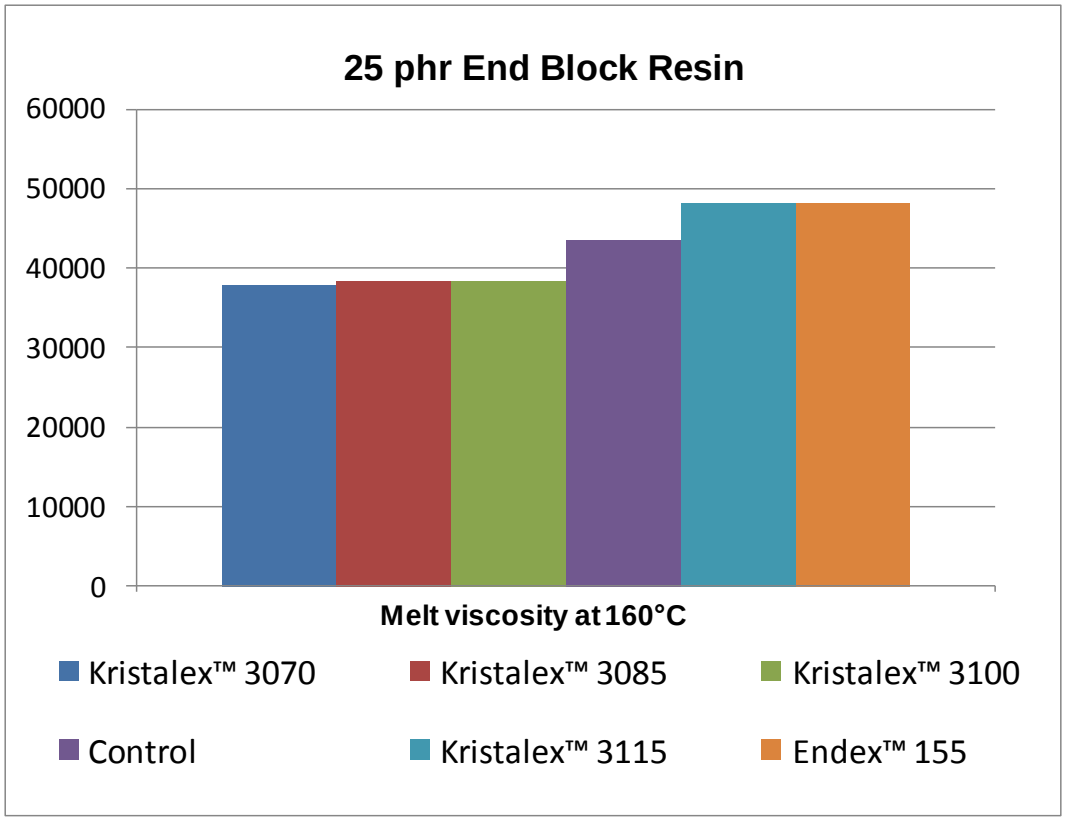
EASTMAN

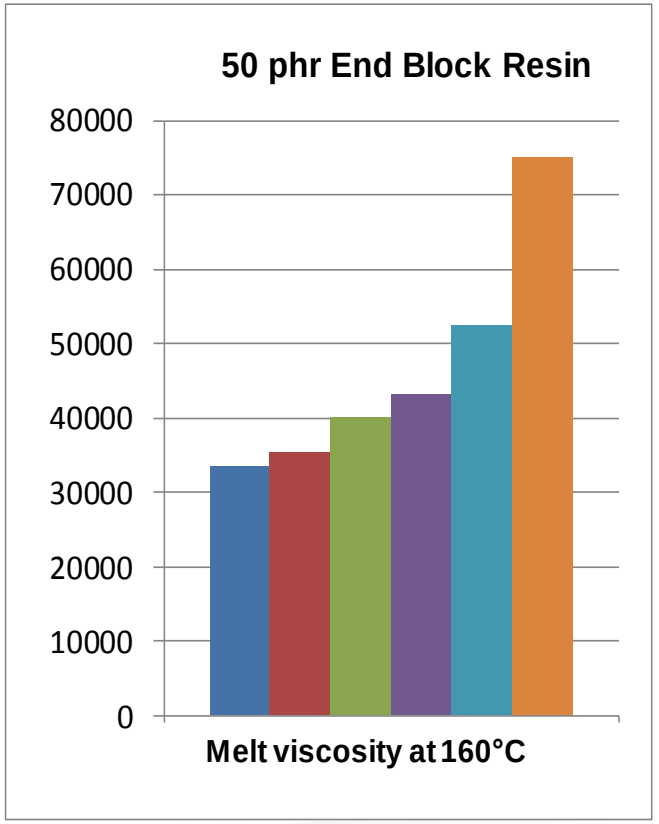
Pure Monomer Resins in Block Copolymer System

Application of pure monomer resins

Viscosity modification

纯单体树脂用于SBC热熔胶粘度调整



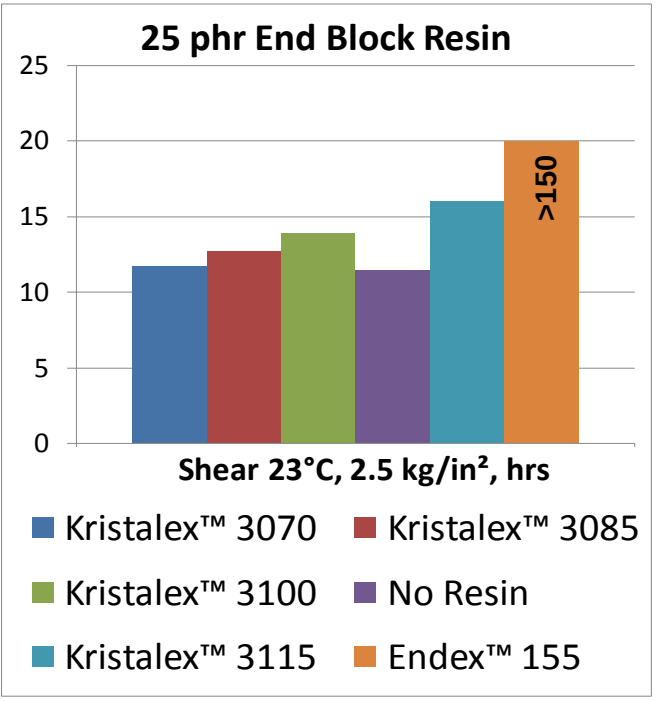


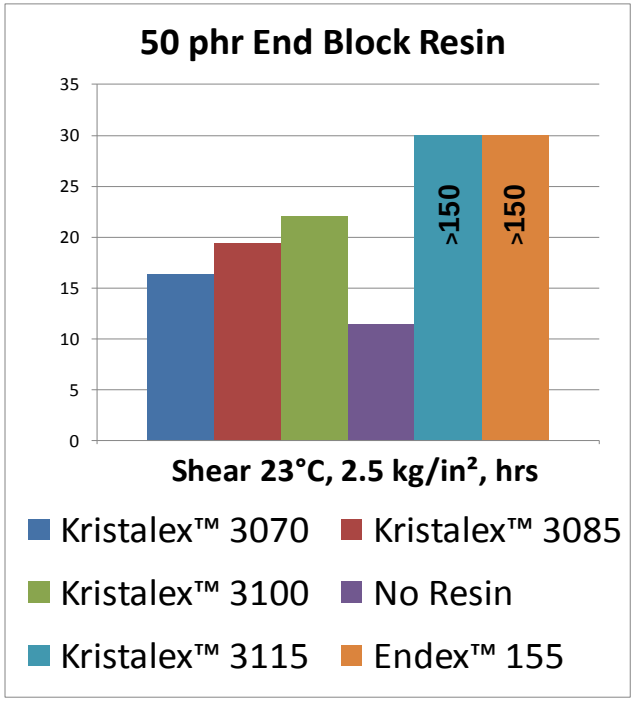
Control formula: SIS (15% styrene): 100 phr, Piccotac™ 1095: 120 phr, naphthenic oil: 10 phr

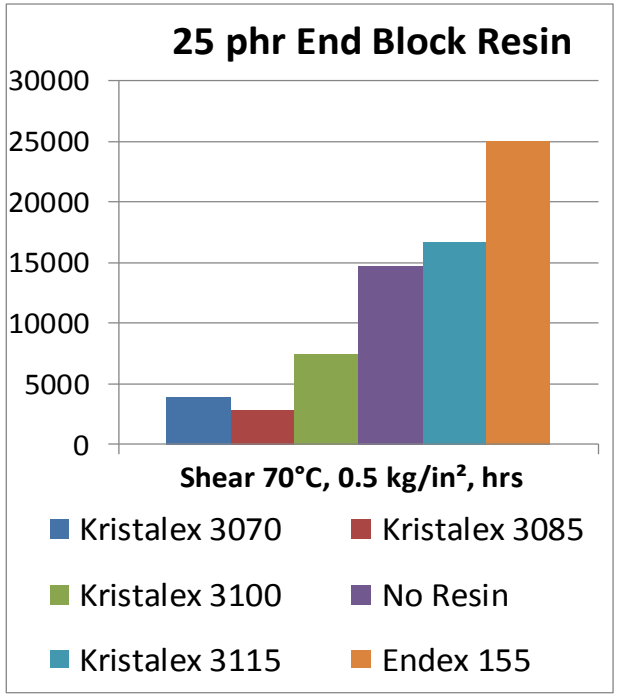
EASTMAN

Application of pure monomer resins

Improve room/high temperature shear resistance





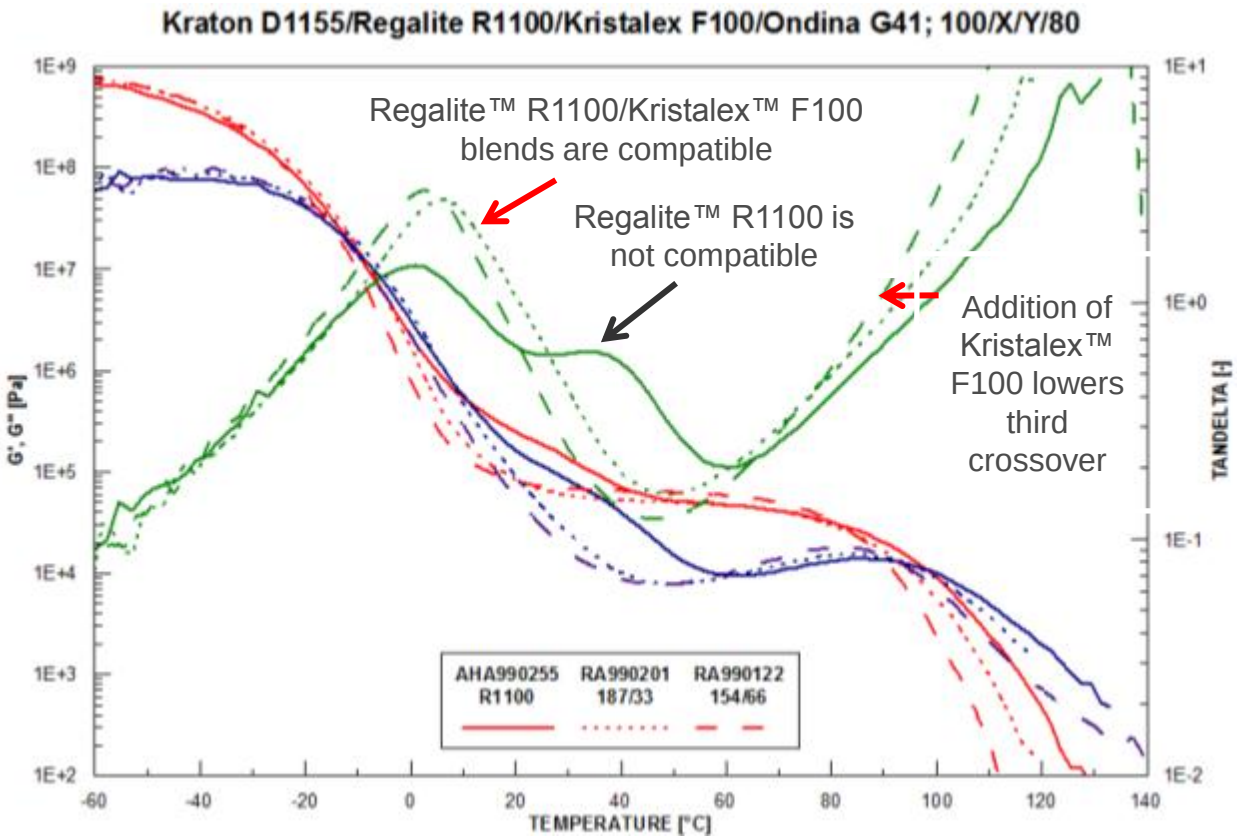


Control Formula: SIS (15% styrene): 100 phr, Piccotac™ 1095: 120 phr, naphthenic oil: 10 phr

EASTMAN

Application of pure monomer resins

Improve compatibility of fully H2HCR with SBS



- Blend of pure monomer resins with fully hydrogenated HCR can be compatible with middle block of SBS
- Increasing the ratio of pure monomer resin in the blend results in more end block softening

Using blend of pure monomer resin with fully H2HCR gives the possibility to formulate SBS adhesive with much better thermal stability than adhesive with partially H2HCR

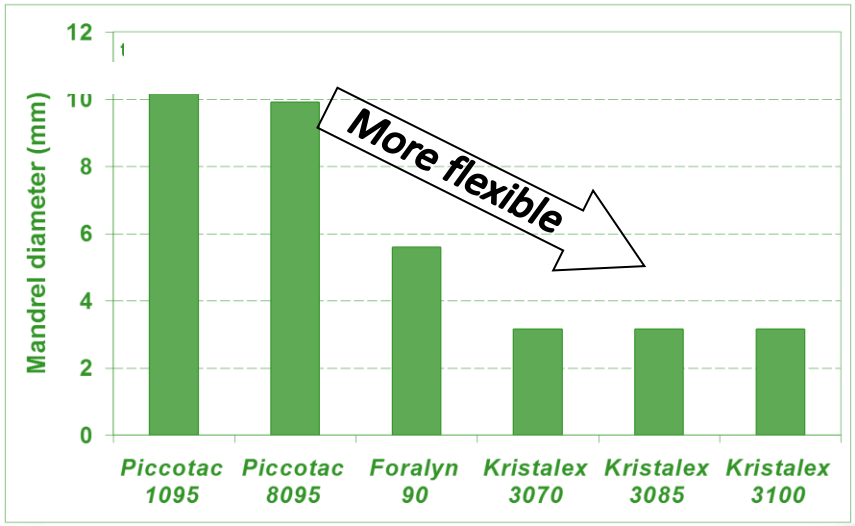
SBS/resin/oil=100/220/80

Pure Monomer Resins in EVA Hot Melt for Packaging

Application of pure monomer resins

EVA hot melt adhesive

Flexibility of EVA HMA with different Resins at -20°C



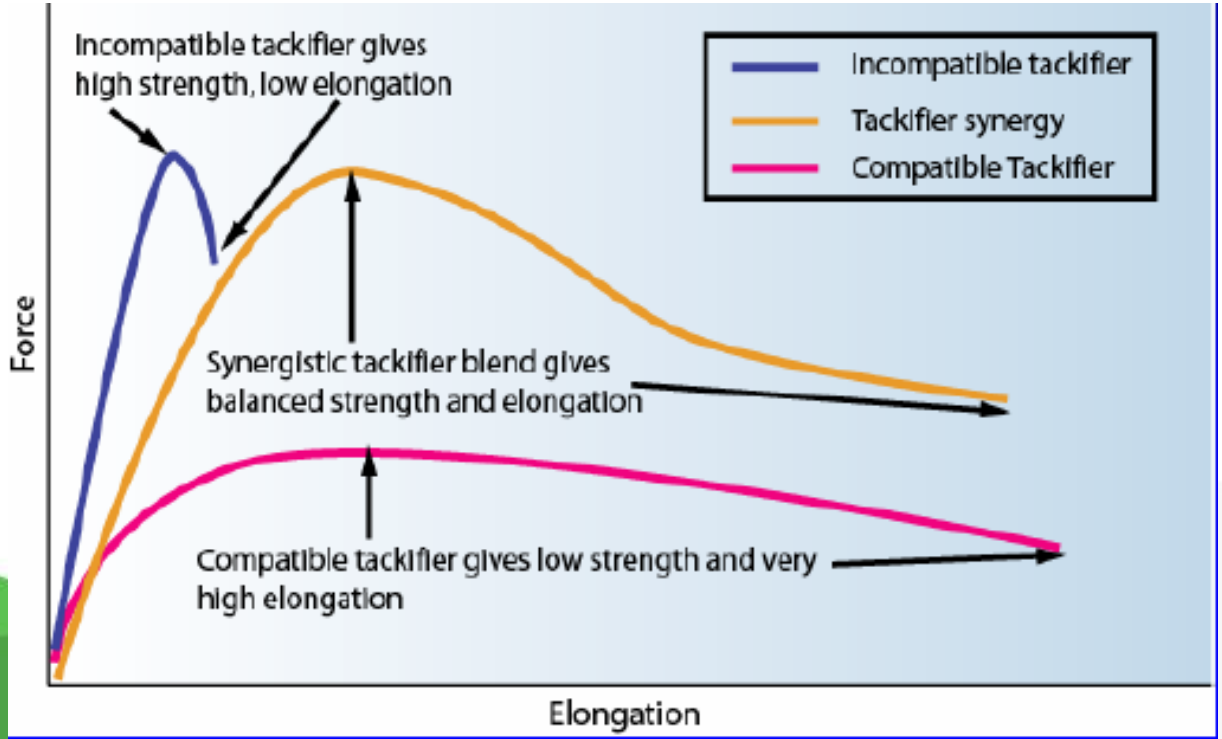
PMR resins = greater low temperature flexibility

- Utilize limited EVA compatibility for better cohesion, hot strength, better low temperature properties, fast setting
- Blends with fully H2HCR can adjust the compatibility with EVA, even to give excellent clarity for specialty applications
- FDA Direct Food Contact Approvals

EASTMAN

Tackifier Synergy with Pure Monomer Resins

- Tackifying resins can combine in mixtures of two or more types that have properties neither resin has individually
- A nonpolar hydrogenated hydrocarbon tackifier can be combined with a relatively polar aromatic tackifier to formulate a blend with specific compatibility



EASTMAN

Unique Pure Monomer Resins

Liquid

Pure Monomer Resins

- Piccolastic™ A5
  - Liquid styrenic resin
  - Ultimate in end-block softening
  - Plasticizer for SBS, SBR, polychloroprene, EVA, acrylics
  - Uses: Frozen food labels and packaging assembly tackifier for contact adhesives

High Molecular Weight

Pure Monomer Resins

- Endex™ 155 and 160
  - Only products available with Tg higher than polystyrene – true endblock reinforcing resins
- Kristalex™ 5140
  - Improves high temperature resistance and cohesion of EVA-based hot melts
- Piccolastic™ D125
  - Increase ambient temperature cohesion with reduced impact on application viscosity

EASTMAN

Regalrez™ hydrogenated hydrocarbon resins

Regalrez™

Product	Source	Softening Point, R&B, °C	Color, YI	Molecular weight distribution				Cloud Points, °C	
				M_n	M_w	Pd	M_z	DACP	MMAP
Regalrez™ 1018	USA	18	8*	390	420	1.1	460	15	68
Regalrez™ 1085	USA	85	2	680	925	1.4	1,200	40	85
Regalrez™ 1094	USA	94	2	630	900	1.4	1,370	54	83
Regalrez™ 1126	USA	124	3	720	1,250	1.7	2,000	62	91
Regalrez™ 1128	USA	128	3	1,050	1,800	1.7	2,900	67	101
Regalrez™ 1139	USA	140	3	1,500	3,100	2.1	5,400	81	108
Regalrez™ 6108	USA	108	4	780	1,500	1.9	2,500	15	54
Regalrez™ 3102	USA	102	3	880	1,300	1.5	1,900	-30	24

*neat

- Hydrogenation at different levels to achieve different degree of aliphatic/aromatic balance
- Regalrez™ 1xxx
  - Fully hydrogenated to give aliphatic characteristics
- *Regalrez*™ 3xxx and 6xxx are unique as partially hydrogenated pure monomer resins
  The only products with both aromatic/aliphatic composition and pure monomer resin color and stability properties

EASTMAN

FDA Compliance of Pure Monomer Resins

- Pure monomer resins use highly refined raw materials in precisely defined proportions
- To comply with FDA direct food contact regulations the composition and the toxicology of the product must be known
- All hydrocarbon resins comply with regulation 21 CFR 175.105 for use in adhesives and coatings with a functional barrier between the adhesive and food.
- Depending on the composition and degree of toxicological data available, pure monomer resins comply with some of the regulations for applications in direct contact with food.

Partial Listing of FDA Compliance For Pure Monomer Resins

	175.125	175.300	175.320	175.380	175.390	176.170	176.180	177.1200	177.1210	177.1400	177.1640	177.2600
PICCOLASTIC												
A5												√
A75	√	√	√	√	√	√	√	√	√	√	√	√
D125	√	√	√	√	√	√	√	√	√	√	√	√
PICCOTEX												
75							√					√
LC							√					√
100							√					√
120			√			√	√	√				√
KRISTALEX												
3070												
3085												
3100		√	√	√	√	√	√		√			
3115		√	√	√	√	√	√		√			
1120		√	√	√	√	√	√		√			
5140		√	√	√	√	√	√		√			
ENDEX												
155												
160												
PLASTOLYN												
240		√	√	√	√	√	√		√			
290		√	√	√	√	√	√		√			
All PMR comply with 21 CFR 175.105 Adhesives with indirect food contact												

EASTMAN

Summary of Key US FDA Food Contact Regulations

- 21 CFR 175.300 – Resinous and polymeric coatings in direct food contact, subject to extractable content limitations
- 21 CFR 175.320 – Resinous and polymeric coatings for polyolefin films in direct food contact
- 21 CFR 176.170 – Components of paper and paperboard in contact with aqueous and fatty food
- 21 CFR 176.180 – Components of paper and paperboard in contact with dry food
- 21 CFR 177.2600 – Rubber articles for repeated use as plasticizer not to exceed 30% by weight