Gooch & Housego

Optical Frequency Conversion Crystals

Frequency conversion by three-wave nonlinear processes allows the frequency conversion of electromagnetic radiation from one frequency into two other frequencies, or from two into one. Second-harmonic generation is a special case in which two photons of the same frequency are combined into a single photon of twice the frequency. Other three-wave nonlinear optical processes are difference-frequency generation, sum-frequency generation, optical parametric oscillation, and optical parametric generation. Optical frequency conversion can occur when an intense beam of light passes through a nonlinear material, such as KDP or BBO. By properly aligning the beam with respect to the crystal lattice structure, it is possible to greatly enhance the frequency conversion effect through a phenomenon known as phase matching. Phase matching for second-harmonic generation takes place when the index of refraction of the generated harmonic beam is equal to the index of refraction of the incident fundamental beam. When such a situation exists, the interacting beams propagate through the crystal with phase velocities τ required for the constructive interaction needed to increase the interaction length and increase the conversion efficiency to practical levels.

Gooch and Housego has considerable experience in the design and production of crystals for nonlinear frequency conversion application from the deep UV to the far IR using a wide selection of crystal materials, including $AgGaS_2$, $AgGaSe_2$, BBO, CdS, CdSe, CLBO, KDP, and KD*P. Several proprietary software routines enable us to supply “optimized” crystals, which allow you to get the best possible performance from your system. G&H routinely finishes nonlinear optical crystals as large as 41 cm × 41 cm × 1 cm for **ICF** applications and as small as a few mm in cross section for **micro-chip laser** applications. Special geometrical shapes include thin plates with a 200:1 diameter to thickness ratio with diameters as large as 160 mm and plates as thin as 400 μm for femtosecond-pulse-duration applications. Brewster-cut bars are supplied for low-loss intra-cavity laser applications. Our combined capabilities of crystal growth, device design, optical fabrication, crystal housing, and performance testing provide materials of superior performance.

光技術をサポートする
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