NOVA Chemicals®

Expandable Styrenics

ARCEL® Resin Compatibility with EPS

A physical mix of ARCEL 730 resin and polystyrene typically used in EPS was processed on an American Leistritz 34 mm counter-rotating twin-screw extruder producing cold-cut pellets at various ARCEL resin concentrations. As shown in the following table, ARCEL resin does not affect extruder performance at levels up to 30%. Without raising extrusion temperatures, die pressure will start to increase slowly at higher concentrations.

Wt. % ARCEL resin	0	10	20	30	50	100
Extruder Zone Temperatures, °F	400	400	400	400	400	400
Die Temperature, °F	410	410	410	410	410	410
Screw speed, (rpm)	100	100	100	100	100	100
Screw Type	STD #2	STD #2	STD #2	STD #2	STD #2	STD #2
Die Pressure, (psig)	260	260	260	290	340	640
Vacuum, (in. Hg)	29	29	29	29	29	29
Current, (amps)	8.5	9.5	8.5	8.5	9.0	10.0
Die Melt Temperature, °F	415	410	410	410	410	430
Strand Appearance	Uniform	Uniform	Uniform	Uniform	Uniform	Fracture
Output Rate, (lbs./hr.)	10.7	11.4	10.7	11.5	11.1	10.9

Flex bars, tensile bars, and 3.25”x2.5”x0.125” plaques were produced from each blend using a Battenfeld 35-ton injection molder operating at standard polystyrene conditions. All parts exhibited uniform composition at all concentrations. The physical properties summarized below show that ARCEL resin at up to 30% concentration has a small but positive effect on polystyrene strength properties

Wt. % ARCEL resin Tensile	0	10	20	30	50	100
Strength at Break, ksi	6.2	6.4	6.6	6.5	6.1	3.3
Tensile Strain at Break, %	1.4	1.5	1.8	1.9	2.0	17.3
Young’s Modulus, ksi	460	470	420	400	350	240
Tensile Test Parameters: 50% Extensometer, 0.5 ipm Crosshead Speed						
Flexural Strength at Yield, ksi	8.2	8.7	9.3	9.5	9.8	7.8
Flexural Strain at Yield, %	1.7	2.0	2.2	2.4	2.9	5.1
Young’s Modulus, ksi	470	440	430	400	360	240
Flexural testing at 0.05 in/min; all samples broke except 100% ARCEL						
Notched Izod, ft-lb./in.	0.19	0.16	0.17	0.16	0.16	0.18
VICAT, °C	108	109	108	108	106	101

This study supports the conclusion that ARCEL resin is fully compatible with polystyrene and can be processed in typical polystyrene recycle streams without significantly affecting extrusion conditions or final product properties.

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