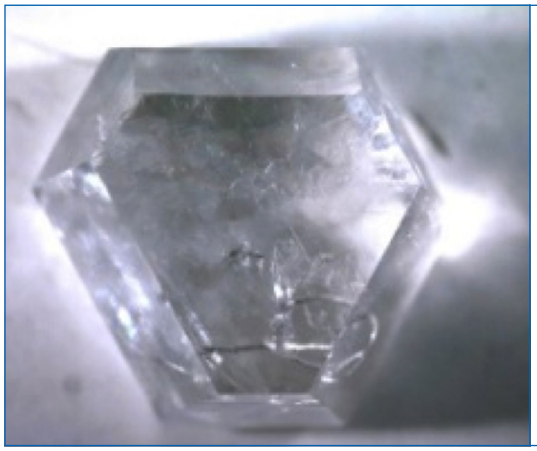
# KBBF—taking laser light places it's never been before

Potassium beryllium fluoroborate (KBBF) is a non-linear optical crystal that can transform laser light to an unprecedented 176nm (deep UV) for use in solid state lasers. Taking 15 years and spending the equivalent of millions of U.S. dollars, development of the first KBBF crystals was accomplished by a group of Chinese researchers under the direction of Dr. Chuangtian Chen. The Chinese initially shared their KBBF crystals with the research community beyond China's borders. However, in 2009 the PRC, realizing the strategic significance of KBBF, halted the external distribution of the crystal. In collaboration with Clemson University, **Advanced Photonic Crystals (APC) has developed a U.S. patented hydrothermal crystal growth process to produce the KBBF crystal here in the United States, becoming the nation's only domestic source of this strategic material.** The samples evaluated and tested to date have demonstrated that APC's KBBF crystals are comparable to, and in many parameters exceed, the quality of the Chinese equivalents, and they can be produced at significantly lower cost.



**KBBF's Deep UV characteristics can enable:**

- **Improved detection of airborne chemical and biological agents**
- **Enhanced detection of explosives and explosive residuals**
- **Significant improvement in the ability to inspect microchips with solid state metrology**
- **Advanced research and development of new superconductor materials and applications**

## APC's Hydrothermal KBBF versus Best-Available BBO

| Measured Parameter | KBBF | BBO |
|---|---|---|
| Transmission Range (nm) | 153-3660 | 189-3300 |
| Phase-matched SHG Cut-off (nm) | 164 | 110 |
| Δn (298.5nm) | 0.0745 | 0.138 |
| Walk-off Angle (degrees at 395nm) | 2.5 | 4.0 |
| Optimum Non-collinear Angle (degrees, should match walk-off angle for best phase matching) | 2.5 | 3.7 |
| NLO Coefficient (pm/V) | 0.76 | 2.3 |
| 400 nm SHG Efficiency | 26.1% | 11.0% |
| **Laser Damage Threshold (GW/cm2 at 1064nm with 10 ns pulse)** | **>> 40** | **13** |
| **Chemical Stability** | **Non-Hygroscopic** | **Hygroscopic** |

**KBBF has up to twice the UV performance of BBO in high power, ultrafast laser applications. For improved U.S. defense and homeland security threat detection, for rejuvenating U.S. superconductor research, and for enabling enhanced metrology capabilities, KBBF is a "game changer". Currently under development at APC.**

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