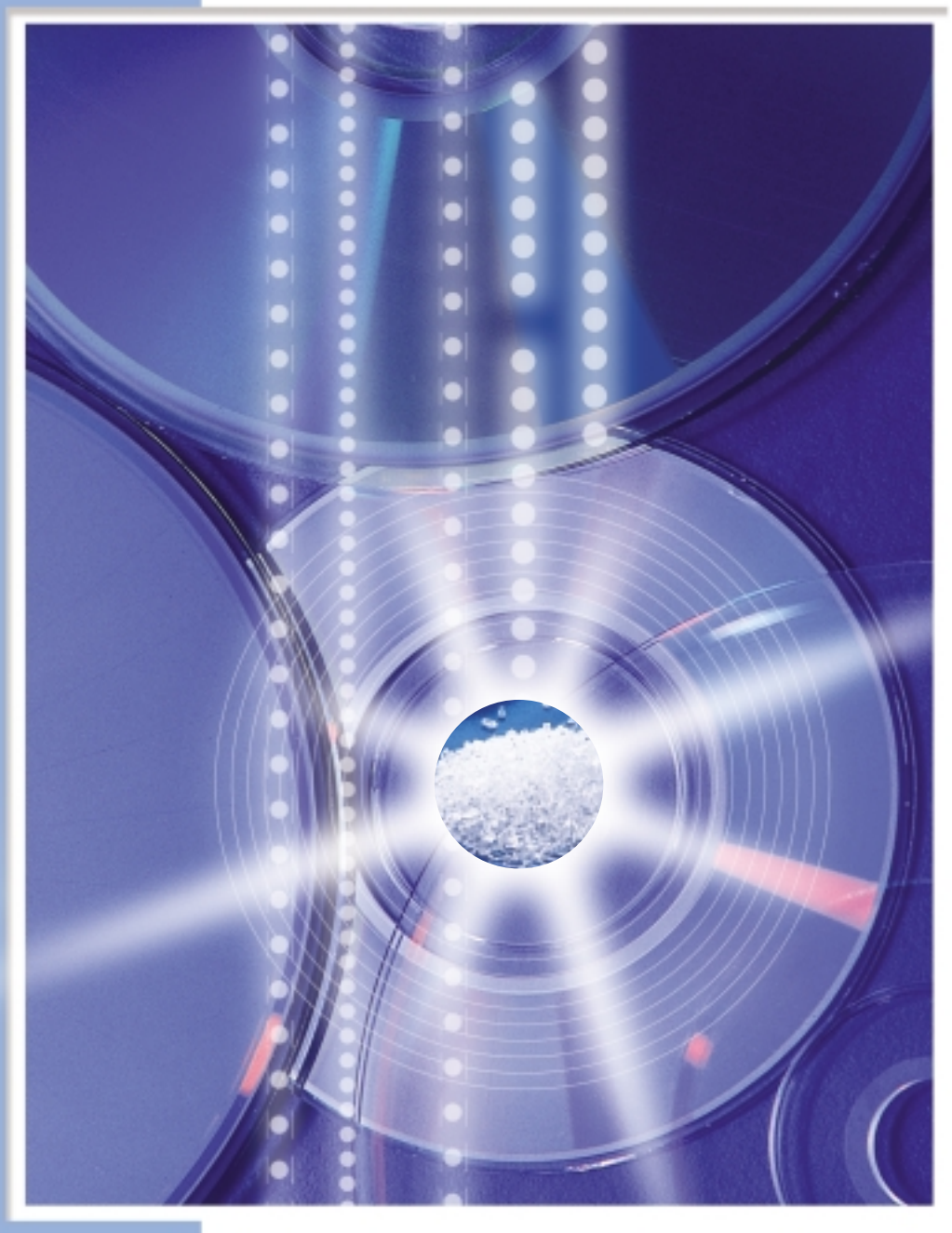
Cyclo Olefin Polymer (COP)

ZEONEX®



ZEON CORPORATION

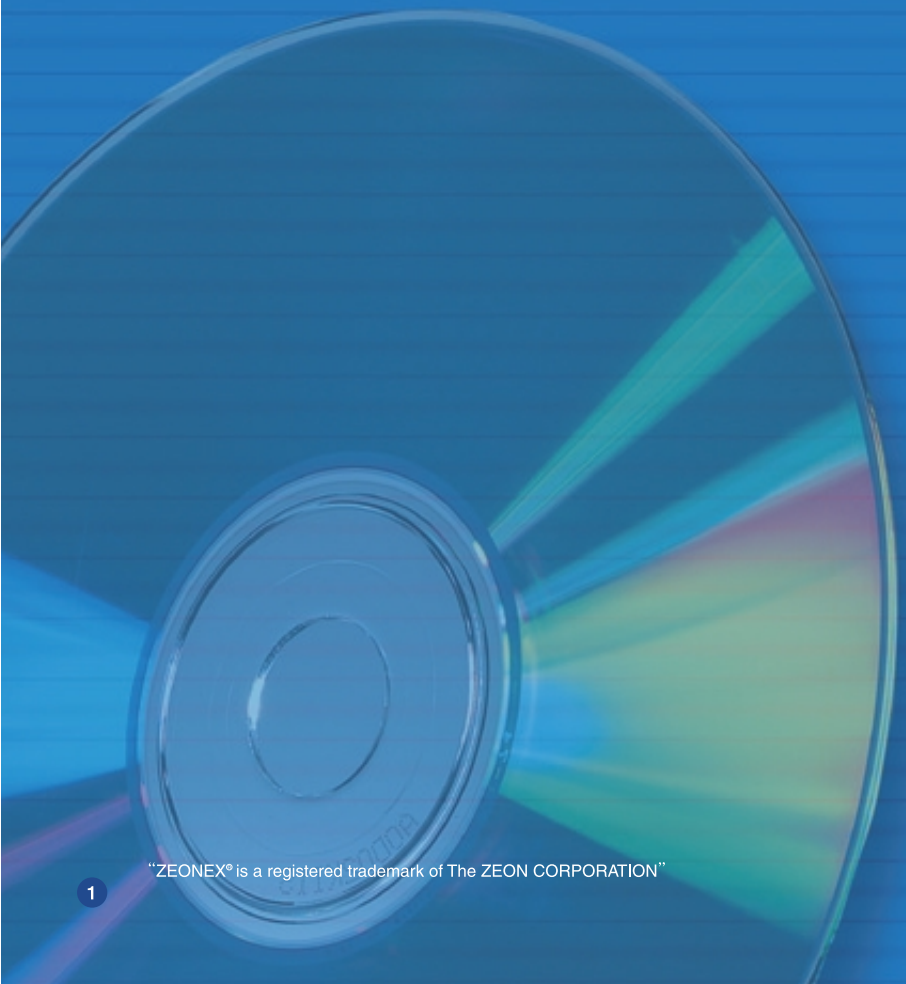
ZEONEX®

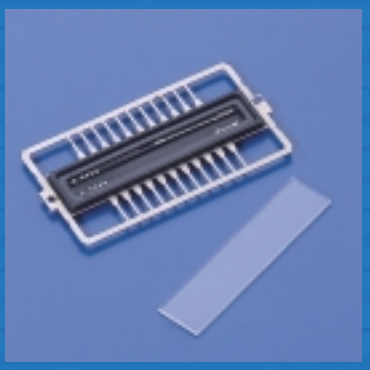
ZEONEX®—New High-performance Thermoplastics for Next-generation

For optics, electronics, and medical applications

Another industry-leading development from ZEON CORPORATION

ZEONEX® — Cyclo Olefin Polymer (COP) offers excellent optical properties for creating optical parts for cameras and laser beam printers.
The resins' high purity makes it suitable for use in a wide range of medical products, while the low dielectric constant and tangents are appropriate for electrical insulation applications.



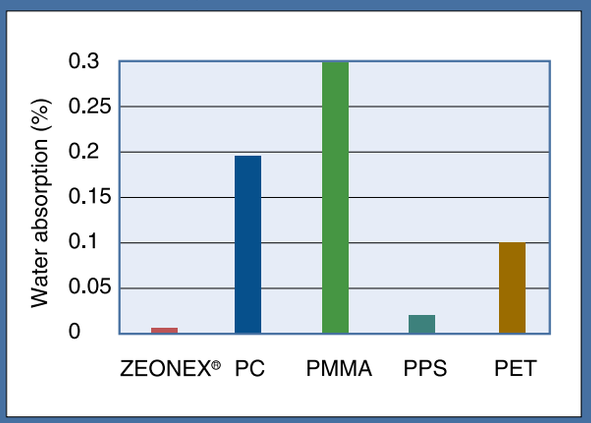


Features

ZEONEX® major properties

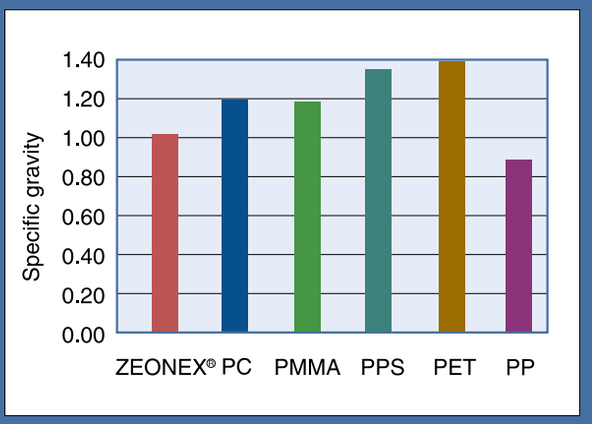
Low water absorbency

Water absorption is less than 0.01% providing excellent dimensional stability.



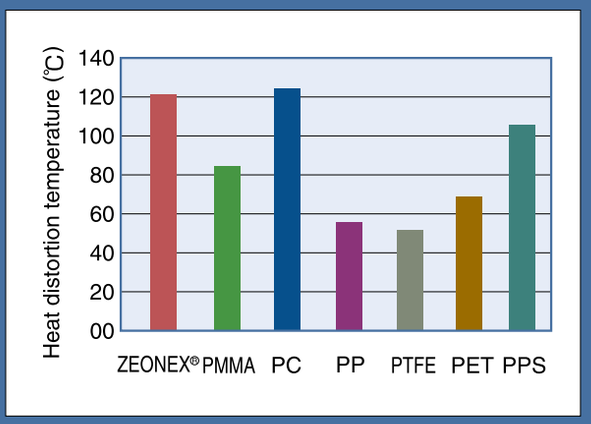
Low specific gravity

Specific gravity is approximately 1, which is lighter than conventional plastics.



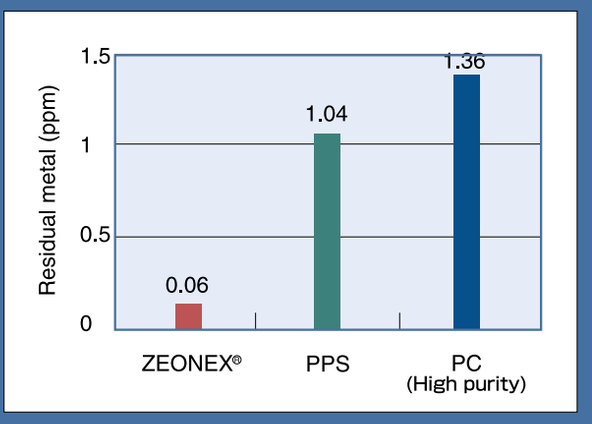
High heat resistance

The heat distortion temperature is above 120°C, allowing other ZEONEX properties to remain stable in a wide range of conditions.



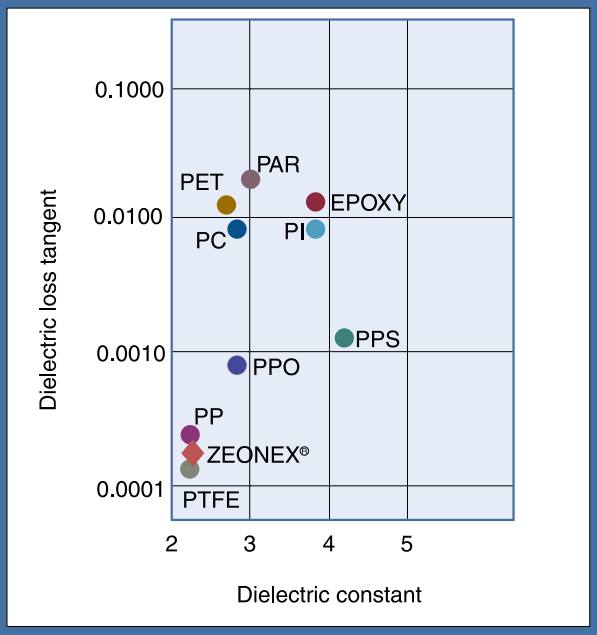
Low content of impurities

Very low content of impurities, supporting the development of electronic and medical applications.



Low dielectric constant and low dielectric loss tangent

Thermoplastic resin with the lowest dielectric constant and lowest dielectric loss tangent—especially good at high frequencies.



Chemical resistance

Excellent resistance to acid and base.

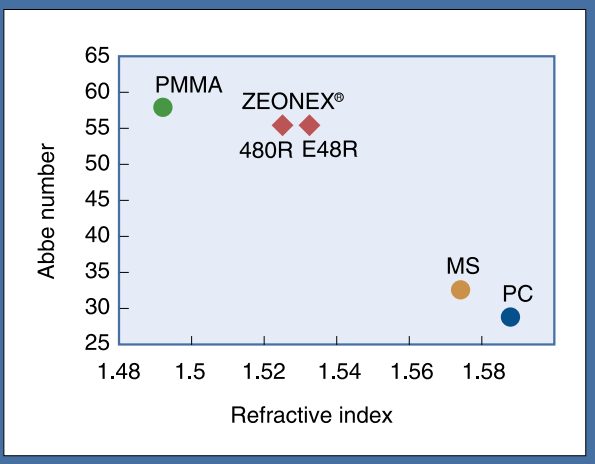
Transparency

Exhibits high transparency and Low birefringence.

Precision molding

Ideal for high-precision molded products, since ZEONEX is easily processed through injection molding, blow molding.

Refractive index



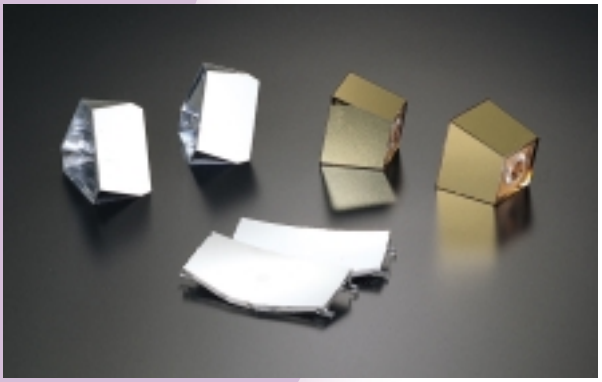
Applications

Camera lenses, prisms and Mobile phone lenses

ZEONEX® has earned high marks for low moisture absorption, good transparency, and high precision molding.

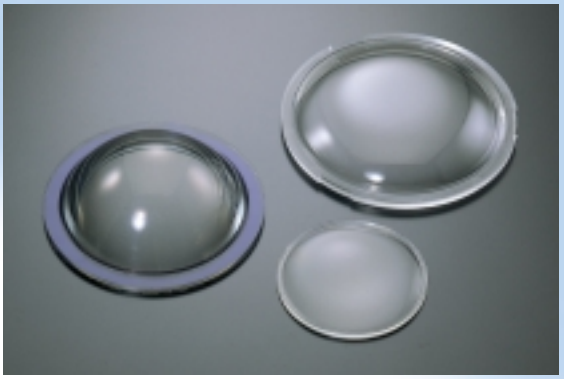
Mirrors

ZEONEX's low moisture absorption, good dimensional stability, and high-precision molding make it an excellent material for mirrors.



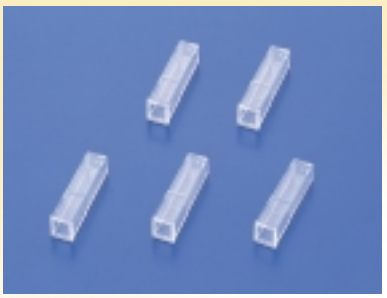
CD and DVD pickup lenses, LBP Fθ lenses projection and projecter lenses

Manufacturers of CD and DVD pickup lenses and LBP Fθ lenses take advantage of ZEONEX's low birefringence, low moisture absorption, and high-precision molding.



Other applications

ZEONEX® has been favorably received in the electric, electronics, medical treatment and optronics fields, based on its outstanding heat resistance, low impurity content, chemical resistance and electric properties.

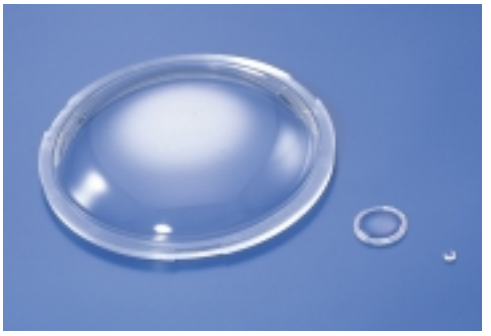


Listed by Grade

Specific grades of ZEONEX® are available for different applications.

Properties	Unit	Measurement methods	Conditions	
Specific gravity	—	ASTM D792	—	
Water absorption	%	ASTM D570	—	
Light transmittance	%	ASTM D1003	Thickness:3mm	
Refractive index	—	ASTM D542	—	
Glass transition temperature	℃	JIS K7121	—	
Heat distortion temperature	℃	ASTM D648	18.0MPa No aneal	
Linear expansion coefficient	cm/cm℃	ASTM E831	—	
M F R	g/10min	ISO1133	280℃21.18N	
			260℃21.18N	
Flexural modulus	MPa	ISO178	—	
Flexural strength	MPa	ISO178	—	
Tensile modulus	MPa	ISO527	—	
Tensile strength	MPa	ISO527	—	
Tensile elongation	%	ISO527	—	
Izod impact strength	J/m	ASTM D256	3.2mm With Notch	
Pencil hardness	—	JIS K5401	—	
Volume resistivity	Ωcm	IEC93	—	
Dielectric breakdown strength	kV/mm	ASTM D149	short-time method,1mm	
Dielectric constant	—	IEO250	1MHz	
Dielectric loss tangent	—	IEO250	1MHz	
Flammability	—	UL standards	—	
Major applications	—	—	—	

※Data represents experimental results and does not guarantee specifie performance levels under actual usage.

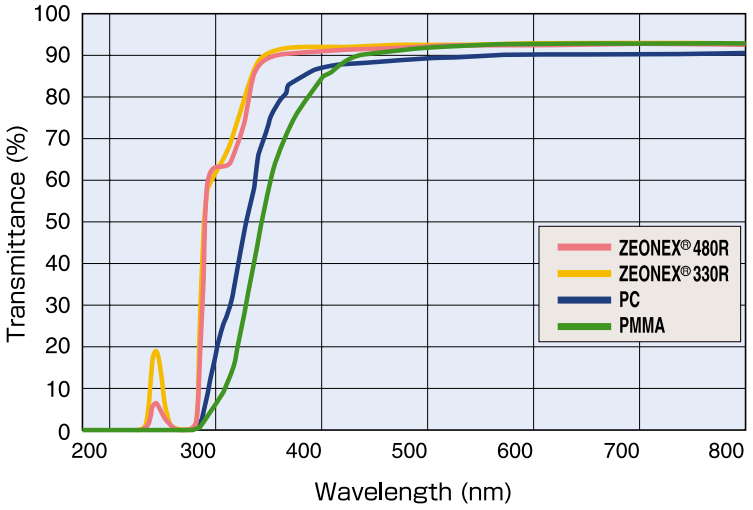


	480	480R	E48R	330R	RS420
	1.01	1.01	1.01	0.95	1.01
	＜0.01	＜0.01	＜0.01	＜0.01	＜0.01
	92	92	92	92	White opaque
	1.525	1.525	1.531	1.509	—
	138	138	139	123	136（DSC）
	123	123	122	103	110（ISO75）
	7×10^{-5}	7×10^{-5}	6×10^{-5}	9×10^{-5}	7×10^{-5}
	20	21	25	—	7（JIS K6719）
	—	—	—	11	—
	2100	2100	2500	3100	1600
	94	94	104	91	64
	2200	2200	2500	—	1700
	59	59	71	45	45
	40	40	10	3	135
	24	24	21	13	510
	H	H	H	3H	B
	＞10^{16}	＞10^{16}	＞10^{16}	＞10^{16}	＞10^{16}（ASTM D257）
	40	40	40	40	40
	2.3	2.3	2.3	2.3	2.3（ASTM D150）
	0.0002	0.0002	0.0002	0.0004	0.0002（ASTM D150）
	94HB	94HB	94HB	94HB	94HB
	Medical equipment and optical components	Lenses and optical components	Lenses and optical components	Lenses and optical components	Connector and antenna components

Properties

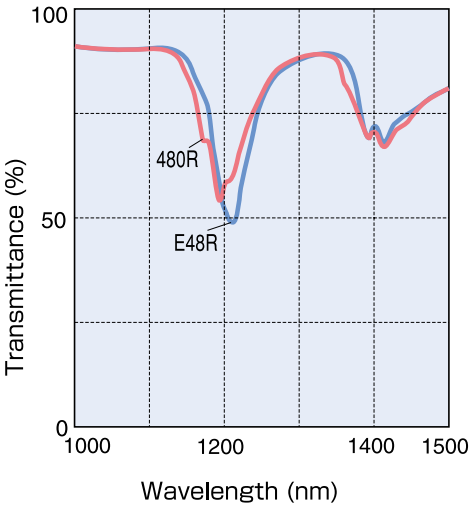
Optical properties

Light transmittance



Thickness: 3 mm

Transmittance in near-infrared area



Thickness: 3 mm

Dependence of refraction index on temperature and wavelength

480R		Wavelength (nm)						Abbe number
		435.835(g)	486.133(F)	546.075(e)	587.562(d)	656.273(C)	785.1(L.D780)	νd
Temperature (°C)	0	1.5396	1.5343	1.5300	1.5277	1.5250	—	56
	25	1.5369	1.5317	1.5273	1.5251	1.5224	—	56
	40	1.5352	1.5299	1.5257	1.5234	1.5207	1.5174	57
	60	1.5329	1.5276	1.5234	1.5211	1.5184	1.5152	57
	80	1.5308	1.5253	1.5214	1.5189	1.5164	1.5132	58

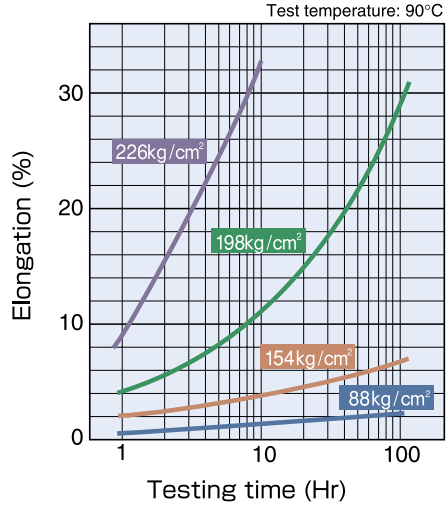
E48R		Wavelength (nm)						Abbe number
		435.835(g)	486.133(F)	546.075(e)	587.562(d)	656.273(C)	785.1(L.D780)	νd
Temperature (°C)	0	1.5456	1.5402	1.5357	1.5334	1.5306	—	56
	25	1.5432	1.5378	1.5334	1.5311	1.5283	—	56
	40	1.5417	1.5363	1.5319	1.5296	1.5268	1.5234	56
	60	1.5396	1.5342	1.5299	1.5275	1.5247	1.5214	56
	80	1.5375	1.5320	1.5278	1.5254	1.5228	1.5195	57

330R		Wavelength (nm)						Abbe number
		435.835(g)	486.133(F)	546.075(e)	587.562(d)	656.273(C)	785.1(L.D780)	νd
Temperature (°C)	0	1.5236	1.5185	1.5143	1.5121	1.5094	—	56
	25	1.5208	1.5157	1.5116	1.5094	1.5067	—	56
	40	1.5192	1.5141	1.5101	1.5079	1.5052	1.5019	57
	60	1.5169	1.5118	1.5078	1.5056	1.5030	1.4997	57
	80	1.5145	1.5094	1.5053	1.5031	1.5005	1.4973	56

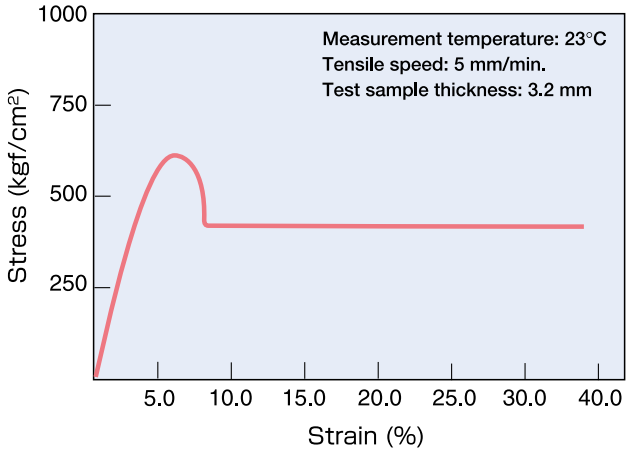
※Carl Zeiss Jena Refractive index detector PR-2 model (0 degrees C and 25 degrees C)
Kalnew Digital Precise Refractive index detector KPR-200(40 degrees C to 80 degrees C)
Data represents experimental resalts and does not guarantee specific performance levels under actual usage.

Mechanical properties

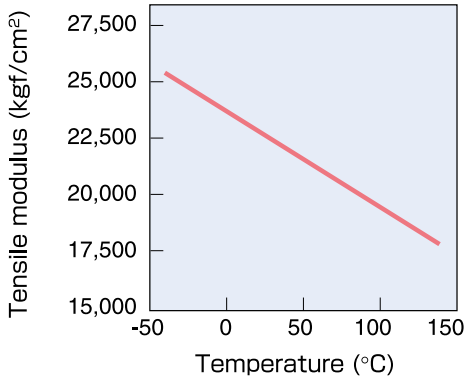
Creep properties of ZEONEX®480R



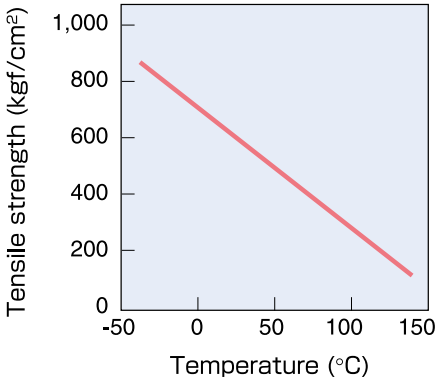
ZEONEX®480R Tensile test



Dependence of ZEONEX®480R tensile modulus on temperature

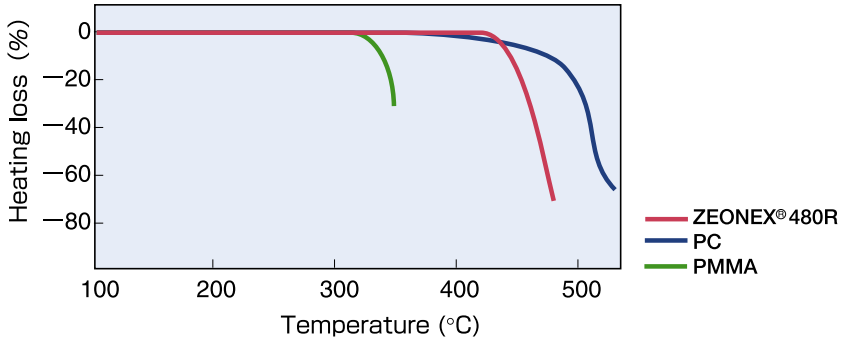


Dependence of ZEONEX®480 tensile strength on temperature



Heat type properties

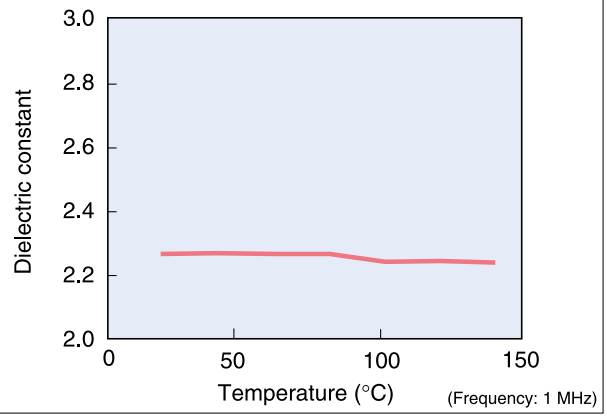
Heat loss under N_2 measured by thermogravimetric analysis



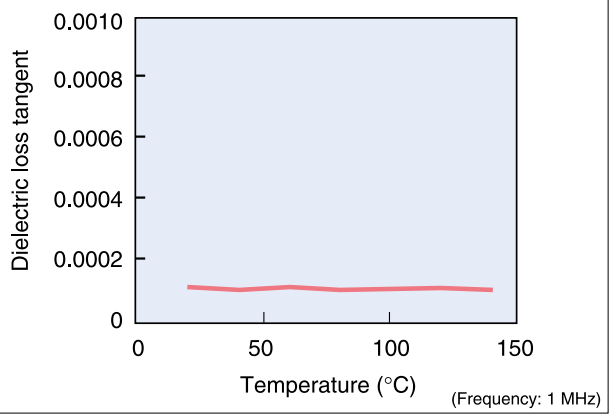
Properties

Electric properties

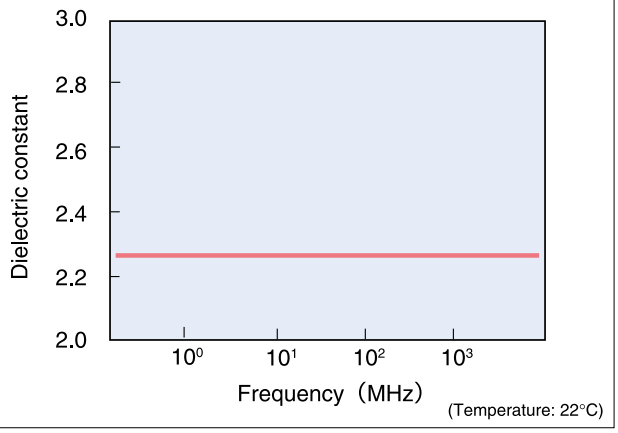
Dielectric constant v.s. temperature



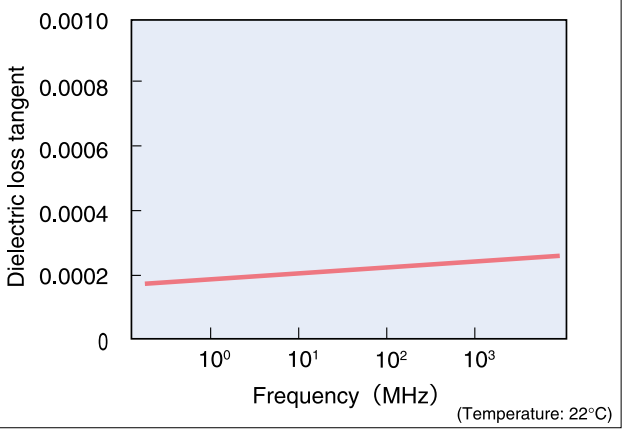
Dielectric loss tangent v.s. temperature



Dielectric constant v.s. frequency

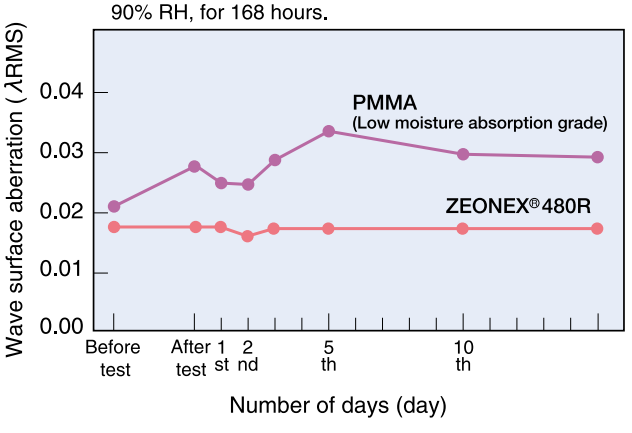


Dielectric loss tangent v.s. frequency

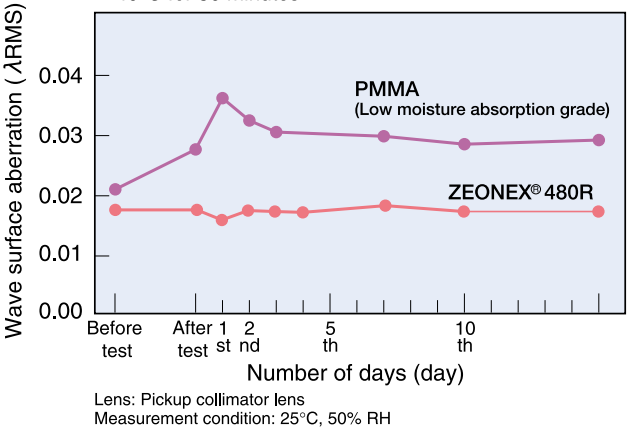


Environmental Resistance of ZEONEX® Lenses

1. High temperature and high humidity—maintains at 60°C, 90% RH, for 168 hours.



2. Heat cycle test—10 cycles at 85°C for 30 minutes to 40°C for 30 minutes



Lens: Pickup collimator lens
Measurement condition: 25°C, 50% RH

Chemical resistance

Test results

Alcohol	Methanol	○
	Ethanol	○
	IPA (isopropyl alcohol)	○
Ketone	Acetone	○
	MEK (methyl ethyl ketone)	○
	Cyclohexanone	×
	MIBK (methylisobutyl ketone)	×
Ether	Ethyl ether	×
	THF (tetrahydrofuran)	×
Aromatic	Xylene	×
Hydrocarbon	n-Pentane	×
	n-Hexane	×
	n-Octane	×
Chlorohydrocarbon	1,2-Dichloroetane	×
Other solvents	Methyl methacrylate	×
	DOP (dioctylphthalate)	×
	DMF (dimethylformamide)	○
	Methyl cellosolve	○
	Limonene	×

Acid	Hydrochloric acid (10%)	○
	Concentrated hydrochloric acid	○
	Sulfuric acid (10%)	○
	Concentrated sulfuric acid	×
	Acetic acid (10%)	○
	Formic acid (10%)	○
	Nitric acid	○
	Phosphoric acid	○
	Hydrofluoric acid (7%), nitric acid (42%), pure water (51%)	○
Base	Caustic soda (50%)	○
	Aqueous ammonia (10%)	○
Other chemicals	Formaldehyde (40%)	○
	Hydrogen peroxide water (30%)	×
Foods	Salad oil	×
	Margarine	○
	Lemon juice	○
	Orange juice	○
Cosmetics	Hair liquid	○
	Hair tonic	○
Detergent	Hair shampoo	△
	Hair rinse	○

Marginal stress
140 kgf/cm^2 or more
○ (usable)
100 to 140 kgf/cm^2
△ (exercise caution in use)
100 kgf/cm^2 or less
× (unusable)

Impurities

Concentration of impurities in ZEONEX®

Impurity	Ca^{2+}	Na^{+}	Cl^{-}	SO_4^{2-}	SO_3^{-}	PO_4^{2-}
Detectable limit (ppm)	0.02	0.02	0.2	1.1	2.7	3.3
Concentration	Less than detectable limit					

Comparison of ZEONEX and other resins

Properties	Unit	Measurement methods	Requirements	ZEONEX 480R	PC optical grade	PC	PMMA	PTFE	PS (GP)	PP
Specific gravity	—	ASTM D792		1.01	1.2	1.2	1.17 ~1.2	2.14 ~2.2	1.04 ~1.05	0.90 ~0.91
Water absorption	%	ASTM D570		＜0.01	0.2	0.15	0.3	＜0.01	＜0.1	＜0.01
Light transmittance	%	ASTM D1003	Thickness: 3mm	92	89	89	93	—	90	—
Refractive index	—	ASTM D542	n_d^{25}	1.525	1.59	1.59	1.49	—	1.59	1.49
Heat distortion temperature	℃	ASTM D648	18.6kgf/cm² No annealing	123	121	123 ~132	74 ~99	55	90 ~104	49~60
Linear expansion coefficient	cm/cm℃	ASTM D696		7×10^{-5}	7×10^{-5}	7×10^{-5}	$5\sim9\times10^{-5}$	10×10^{-5}	$6\sim8\times10^{-5}$	11×10^{-5}
Molding shrinkage	%	ASTM D955		0.5~0.7	0.5~0.7	0.5~0.7	0.3~0.7	—	0.3~0.7	1.6~1.9
Flexural modulus	kgf/cm	ASTM D790		21000	21000	24000	30000	3500 ~6300	30000	12000 ~18000
Flexural strength	kgf/cm²	ASTM D790		960	920	1000	1100	—	800	400
Tensile modulus	kgf/cm²	ASTM D638		22000	21000	22000	23000 ~33000	4000 ~5600	32000 ~34000	12000 ~16000
Tensile strength	kgf/cm²	ASTM D638		600	630	670	490 ~770	140 ~350	500 ~580	320 ~420
Tensile elongation	% ²	ASTM D638		40	90	110	2~10	200 ~400	2.0~3.6	100 ~600
Izod impact strength	kgf・cm/cm	ASTM D256	3.2mm Notched	2.4	6	75~100	1.6~3.3	16.3	2.2~2.4	2.2 ~5.4
Pencil hardness	—	JIS K5401		H	B	B	3H	—	—	—
Volume resistivity	Ω cm	ASTMD257		$>10^{16}$	$>10^{16}$	$>10^{16}$	$>10^{15}$	$>10^{16}$	$>10^{16}$	$>10^{16}$
Dielectric breakdown strength	KV/mm	ASTM D149		40	30	18~22	20	9~12	22	30~32
Dielectric constant	—	ASTMD150	1MHZ	2.3	3.0	3.0	2.6	2.1	2.5	2.3
Dielectric loss tangent	—	ASTMD150	1MHZ	0.0002	0.009	0.01	0.02	0.0002	0.0005	0.0003

PL(Product Liability) Notes

1. Please observe the following precautions for the storage and use of the product and items molded from the product.

   (1) Keep away from fire, since ZEONEX is combustible.
   (2) Avoid exposure to direct sunlight, which can discolor ZEONEX.
   (3) Do not use or expose to temperatures over Heat distartion temperature, since ZEONEX may discolor, deform, or melt.
   (4) Improper molding conditions or use with a poorly designed mold may induce solvent cracking through residual stress.
   (5) Do not use for parts that are subject to continuing load (snapfit insert molded products, screw stops, etc.), since the material may crack.
   (6) Do not expose to the following solvents and liquids which may cause ZEONEX to liquefy or swell.
   - Aromatic solvents such as benzene, toluene, etc.
   - Chlorinated hydrocarbon solvents, including dichloromethane, carbon tetrachloride, etc.
   - Vegetable and mineral oils and greases
   - Hydrocarbon solvents such as n-Hexane, cyclohexane and ligroin, etc.
   - Ethers such as diethylether, etc.
   - Ketones such as cyclohexanone, etc.
   - Test other materials and liquids containing long-chain alkyl groups in their structure prior to use.

   (7) Test ZEONEX for chemical resistance prior to use.

2. Contact ZEON CORPORATION before utilizing ZEONEX in medical care products, foods or toys.

3. Please refer to the Material Safety Data Sheet for specific details.

Related laws and standards

1. TSCA : TSCA Inventory
2. EINECS : EINECS Inventory

Other disclaimers and warnings

(1) Specifications listed in the catalog are typical measurements using standard test methods, but are not intended to imply guaranteed values for all possible applications. Consequently, listed values may not be applicable to products used under differing conditions.
(2) Catalog descriptions and specifications are subject to change without notice.
(3) Applicable industrial patents and copyrights should be observed when adopting applications introduced in this catalog.
(4) Physical properties cited for other resins are drawn from related catalogs and documents.
(5) Contact ZEON CORPORATION for detailed technical information.

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