Ethylene vinyl acetate (EVA)

Description

Image

Caption

1. Slippers. © Zhangzhou Yongxin Trade Co. 2. Running shoes. © Adidas

The material

Ethylene-Vinyl-Acetate elastomers (EVA) are built around polyethylene. They are soft, flexible and tough, and retain these properties down to -60 C. Fillers improve both hardness and stiffness, but with some degradation of other properties. EVAs blend well with PE because of their chemical similarity. EVA is available in pastel or deep hues; it has good clarity and gloss. It has good barrier properties, little or no odor, is UV resistance and FDA-approval for direct food contact. The toughness and flexibility is retained even at low temperatures and it has good stress-crack resistance and good chemical resistance. EVA can be processed by most normal thermoplastic processes: co-extrusion for films, blow molding, rotational molding, injection molding and transfer molding.

Composition (summary)

(CH2)n-(CH2-CHR)m

General properties

Density		59	-	59.6	lb/ft^3
Price	*	1.04	-	1.15	USD/lb
Date first used		1972			

Mechanical properties

Young's modulus		0.00145	-	0.0058	10^6 psi
Shear modulus		0.00116	-	0.00145	10^6 psi
Bulk modulus	*	0.189	-	0.203	10^6 psi
Poisson's ratio	*	0.47	-	0.49	
Yield strength (elastic limit)		1.74	-	2.61	ksi
Tensile strength		2.32	-	2.9	ksi
Compressive strength		1.91	-	2.87	ksi
Elongation		730	-	770	% strain
Fatigue strength at 10^7 cycles	*	1.74	-	1.86	ksi
Fracture toughness	*	0.455	-	0.637	ksi.in^0.5
Mechanical loss coefficient (tan delta)	*	0.34	-	0.83	

Thermal properties

Glass temperature	*	-99.7	-	-9.67	°F
Maximum service temperature		116	-	125	°F
Minimum service temperature	*	-190	-	-99.7	°F
Thermal conductor or insulator?		Good insulator			
Thermal conductivity		0.173	-	0.231	BTU.ft/h.ft^2.F

Specific heat capacity	*	0.478	-	0.525	BTU/lb.°F
Thermal expansion coefficient		88.9	-	106	µstrain/°F

Electrical properties

Electrical conductor or insulator?		Good insulator			
Electrical resistivity	*	3.16e21	-	1e22	µohm.cm
Dielectric constant (relative permittivity)		2.9	-	2.95	
Dissipation factor (dielectric loss tangent)		0.005	-	0.022	
Dielectric strength (dielectric breakdown)		673	-	686	V/mil

Optical properties

Transparency		Translucent			
Refractive index		1.48	-	1.49	

Processability

Castability		3	-	4	
Moldability		4	-	5	
Machinability		3			
Weldability		2			

Eco properties

Embodied energy, primary production	*	8.13e3	-	8.97e3	kcal/lb
CO2 footprint, primary production	*	2	-	2.21	lb/lb
Recycle		✗			

Supporting information

Design guidelines

EVA is available in pastel or deep hues, it has good clarity and gloss. It has good barrier properties, little or no odor, is UV resistance and FDA-approval for direct food contact. The toughness and flexibility is retained even at low temperatures and it has good stress-crack resistance and good chemical resistance. EVA can be processed by most normal thermoplastic processes: co-extrusion for films, blow molding, rotational molding, injection molding and transfer molding.

Typical uses

Medical tubes, milk packaging, beer dispensing equipment, bags, shrink film, deep freeze bags, co-extruded and laminated film, closures, ice trays, gaskets, gloves, cable insulation, inflatable parts, running shoes.

Links

Reference

ProcessUniverse

Producers