

Birefringent Crystals

Birefringent Crystals	YVO4	Calcite	α -BBO
Physical and Optical Properties			
Transparency Range	400~5000nm	350~2300nm	189~3500nm
Crystal Structure	trigonal, space group R3c	Trigonal, space group R 3c	trigonal, space group R3c
Crystal Class	Positive uniaxial	Positive uniaxial	Negative Uniaxial
Crystal Cell	a =b= 7.12Å, c= 6.29Å	a =b= 4.621Å, c= 3.053Å	a=b=12.532Å, c=12.717Å
Density	4.22 g/cm ³	3.18 g/cm ³	3.85g/cm ³
Hygroscopic Susceptibility	Low	Low	Low
Mohs Hardness	5	6	4.5
Thermal Expansion Coefficients	aa=4.43x10 ⁻⁶ /k ac=11.37x10 ⁻⁶ /k	aa=6.23-9.25 x 10 ⁻⁶ /k ac=10.86-14.54 x 10 ⁻⁶ /k	aa=4 x 10 ⁻⁶ /k cc=36 x 10 ⁻⁶ /k
Optical Homogeneity	10 ⁻⁶ /cm	10 ⁻⁶ /cm	10 ⁻⁶ /cm
Absorption Coefficient	0.05%/cm-1 @1064nm	0.07@0.2m 0.02@5.0m	0.05%/cm-1 @1064nm
Refractive Index, Birefringence($\Delta n = n_e - n_o$) and Walk-Off Angle at 45 deg(ρ)	$n_e = 2.2154, n_o = 1.9929,$ $\Delta n=0.2251,$ $\rho=6.042^\circ @ 633nm$	$n_e = 1.48520, n_o = 1.65578$ $\Delta n=0.17058,$ $\rho=6.205^\circ @ 633nm$	$n_e = 1.67056, n_o = 1.54831,$ $\Delta n=0.1222; \rho=4.345^\circ @$ 532nm
Capabilities			
Diameter	max. 30~40mm	max. 150	max. 40~50mm
Length	max. 25~35mm	max. 100	max. 25~35mm
Surface Quality	better than 20/10 scratch/dig Per MIL-0-13830A	better than 20/10 scratch/dig Per MIL-0-13830A	better than 20/10 scratch/dig Per MIL-0-13830A
Beam Deviation	<10 arc second	<10 arc second	<10 arc second
Optical Axis Orientation	+/-0.2°	+/-0.2°	+/-0.2°
Flatness	< $\lambda/8 @633nm$	< $\lambda/8 @633nm$	< $\lambda/8 @633nm$
Transimission Wavfront Distortion	< $\lambda/4 @633nm$	< $\lambda/4 @633nm$	< $\lambda/4 @633nm$
Coating	upon specification	upon specification	upon specification
Birefringent Crystals	LiNbO3	MgF2	Quartz
Physical and Optical Properties			
Transparency Range	420 ~ 5200 nm	0.12~8.5nm	200~2300nm
Crystal Structure	Trigonal, space group R 3c	Trigonal, space group R 3c	Trigonal, space group R 3c
Crystal Class	Negative Uniaxial	Positive Uniaxial	Positive Uniaxial
Crystal Cell	a =b= 0.515Å, c= 13.863Å	a = 4.621Å, c= 3.053Å	
Density	4.64 g/cm ³	3.18 g/cm ³	2.65 g/cm ³
Hygroscopic Susceptibility	Low	Low	Low
Mohs Hardness	5	6	7
Thermal Expansion Coefficients	aa=2.0 x 10 ⁻⁶ /k @ 25°C cc=2.2 x 10 ⁻⁶ /k @ 25°C	ac= 10.86-14.54x10 ⁻⁶ /k aa= 6.23-9.25x10 ⁻⁶ /k	aa=6.2x10 ⁻⁶ /k ac=10.7x10 ⁻⁶ /k
Optical Homogeneity	~ 5 x 10 ⁻⁵ /cm	10 ⁻⁶ /cm	10 ⁻⁶ /cm
Absorption Coefficient	0.1%/cm @ 1064 nm	0.07 at 0.2 μ m;0.02 at 5.0 μ m	0.1%/cm @ 1064 nm
Refractive Index, Birefringence($\Delta n = n_e - n_o$)	$n_e = 2.20263, n_o = 2.28629$ $\Delta n=0.08366,$	$n_e = 1.38876, n_o = 1.37698$ $\Delta n=0.01178,$	$n_e = 1.55170, n_o = 1.54265$ $\Delta n=0.00905,$

and Walk-Off Angle at 45 deg(ρ)	$\rho=2.135^\circ @ 633\text{nm}$	$\rho=0.488^\circ @ 633\text{nm}$	$\rho=0.335^\circ @ 633\text{nm}$
Capabilities			
Diameter	max. 30~40	max. 50mm	max. 100mm
Length	max. 25~35mm	max. 100mm	max. 100mm
Surface Quality	better than 20/10 scratch/dig Per MIL-0-13830A	better than 20/10 scratch/dig Per MIL-0-13830A	better than 20/10 scratch/dig Per MIL-0-13830A
Beam Deviation	<10 arc second	<10 arc second	<10 arc second
Optical Axis Orientation	+/-0.2°	+/-0.2°	+/-0.2°
Flatness	< $\lambda/8 @633\text{nm}$	< $\lambda/8 @633\text{nm}$	< $\lambda/8 @633\text{nm}$
Transmission Wavfront Distortion	< $\lambda/4 @633\text{nm}$	< $\lambda/4 @633\text{nm}$	< $\lambda/4 @633\text{nm}$
Coating	upon specification	upon specification	upon specification