

LGS($\text{La}_3\text{Ga}_5\text{SiO}_{14}$)



DESCRIPTION

LGS($\text{La}_3\text{Ga}_5\text{SiO}_{14}$) is a multifunctional intraocular crystal that can be used as an electro-optic crystal after considering and studying the interaction between electro-optic effect and optical rotation in functional crystals. The LGS electro-optic Q switch passes light along the Z direction of the crystal and applies an electric field along the X direction, which can make full use of the lateral electro-optic effect of the crystal to realize the Q-switch function of the LGS crystal. The electro-optic Q-switch made by LGS is actually a new kind of rotation-electro-optical Q-switch. Because of the effect of optical rotation, it can be used as a practical switch and a good Q-modulation result can be obtained. LGS crystal widens the new direction of exploring and discovering new electro-optic crystals from optically active crystals.

FEATURES

- High damage threshold
- Good optical rotation
- Can withstand high and low temperature changes
- Stable physical and chemical properties
- High electromechanical coupling coefficient (3 times of quartz)
- Low equivalent series resistance

APPLICATIONS

- electro-optic Q-switch
- SAW device
- BAW device
- Sensor
- High power high repetition rate all solid state laser
- High and low temperature change laser



LGS(La₃Ga₅SiO₁₄)

PARAMETERS

MATERIAL AND SPECIFICATIONS

Property	Value
Point group	32
Airborne group	P32 ₁
specific resistance	4.0×10 ¹² Ω/cm ¹
Thickness	0.13-0.5mm
Diameter	50mm
Length	90-100mm
Melting point	1470℃
Density	5.67g/cm ³
Mohs hardness	5.5
Thermal expansion coefficient	aa=16×10 ⁻⁶ /K, ac=4×10 ⁻⁶ /K
Photo damage threshold	670MV/cm ²
Cell Parameters	a=b=0.8162nm c=0.5087nm
Dielectric constant	ε ₁₁ =18.27 ε ₃₃ =55.26
Electro-optical coefficients	γ ₁₁ =2.3×10 ⁻¹² m/V γ ₃₃ =1.8×10 ⁻¹² m/V
Piezoelectric strain constant(10 ⁻¹²)C/N	d ₁₁ =6.3 d ₁₄ =-5.4
Phase velocity,m/s	2750~2850
Electromechanical coupling coefficient K[%]	0.28~0.46
Coefficient of thermal expansion	α ₁₁ =5.15×10 ⁻⁶ K ⁻¹ α ₃₃ =3.65×10 ⁻⁶ K ⁻¹

COMPARATIVE PROPERTIES OF PIEZOELECTRIC CRYSTALS

Crystal Properties	Quartz	LGS	Li ₂ B ₄ O ₇	LiTaO ₃
Electromechanical Coupling Factor K, %(BAW)	7	15.8	24	47
Frequency Spacing Δf, %	0.25	0.9	4	7
Q-Factor Q, ×10 ³	100	50	10	2
Temperature Frequency Coefficient TFC,×10 ⁻⁶ /℃	0.5	1.6	6	4

SAW PROPERTIES OF LANGASITE AND QUARTZ

Crystal Properties	Quartz	LGS
Density, g/cm ³	2.65	5.746
SAW Velocity V _{ef} , m/s	(0°, 132.75°, 0°) 3157	(0°, 140°, 25°) 2756
Electromechanical coupling factor K _{2emc} , %(SAW)	0.14	0.36
Second order temp. coef.α ₂ , ×10 ⁻⁹ /C	-3.2	-6.8
Temp. Coef. TTO, ℃	25	23
Dielectric Constant e	4.92	27
Power flow angle , °	0	0.5

DIELECTRIC, PIEZOELECTRIC, ELASTIC STIFFNESS CONSTANTS AND THEIR FIRST ORDER TEMPERATURE COEFFICIENTS OF LANGASITE CRYSTAL

	Relative Dielectric Constant		Piezoelectric Constant (pC/N)				Elastic Stiffness (10 ¹¹ Pa)			
Constant	ε ₁₁	ε ₃₃	d ₁₁	d ₁₄	c ₁₁	c ₁₂	c ₁₃	c ₁₄	c ₃₃	c ₄₄
Value	18.96	50.19	5.66	-5.48	1.898	1.058	1.022	0.144	2.626	0.535
First Order Temp. Coef. (10 ⁻⁶ ·K ⁻¹)	150	-760	329	-342	-66	204	-75	-335	-94	-63



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LGS CRYSTAL FOR Q-SWITCH

Property	Value
Maximum operating frequency	50KHz
Maximum output power	7.5W
Pulse width	46ns
Energy output -40 °C	155mJ
Energy output +50 °C	163mJ
Room temperature energy output	167mJ
Electro-optic conversion efficiency	1.26%

