



Makrolon® AR1 sheet

Abrasion resistant

Makrolon® AR1 sheet is a one side hardcoated polycarbonate product. The hardcoat provides excellent abrasion resistance, chemical resistance, and long lasting outdoor weathering performance. Over its life cycle, its performance can reduce maintenance and replacement costs significantly compared to acrylic, glass, and standard polycarbonate. Makrolon AR1 sheet has a seven (7) year Limited Product Warranty against breakage, yellowing, and hazing. The terms of the warranty are available on request.

Applications

Lamination, spall shield, single surface decorative applications

Regulatory code compliance and certifications

ICC-ES Evaluation Report ESR-2728
Miami-Dade County NOA #12-0605.05
Florida Building Code 2010 High Velocity Hurricane Zone Classified
CPSC 16 CFR 1201 Safety Standard
ANSI Z97.1-2004: American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test
UL 94 Flammability File #E351891
UL 972: Burglary Resistant File #BP2126

Typical Properties*			
Property	Test Method	Units	Values
PHYSICAL			
Specific Gravity	ASTM D 792	–	1.2
Refractive Index	ASTM D 542	–	1.586
Light Transmission, Clear @ 0.118"	ASTM D 1003	%	86
Light Transmission, I30 Gray @ 0.118"	ASTM D 1003	%	50
Light Transmission, K09 Bronze @ 0.118"	ASTM D 1003	%	50
Light Transmission, I35 Dark Gray @ 0.118"	ASTM D 1003	%	18
Water Absorption, 24 hours	ASTM D 570	%	0.15
Poisson's Ratio	ASTM E 132	–	0.38
Chemical Resistance	ASTM D 1308	–	Pass
Taber Abrasion @ 100 Cycles, Delta Haze CS-10F Wheel @ 500 g load	ASTM D 1044	%	2
MECHANICAL			
Tensile Strength, Ultimate	ASTM D 638	psi	9,500
Tensile Strength, Yield	ASTM D 638	psi	9,000
Tensile Modulus	ASTM D 638	psi	340,000
Elongation	ASTM D 638	%	110
Flexural Strength	ASTM D 790	psi	13,500
Flexural Modulus	ASTM D 790	psi	345,000
Compressive Strength	ASTM D 695	psi	12,500
Compressive Modulus	ASTM D 695	psi	345,000
Izod Impact Strength, Notched @ 0.125"	ASTM D 256	ft-lbs/in	16
Izod Impact Strength, Unnotched @ 0.125"	ASTM D 256	ft-lbs/in	No Break
Instrumented Impact @ 0.125"	ASTM D 3763	ft-lbs	>47
Shear Strength, Ultimate	ASTM D 732	psi	10,000
Shear Strength, Yield	ASTM D 732	psi	6,000
Shear Modulus	ASTM D 732	psi	114,000
Rockwell Hardness	ASTM D 785	–	M70 / R118
THERMAL			
Coefficient of Thermal Expansion	ASTM D 696	in/in/°F	3.75 x 10 ⁻⁵
Coefficient of Thermal Conductivity	ASTM C 177	BTU-in/hr-ft ² -°F	1.35
Heat Deflection Temperature @ 264 psi	ASTM D 648	°F	270
Heat Deflection Temperature @ 66 psi	ASTM D 648	°F	280
Brittleness Temperature	ASTM D 746	°F	-200
Shading Coefficient, Clear @ 0.236"	NFRC 100-2010	–	0.97
Shading Coefficient, Gray or Bronze @ 0.236"	NFRC 100-2010	–	0.77
U factor @ 0.236" (summer/winter)	NFRC 100-2010	BTU/hr-ft ² -°F	0.85/0.92
U factor @ 0.375" (summer/winter)	NFRC 100-2010	BTU/hr-ft ² -°F	0.78/0.85
ELECTRICAL			
Dielectric Constant @ 10 Hz	ASTM D 150	–	2.96
Dielectric Constant @ 60 Hz	ASTM D 150	–	3.17
Volume Resistivity	ASTM D 257	Ohm-cm	8.2 x 10 ¹⁶
Dissipation Factor @ 60 Hz	ASTM D 150	–	0.0009
Arc Resistance	–	–	–
Stainless Steel Strip Electrodes	ASTM D 495	Seconds	10
Tungsten Electrodes	ASTM D 495	Seconds	120
Dielectric Strength, in air @ 0.125"	ASTM D 149	V/mil	380
FLAMMABILITY			
Horizontal Burn, AEB	ASTM D 635	in	<1
Ignition Temperature, Self	ASTM D 1929	°F	1022
Ignition Temperature, Flash	ASTM D 1929	°F	824
Flame Class @ 0.060"	UL 94	–	HB
Flame Class @ 0.236"	UL 94	–	HB

*Typical properties are not intended for specification purposes

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Security ratings for AR 0.500"

Forced Entry & Containment
ASTM F 1233.08 Class 2.0 Body Passage
ASTM F 1233.08 Class 1.4 Contraband Passage
ASTM F 1915 Grade 3
H.P. White TP 0500 Level 1 Sequence 8

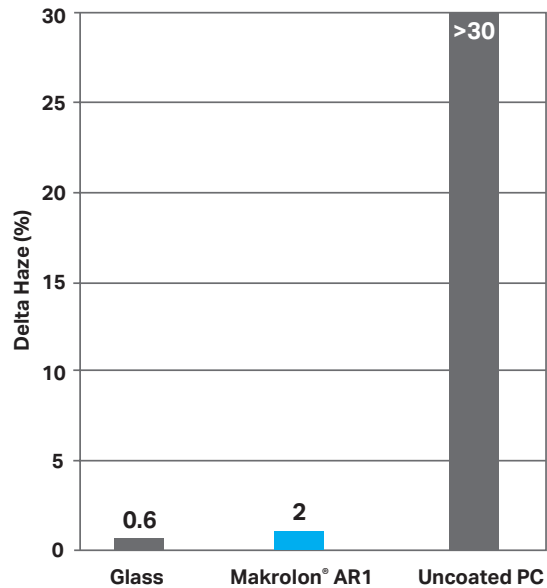
Chemical Resistance*

Chemical Tested	Resistance Time
Acetone	>24 hrs
Ammonia (10% concentration)	>24 hrs
Antifreeze (50/50)	>24 hrs
Benzene	>24 hrs
Bleach (Clorox concentrated)	>24 hrs
Chloroform	>24 hrs
Denatured Alcohol	>24 hrs
Di (2-ethylhexyl) phthalate	>24 hrs
Diesel Oil	>24 hrs
Isopropyl Alcohol (IPA)	>24 hrs
Kerosene	>24 hrs
Methyl Alcohol	>24 hrs
Methyl Butyl Ketone	>24 hrs
Methyl Ethyl Ketone	>24 hrs
Methylene Chloride	>24 hrs
Naphthalene, 1-bromo-	>24 hrs
Potassium Hydroxide - Lye (10%)	>24 hrs
Sodium Hydroxide (10%)	>24 hrs
Toluene	>24 hrs
Turpentine	>24 hrs
Unleaded Gasoline (87 Octane)	>24 hrs
Vinegar	>24 hrs
Xylene	>24 hrs
Acids:	
Hydrochloric Acid (20%)	>24 hrs
Nitric Acid (20%)	>24 hrs
Sulfuric Acid (20%)	>24 hrs

*Tested in accordance to ASTM D 1308-02

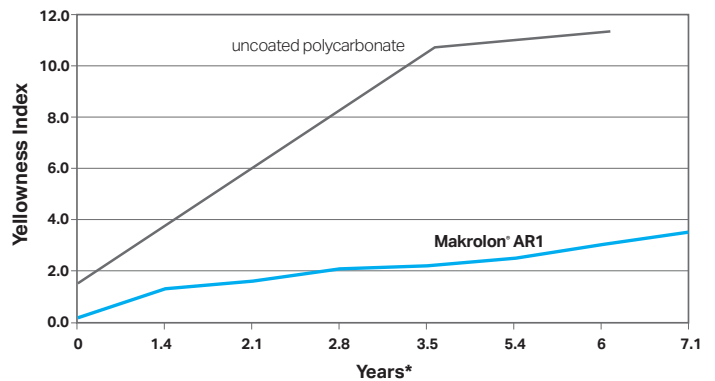
Always keep hazardous chemicals away from uncoated edge of Makrolon Polycarbonate

Abrasion Resistance*



*Taber Abrasion per ASTM D 1044, 100 cycles using CS-10F wheels at 500 g load

Weathering Behavior of Makrolon® in Vertical Orientation



*Based upon Xenon WOM accelerated weathering for UV dose at mid-latitude location

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