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KTP Crystals for SHG

KTP is grown in by adding flux in a top seeded solution at a temperature of 1, 150C. This type is commonly sold, and it is called flux-grown KTP crystal, or F_KTP. Density for the flux-grown crystal is 2.945 gms/cm^3. The other method of grown KTP is known as Hydrothermal, and the crystal is called H_KTP. In this method the crystal at very high temperature and under pressure of ~ 900 atmospheres. Its resultant density is 3.03 gms/cm^3.

The F_KTP is Type II cut at è = 90, and ø = 24° in the X-Y plan at room temperature (24°C). If you change the operating temperature, the angle would become greater. For example, from 25°C to 100°C, the new ø = 26°. If the crystal was cut at room temperature (25°C) and then operated at 100°C, the crystal would have to be moved 2° to compensate for the temperature rise. It would not be at its optimal point, since it was originally cut for 25°C operation.

The overall efficiency could drop form 50% to as low as 40% conversion. The combination of temperature and angle gives an optimum efficiency point. If one parameter changes, the overall efficiency will decrease. Therefore, the temperature of operation must be given when ordering a KTP crystal. To maintain efficiency, the crystal is cut to the appropriate angle at the temperature it is intended to operate. The operating temperature must be part of the specification for KTP crystals.

The other confusion may occur when using an oven with a KTP crystal. The operating temperature of the oven must be greater than any ambient temperature, in this case 70°C. The limit is usually about 100°C. The oven is used to keep the temperature constant on the crystal as the "outside" or ambient temperature fluctuates.

The acceptance angle for ø = 26°, that is 100°C operation, is approximately 12mRad-cm with a temperature acceptance 25C-cm, and the approximate walk-off angle is 1mRad. At the higher temperature, the photo-refractive damage is improved.

NCPM stands for Non-Critical Phase Match. It is also known as temperature phase match. The most conversion takes place at an optimal temperature.

CRITICAL PHASE MATCH is also known as angle tuned method and angle phase match. Here a certain angle is optimal for a wavelength (therefore it is critical) at a certain given temperature.

NCPM is preferred because the temperature and output SHG efficiency can be stabilized. However, non-critical phase matching can also use the higher temperature provided by an oven, but the temperature must be given to compensate for this temperature.

The acceptance angle for ø = 26° and for operating temperature of 100°C is about 12 mRad-cm (approx.). The temperature acceptance width is 25°C-cm. Walk-off angle is 1 mRad (approx.). Photo refractive damage is improved when you operate at 100°C.

All SHG experiments need a plane polarized beam. Single mode oscillation is better than multimode for stability of SHG from pulse to pulse.

In short, if the crystal does not have an oven, and the ambient temperature varies from -10°C to 70°C, we will not be able to warranty SHG efficiency and the KTP SHG product and its damage.

Please remember that if you wish to operate KTP at any temperature, for example, 70°C and 100°C, we must know, as we have to cut the crystal accordingly. You must choose the temperature in this range only, to receive our warranty.