Lithium Niobate

magnesium-doped lithium niobate

- CONSISTENT QUALITY
- HIGH PURITY
- LASER DAMAGE-RESISTANT
- 3-INCH DIAMETER

Optical quality lithium niobate doped with magnesium oxide (MgO:LN) is available from Crystal Technology, Inc. This high purity, laser damage resistant lithium niobate can withstand optical intensities at least one hundred times as great as undoped, congruent composition lithium niobate without photorefractive damage.[1-3] It has been shown that the concentration of MgO strongly affects this performance and therefore needs to be tightly controlled.[3-4] The lithium to niobium ratio also affects the photorefractive properties.[5-6]

Crystal Technology, Inc. uses the following notation to specify the composition of the melt from which the MgO:LN crystal material is grown.

A = number of moles of Li_2O
B = number of moles of Nb_2O_5
C = number of moles of MgO

For a congruent, undoped crystal, the molar ratio is:

$A/(A+B) *100\% = 48.38\%$

For MgO:LN with X mol% MgO, the molar fraction X is defined as:

$X = 3C/(A+5B+3C)*100\%$

Note that there are many ways to specify ternary compounds. The notation shown here is based on the number of constituent molecules rather than weight percentages.

In conventional lithium niobate, visible-wavelength laser illumination ionizes defect centers in the crystal.[7] The free charges generated in this process migrate to trapping centers, establishing spatially varying space charge fields. These random fields, through the electro-optic effect, scatter the incident laser radiation. Magnesium doping reduces the magnitude of the scattered light by shorting these random fields via increased photoconductivity.

MgO:LN has been successfully used to frequency double Nd:YAG lasers with high efficiency. In a single pass geometry at a fundamental intensity of 50MW/cm^2, 53% of the incident 1.064µm radiation was converted into 0.532µm radiation.[8] In another example, using a resonant cavity design, 500mW of single-frequency green light was produced from a 700mW Nd:YAG laser – a conversion efficiency of 71%.[9] These results indicate the potential of MgO:LN as an efficient frequency doubler creating many new applications for green lasers.

Optically polished, AR coated MgO:LN crystals are available in standard and custom sizes. Attractive quantity discounts apply. Double-side polished Z-axis oriented wafers of 3" diameter can also be supplied.

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