Ethylene-vinyl alcohol copolymer

PING XU

ACRONYMS, TRADE NAMES EVA, Clarene® (Colortech); Eval® (Eval); GL®; Levasint® (Bayer)

CLASS Chemical copolymers

STRUCTURE $[-CH_2-CH_2-]_m-[-CH_2-\underset{\displaystyle OH}{\underset{|}{CH}}-]_n$

MAJOR APPLICATIONS Coextrusion, film lamination, coatings, and food packaging.

PROPERTIES OF SPECIAL INTEREST Superior barrier properties to gases, fragrances, solvents, etc.

PROPERTY	UNITS	CONDITIONS*	VALUE	REFERENCE
Linear thermal expansion coefficient	K^{-1}	32 mol% vinyl alcohol, melt index = 3.8 g/10 min	11×10^{-5}	(1)
		38 mol% vinyl alcohol, melt index = 3.8 g/10 min	12×10^{-5}	
		44 mol% vinyl alcohol, melt index = 13.0 g/10 min	13×10^{-5}	
Density	g cm^{-3}	ASTM D1505		(1)
		27 mol% vinyl alcohol, melt index = 3.0 g/10 min	1.20	
		32 mol% vinyl alcohol, melt index = 3.8 g/10 min	1.19	
		38 mol% vinyl alcohol, melt index = 3.8 g/10 min	1.17	
		44 mol% vinyl alcohol, melt index = 13.0 g/10 min	1.14	
Interaction parameter χ	–	No composition given, 20°C, water	1.2–1.8	(2)
Heat of fusion	J g^{-1}	32 mol% vinyl alcohol, melt index = 3.8 g/10 min	81.9	(1)
		38 mol% vinyl alcohol, melt index = 3.8 g/10 min	81.1	
		44 mol% vinyl alcohol, melt index = 13.0 g/10 min	79.8	
Heat of combustion	J g^{-1}	32 mol% vinyl alcohol, melt index = 3.8 g/10 min	30,037	(1)
		38 mol% vinyl alcohol, melt index = 3.8 g/10 min	31,200	

PROPERTY	UNITS	CONDITIONS*	VALUE	REFERENCE
Heat of combustion	$J\,g^{-1}$	44 mol% vinyl alcohol, melt index = 13.0 g/10 min	32,366	
Glass transition temperature	K	Dynamic viscoelasticity		(1)
		27 mol% vinyl alcohol, melt index = 3.0 g/10 min	345	
		32 mol% vinyl alcohol, melt index = 3.8 g/10 min	342	
		38 mol% vinyl alcohol, melt index = 3.8 g/10 min	335	
		44 mol% vinyl alcohol, melt index = 13.0 g/10 min	328	
Melting point	K	DSC		(1)
		27 mol% vinyl alcohol, melt index = 3.0 g/10 min	464	
		32 mol% vinyl alcohol, melt index = 3.8 g/10 min	454	
		38 mol% vinyl alcohol, melt index = 3.8 g/10 min	448	
		44 mol% vinyl alcohol, melt index = 13.0 g/10 min	437	
Tensile modulus	MPa	ASTM D638		(1)
		27 mol% vinyl alcohol, melt index = 3.0 g/10 min	3,138	
		32 mol% vinyl alcohol, melt index = 3.8 g/10 min	2,648	
		38 mol% vinyl alcohol, melt index = 3.8 g/10 min	2,352	
		44 mol% vinyl alcohol, melt index = 13.0 g/10 min	2,062	
Tensile strength at break	MPa	ASTM D638		(1)
		27 mol% vinyl alcohol, melt index = 3.0 g/10 min	71.6	
		32 mol% vinyl alcohol, melt index = 3.8 g/10 min	71.6	
		38 mol% vinyl alcohol, melt index = 3.8 g/10 min	46.1	
		44 mol% vinyl alcohol, melt index = 13.0 g/10 min	51.0	
Elongation at break	%	ASTM D638		(1)
		27 mol% vinyl alcohol, melt index = 3.0 g/10 min	200	
		32 mol% vinyl alcohol, melt index = 3.8 g/10 min	230	

PROPERTY	UNITS	CONDITIONS*	VALUE	REFERENCE
Elongation at break	%	38 mol% vinyl alcohol, melt index = 3.8 g/10 min	280	
		44 mol% vinyl alcohol, melt index = 13.0 g/10 min	380	
Izod impact strength	$J\,m^{-1}$	ASTM D255, notched		(1)
		27 mol% vinyl alcohol, melt index = 3.0 g/10 min	58.7	
		32 mol% vinyl alcohol, melt index = 3.8 g/10 min	90.7	
		38 mol% vinyl alcohol, melt index = 3.8 g/10 min	64.1	
		44 mol% vinyl alcohol, melt index = 13.0 g/10 min	53.4	
Rockwell hardness	–	ASTM D785		(1)
		27 mol% vinyl alcohol, melt index = 3.0 g/10 min	104	
		32 mol% vinyl alcohol, melt index = 3.8 g/10 min	100	
		38 mol% vinyl alcohol, melt index = 3.8 g/10 min	93	
		44 mol% vinyl alcohol, melt index = 13.0 g/10 min	88	
Taber abrasion	mg	ASTM D1175, 1,000 times		(1)
		32 mol% vinyl alcohol, melt index = 3.8 g/10 min	1.2	
		38 mol% vinyl alcohol, melt index = 3.8 g/10 min	2.0	
		44 mol% vinyl alcohol, melt index = 13.0 g/10 min	2.2	
Bending strength	MPa	ASTM D790		(1)
		27 mol% vinyl alcohol, melt index = 3.0 g/10 min	149	
		32 mol% vinyl alcohol, melt index = 3.8 g/10 min	128	
		38 mol% vinyl alcohol, melt index = 3.8 g/10 min	108	
Surface resistivity	ohm	Various films	$1.9–2.7 \times 10^{15}$	(1)
Volume resistivity	ohm cm	Various films	$0.47–1.2 \times 10^{13}$	(1)
Thermal conductivity	$W\,m^{-1}\,K^{-1}$	32 mol% vinyl alcohol, melt index = 3.8 g/10 min	0.35	(1)
		44 mol% vinyl alcohol, melt index = 13.0 g/10 min	0.36	