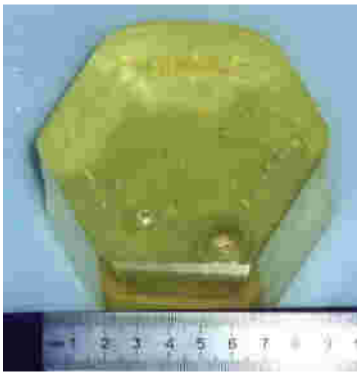
ADVANCED XTAL PRODUCTS

Langatate Main Properties



Langatate – or “LGT” for short - is a piezoelectric crystal of the same crystal class as quartz, Langasite, and Gallium phosphate.. As opposed to quartz it has no phase transition up to the melting point at ≈1450°C. Therefore it is an excellent candidate for high temperature applications in sensors.
LGT has a piezoelectric factor d_{11}, which is about 2.8 times that of quartz., which allows to realize piezo sensors with significantly higher sensitivity. The temperature stability of d_{11} is better than that of Langasite.
As the piezoelectric coupling factor is 2.3 to three times that of quartz, resonators with high pullability can be manufactured with this material, having a temperature stability in the same order of magnitude as quartz resonators. The Q-factor is reported to be higher than quartz.
Langasite crystals are synthetically grown by the Czochralski method in boules up to 100 mm diameter. LGT has excellent thermal, piezoelectric and dielectric properties and is resistant to many chemicals.
The main applications of LGT include

- Surface Acoustic Wave (SAW) Sensors, Bulk Wave Sensors, and Piezo static Sensor elements, for high sensitivity and high temperature applications
- Crystal Units as Bulk Wave (BAW) resonators
- SAW devices for frequency control and selection
- Piezoelectric filters, both discrete and monolithic

	Langatate (LGT)	**α - Quartz**
Chemical formula	$La_3Ga_{5.5}Ta_{0.5}O_{14}$	SiO_2
Crystal space group	32	32
Density	6.130 kg m^{-3}	2.648 kg m^{-3}
Curie Temperature	-	573.3 °C
Melting Point	≈1450 °C	1723 °C
Moh’s Hardness	6.5	7.0
Dielectric constants @ 1 MHz	$\varepsilon_{33}/\varepsilon_0$= 80.3	$\varepsilon_{33}/\varepsilon_0$= 4.68
Coefficient of thermal expansion	$\alpha_{11} = 5.05\cdot10^{-6}$ / K $\alpha_{33} = 3.12\cdot10^{-6}$ / K	$\alpha_{11} = 7.64\cdot10^{-6}$ / K $\alpha_{33} = 14.0\cdot10^{-6}$ / K
Piezoelectric charge coefficient	$d_{11} = -6.\ 5\cdot10^{-12}$ C N^{-1} $d_{14} = 4.7\cdot10^{-12}$ C N^{-1}	$d_{11} = -2.3\cdot10^{-12}$ C N^{-1} $d_{14} = -0.67\cdot10^{-12}$ C N^{-1}
Piezoelectric strain coefficient	e_{11} = - 0.26 C m^{-2} e_{14} ≈ 0.36 C m^{-2}	e_{11} = 0.171 C m^{-2} e_{14} = -0.0436 C m^{-2}
Coupling factor for BAW k^2	20 % (Y-cut)	7.0 % (AT-cut)
Elastic stiffness [in 10^{10} N m^{-2}]	$C_{11} = 11\cdot10^{10}$ N m^{-2} $C_{33} = 19\cdot10^{10}$ N m^{-2}	C_{11} = 8.674 C_{12} = 0.699 C_{13} = 1.191 C_{14} = -1.791 C_{33} = 10.72 C_{44} = 5.794 C_{66} = 3.99

Values are collected from various publications

GmbH & Co. KG
Wasemweg 5
D-74821 Mosbach
Germany

web : www.AXTAL.com
fon : +49 (6261) 939834
fax : +49 (6261) 939836
e-mail: info@axtal.com