Crystal Growth of KBBF and Prism-free Doubler for deep-UV Generation

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$KBe_2BO_3F_2$ (KBBF) is still the only practical deep-UV nonlinear optical crystal that can generate coherent radiation below 200 nm by direct second harmonic [1]. However, KBBF crystal is grown as a thin plate along the *a-b* plane and is easily cleavage, it is difficult to cut the crystal along the phase-matching direction. So far, almost all the frequency doubler based on KBBF crystals are designed as prism-contacted devices (PCD) with sandwich-like structures so that the fundamental frequency laser can propagate along the phase-matching direction in KBBF [2]. However, the damage threshold of PCD is two orders of magnitude lower than that of KBBF crystals itself, which limits the output power of deep-UV lasers. Furthermore, the lower transmittance of PCD due to the two extra interfaces limits the output power of continuous wave (cw) deep-UV lasers. In this paper, we have made a breakthrough in the growth of KBBF crystals, fabricated prism-free frequency doubler through overcoming the disadvantage of easily cleavability of crystal, and realized the deep-UV laser output at 193 nm and 177.3 nm. Finally, we also evaluate the commercialization viability of KBBF crystals.

References

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[2] Chen CT et al. Deep ultraviolet harmonic generation with $KBe_2BO_3F_2$ crystal. Chinese Physics Letters. 2001;**18**(8):1081.