

Description

Crysoptix coatable Thin Birefringent Film™ (TBF™) retarders can be efficiently used for compensation of ubiquitous VA and IPS LCD modes as well as for developing custom solutions for various optical applications. Crysoptix TBF™ coating technology provides an efficient low-cost solution for patterning internal and external retarders for 3D LCD TV.

The examples below are not intended to be an exhaustive list of targeted LCD designs, but allow to illustrate several important applications of new materials.

Retarders classification

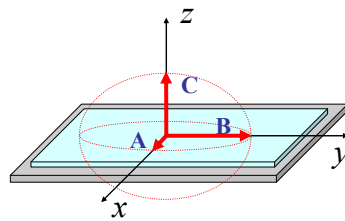
Optical anisotropy:

Uniaxial plates

- $n_x < n_y = n_z$ “-A”
- $n_x = n_y > n_z$ “-C”
- $n_x = n_z < n_y$ “+A”

Biaxial plates

- $n_x < n_z < n_y$ “+B_A”
- $n_z < n_x < n_y$ “+A_C”



NZ factor:

$$NZ = \frac{R_{yz}}{R_{yx}} \cong \frac{\Delta n_{yz}}{\Delta n_{xy}} \equiv \frac{n_y - n_z}{n_y - n_x}$$

In common practice:

$$R_o = R_{yx} = (n_y - n_x) \cdot d$$

$$R_{th} = \left(\frac{n_x + n_y}{2} - n_z \right) \cdot d$$

VA mode LCD

There are several ways to compensate vertical alignment mode LCD with Crysoptix retarders:

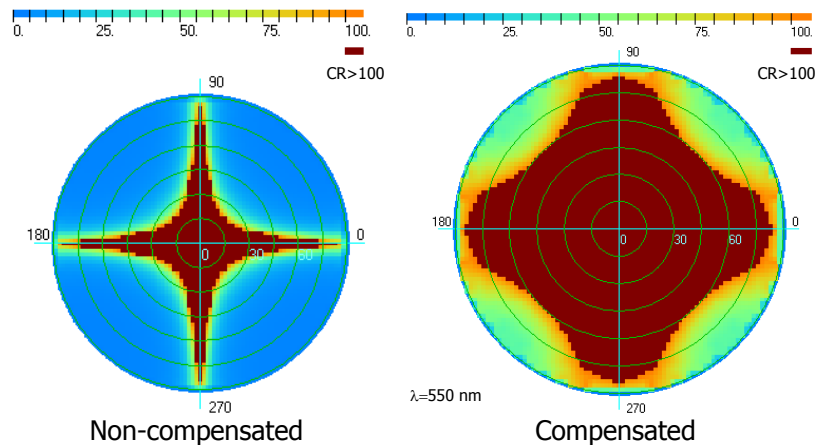
1. Compensation with two biaxial B_A-plate retarders.
2. Compensation with negative C-plate and positive A-plate retarders.

1. Compensation with two biaxial B_A-plate retarders

The biaxial B_A-plate retarder (only 0.3 μm thick) is coated on conventional TAC film and laminated with PVA polarizer.

Front PVA
TAC
VA LC
TAC
BA-LT-1000
TAC
Rear PVA
backlight

BA-LT-1000 (NZ=0.4)	
Δn _{yx}	0.36
Δn _{yz}	0.15
Δn _{zx}	0.22



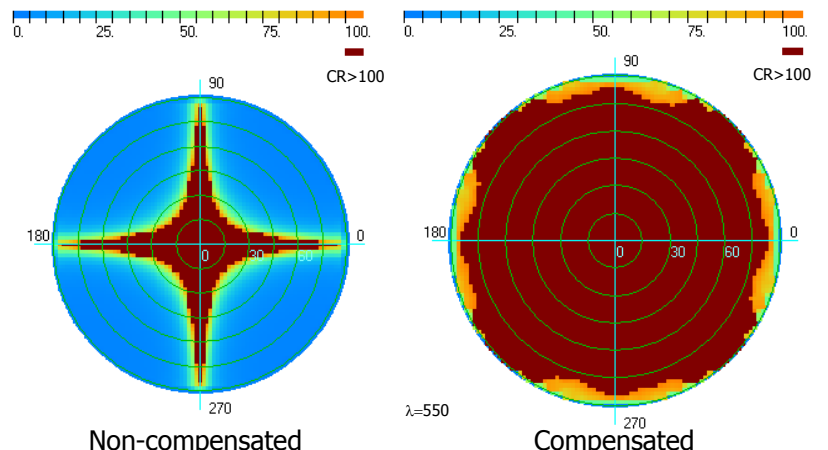
Contrast ratio viewing angle map is shown on the right figure.

2. Compensation with negative C-plate and positive A-plate retarders

The negative C plate retarder (only 1.4 μm thick) is coated on birefringent polymer film (e.g., PET or OPP) or on LC cell glass.

Front PVA
PET film
CN-LT-1000
VA LC
TAC
Rear PVA
backlight

CN-LT-1000	
Δn _{yx}	0
Δn _{yz}	0.12
Δn _{zx}	0.12



Contrast ratio viewing angle map is shown on the right figure.

Note: TAC = triacetyl cellulose, PET = polyethylene terephthalate, OPP = oriented polypropylene, PVA = polyvinyl alcohol

IPS mode LCD

There are several ways to compensate in-plane switching mode LCD with Crysoptix retarders:

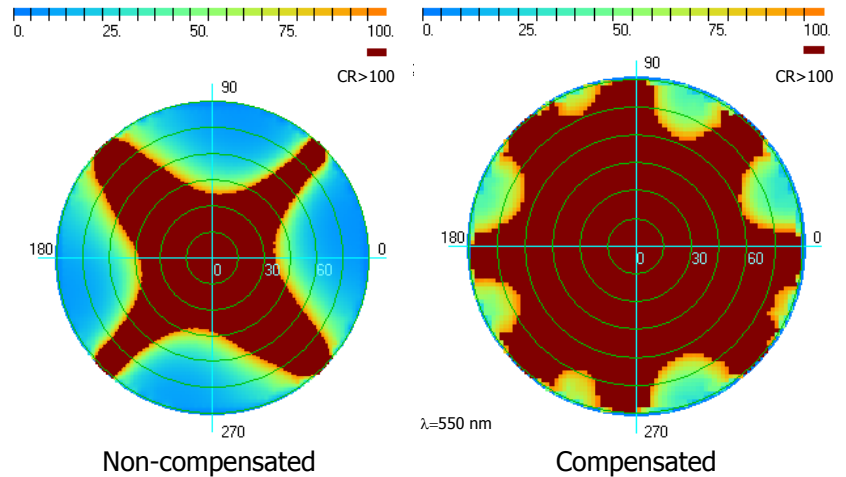
1. Compensation with single biaxial B_A-plate retarder.
2. Compensation with biaxial B_A-plate retarder and positive A-plate.

1. Compensation with single biaxial B_A-plate retarder

The biaxial B_A-plate retarder (only 0.4 μm thick) is coated on conventional TAC film and laminated with PVA polarizer.

Front PVA	BA-LT-1000 (NZ~0.4) Δn_{yx} 0.36 Δn_{yz} 0.15 Δn_{zx} 0.22
TAC	
BA-LT-1000	
IPS LC	
TAC	
Rear PVA	
backlight	

Contrast ratio viewing angle map is shown on the right figure.



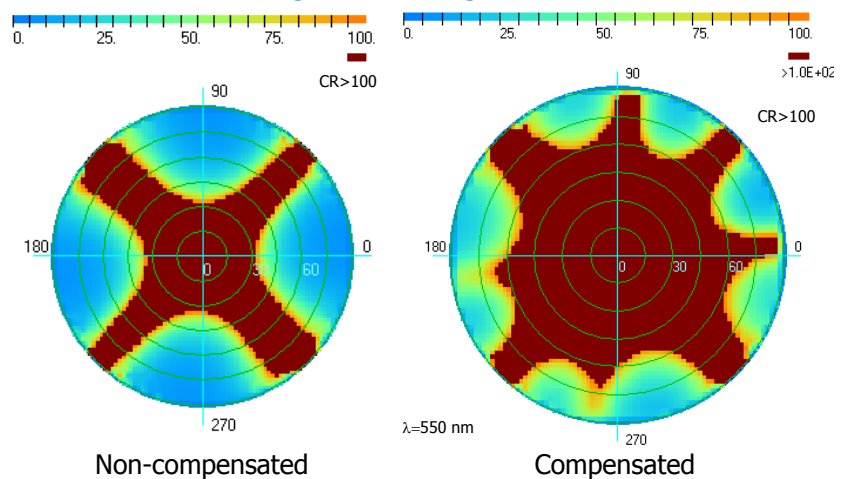
2. Compensation with biaxial B_A-plate retarder and positive A-plate

The biaxial B_A-plate retarder (only 0.7 μm thick) is coated on coated either on birefringent positive A-plate polymer film (e.g., PET or OPP) or on LC cell glass.

Front PVA	BA-LT-1000 (NZ~0.4) Δn_{yx} 0.36 Δn_{yz} 0.15 Δn_{zx} 0.22
PET film	
BA-LT-1000	
IPS LC	
TAC	
Rear PVA	
backlight	

Contrast ratio viewing angle map is shown on the right figure.

The design possesses an improved spectral performance due to anomalous dispersion of birefringence.



3D displays

Crysoptix TBF™ retarder can be patterned on plastic and glass substrate for application in stereoscopic displays enabling 3D effect.

OLED and other applications

Crysoptix positive A-plate retarder can be used as quarterwave and halfwave plates.

For example, quarterwave positive A-plate retarder together with front polarizer can be used in OLED display for cancelling ambient illumination and better display viewing performance.

For special application purpose, we can coat retarders with arbitrary desired retardation value.

Crysoptix KK is a leading material technology company developing, manufacturing and marketing products based on a molecular design of organic components. Crysoptix manufactures a set of unique liquid inks, which are used to produce optical films for LCD. Crysoptix technology is covered by an extensive patent portfolio and is currently being applied to product improvements and cost reduction opportunities in LCD industry.

For more information, visit us at www.crysoptix.com
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