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Human Chemistry, Human Solutions

PURE-ACE®

TEIJIN LIMITED Plastics Solution Division

Optical PC Films overview

PURE-ACE®

Resin type	Grade	Features	Thickness (μm)	Typical Application
General PC	D,L	Isotropic (Low retardation)	25~100	Various types of substrate films
	K	Light guiding property	25~100	Light guiding films
	GT,GR	Retardation	30~70	Optical compensation for LCDs 3D glasses
	GW	Low Re and high Rth	25~50	Privacy display
	KJ,KL,KH	High retardation (≧3,000 nm)	125~380	Polarized sunglass lenses Anti-rainbow function
Special PC	RM	Retardation (Reverse wavelength dispersion)	~60	Anti-reflection for OLEDs (1/4 wavelength plates)

Application

◆ **Antireflection for OLEDs**
Reverse wavelength dispersion films
(Pure-Ace RM)

◆ **In-vehicle display**
Reverse wavelength dispersion films (PURE-ACE RM)
High retardation films (Pure-Ace KJ)

◆ **Privacy display**
Biaxial stretched retardation films
(Pure-Ace GW)

◆ **Polarized sunglasses**
PC retardation/high retardation films
(PURE-ACE GR/KJ)

◆ **For AR／VR**
Reverse wavelength dispersion films
(PURE-ACE RM)

Optical Isotropic Film Properties

Property	Unit	Test method	Measurement conditions	General PC D	General PC K	General PC L	PEN	PET
Density	kg/m^3	ISO 1183	–	1200	1200	1200	1330	1380
Refractive index	–	ISO 489	–	1.58	1.58	1.58	1.75	1.66
Tg	°C	ISO 3146	–	145	145	145	155	110
CTE	$\times 10^{-5}$/ °C	ISO 11359-2	–	7	7	7	1.5~2.0	1.0~1.5
Water absorptioncoefficient	%	ISO 62	23°C in water for 24h	0.2	0.2	0.2	0.3	0.4
Tensile stress at break	MPa	ISO 527-1 and ISO 527-2	20mm/min	56	56	60	280	230
Tensile strain at break	%			5	5	80<	90	120
Tensile modulus	MPa			2300	2300	2300	6000	5500
Thermal shrinkage	%	–	140°C	<0.1	<0.1	<0.1	–	–
		–	150°C	–	–	–	~0.4	~1.0
Haze	%	ISO 147782	Thickness mm	0.2	0.2	0.2	0.2	0.2
Total transmittance	%	ISO 13468-1	Thickness mm	91	91	91	91	91

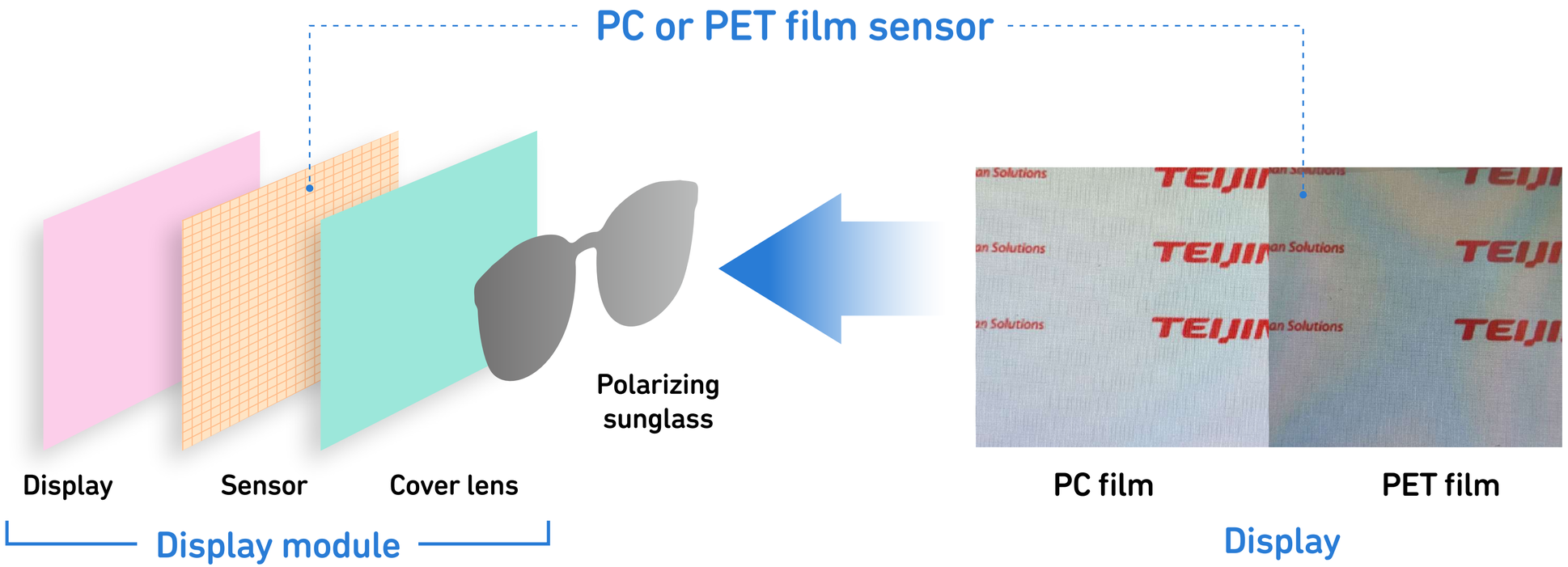
*Note：The values in the above table are typical values, not guaranteed values.

Retardation Film Properties

Property	Unit	Test method	Measurement conditions	General PC				Special PC	COP	PET
				Uniaxial stretched			Biaxial stretched	Uniaxial stretched	Other material A	Other material Z
				GT	GR	KJ,KL,KH	GW	RM		
Density	kg/m^3	ISO 1183	–	1200	1200	1200	1200	1180	1030	1380
Refractive index	–	ISO 489	–	1.58	1.58	1.58	1.58	1.54	1.51	1.53
Tg	°C	ISO 3146	–	145	145	145	145	138	138	110
CTE	$\times 10^{-5}/°C$	ISO 11359-2	–	7	7	7	7	7	7	1.0~1.5
Retardation Re	nm	Parallel nicol rotation method parallel nicol spectroscopy	Measurement wavelength 589nm High retardation measurement	120~430	120~580	3000~5000	0~100	129~147	–	–
Retardation Rth	nm	Parallel nicol rotation method	Measurement wavelength 589nm	Re/2	Re/2	Re/2	100~550	90~110	–	–
Wavelength Dispersion	Re450/Re550 Re650/Re550	– –	– –	1.10 0.96	1.10 0.96	1.10 0.96	1.10 0.96	0.89 1.04	1.01 1.00	1.01 1.00
Photoelasticity	$10^{-13}cm^2/dyne$	–	–	80	80	80	80	15	4	6
Haze	%	ISO 147782	Thickness mm	0.1	0.1	0.1	0.1	0.1	0.3	0.1
Total transmittance	%	ISO 13468-1	Thickness mm	90	90	90	90	91	92	92

*Note：The values in the above table are typical values, not guaranteed values.

Adoption Examples of Optical Isotropic Films

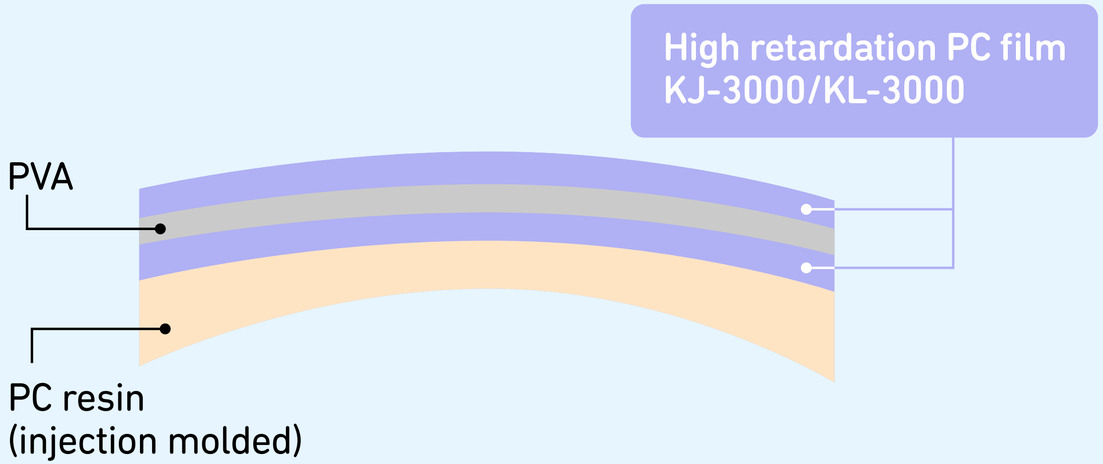


- In the case of display used PET film based sensor, rainbow-colored patterns are observed through polarized sunglasses because of the film produced with bi-axial stretched.
- If the sensor base film replaced by isotropic PC films, you will no longer see rainbow pattern through sunglasses.

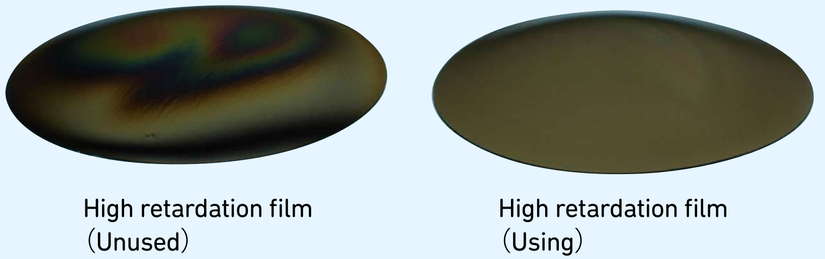
Adoption Example of High Retardation Films (Polarized Lens for Sunglasses)

KJ-3000 (300 μm thick) and KL-3000 (125 μm thick) are PC films with a retardation greater than 3,000 nm.

◆ Application example



< Observation under polarized light >



High retardation film
(Unused)

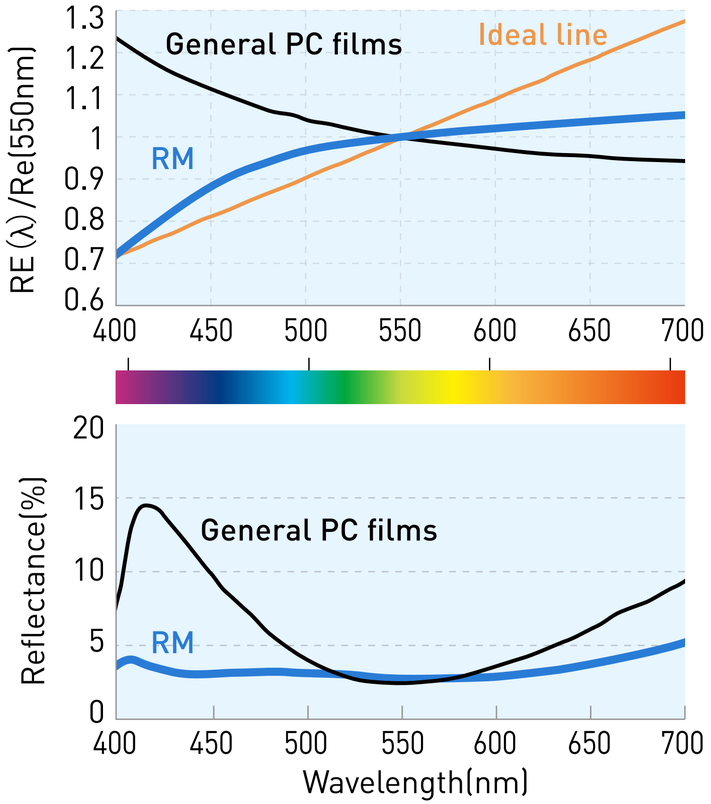
High retardation film
(Using)

Using high retardation films prevents interference patterns caused by secondary process such as bending.

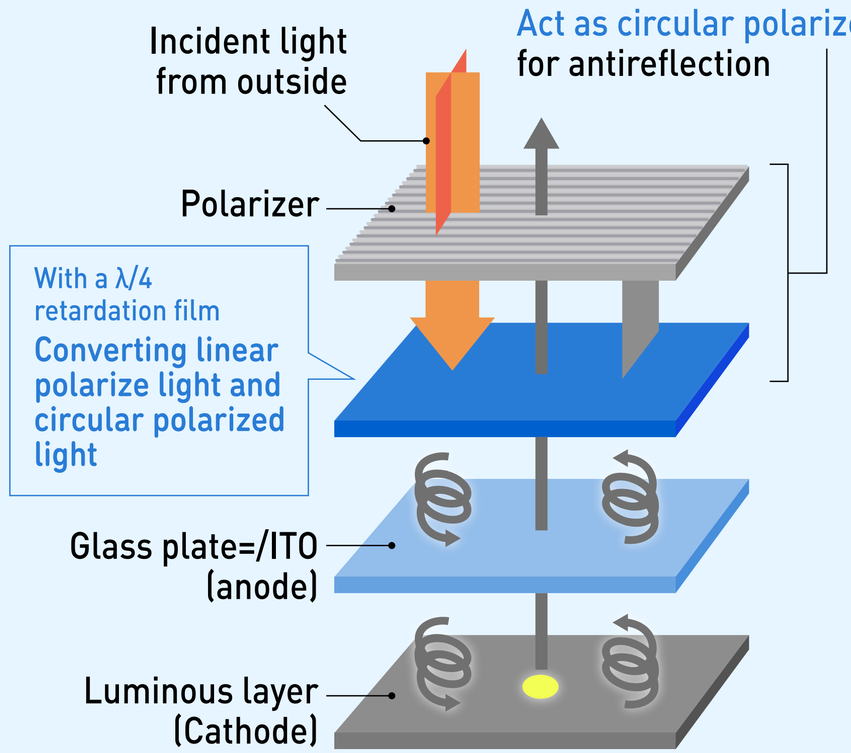
Adoption Example of PURE-ACE® RM (AM-OLED Antireflection Film)

Reverse wavelength λ/4 retardationfilm (PURE-ACE® RM)

- The single layer film enables to prevent wider wavelength anti-reflection.
- Visibility of OLED display will be upgraded.



◆ Typical OLED structure and the film functionality



If film retardation is away from the ideal λ/4 line, some wavelength light leaks and display has specific colors on it.

Necessity of reverse wavelength dispersion film

Using reverse wavelength dispersion λ/4 retardation films allows to have the deeper black color on OLDE display when its turned off.