

MgO:PPLN

Periodically poled Lithium Niobate (PPLN)

PPLN is created by periodically inverting the ferroelectric domains in a lithium niobate (LiNbO₃) crystal, resulting in a higher efficiency of nonlinear optical processes.

Quasi-phase matching (QPM): PPLN enables efficient second-order nonlinear optical processes, such as second harmonic generation (SHG), sum-frequency generation (SFG), optical parametric oscillation (OPO), and spontaneous parametric down-conversion (SPDC), through quasi-phase matching. This technique compensates for the phase mismatch between the interacting waves, allowing for efficient energy conversion over longer interaction lengths. The QPM in PPLN can be engineered during the fabrication process, allowing for phase matching at tailored wavelengths. This tunability enables the generation of coherent radiation over a wide range of wavelengths.

Features of PPLN

- Broad transparency range: 420 nm - 5200 nm
- High nonlinear coefficient: PPLN has a large nonlinear optical coefficient ($d_{33} \sim 27 \text{ pm/V}$), which is essential for efficient nonlinear optical processes.
- Compact design: PPLN devices can be designed in compact and integrated configurations, making them suitable for applications where size and portability are important considerations.
- PPLN exhibits a relatively high resistance to photorefractive damage enabling high-power operation and improved device lifetime. Absorption coefficient of $\sim 0.1/\text{cm}$ @ 1064nm and Laser damage threshold of 100 MW/cm^2 @ 1064, 10ns.

Applications

- Frequency conversion for laser systems
- Nonlinear spectroscopy
- Optical communications
- Integrated photonics
- Perfectly suited for compact low power solid state laser systems
- Quantum light sources



PPLN Specifications

Aperture	Up to 1x5 mm ²
Length	Up to 40 mm
Transparency Range	420-5200 nm
Flatness	Up to $\lambda/10$ @ 633nm
Scratch/Dig	10/5
Perpendicularity	<10 arc min.
Parallelism	20 arc sec.
Wavefront Distortion Control	$\lambda/8$ @633 nm
AR Coating	AR, DBAR, HR
Absorption Coefficient	<0.1/cm @ 1064nm
Laser-Induced Damage Threshold	100 MW/cm ² , @ 1064 nm, 10 ns