# $LiB_3O_5$를 이용한 UV 광 파라메트릭 진동자

# UV Optical Parametric Oscillator based on $LiB_3O_5$ crystals

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Demands for ultra-violet (UV) laser sources are ever increasing for semiconductor lithography, dermatopathy and spectroscopy. However, conventional UV laser sources, such as excimer lasers and dye lasers are expensive, bulky in size, and difficult to maintain because of toxic gases. Moreover, wavelengths are unable to be tuned. We present a non-critically phase matched UV OPO based on a $LiB_3O_5$ crystal, the wavelength of which can simply be tuned by angle or temperature[1-2].

The experimental setup is shown in Fig. 1. The UV OPO was pumped by 266 nm, which was obtained by two consecutive second harmonic generations of a Nd:YAG laser (1064 nm, 9 ns, 10 Hz) using a KDP and a CLBO crystals, respectively. The phase matching condition for CLBO crystal for 4HG is type I ($\phi = 45.03^{\circ}$, $\theta = 61.42^{\circ}$) and the corresponding nonlinear optical coefficient is 0.822 pm/V. The UV OPO consisted of two plane cavity mirrors and a LBO crystal, and the cavity was a singly resonant. The input coupler mirror had transmissivities of ~0% near 314 nm and 92-93% at 266 nm. The output coupler mirror had transmissivities of ~90% at 266 nm and near 1743 nm, and 85-90% near 314 nm. The phase matching condition for LBO OPO was type II non-critical phase matching ($\theta = 0^{\circ}$) and the corresponding nonlinear optical coefficient was 0.98 pm/V. The LBO crystal length was 16 mm and the total cavity length was 20.6 mm.

Fig. 2 shows the energy of the signal wave at 314 nm as a function of the pump wave. The threshold pump intensity was 25.34 $MW/cm^2$, which agrees very well with the theory[3]. The conversion efficiency was 3.4% at the pump intensity of 32.9 $MW/cm^2$. The temporal profile of the OPO signal is shown in Fig. 3. The rear part of the signal is much broadened as long as ~40 ns, which is a characteristic of pulsed OPOs.

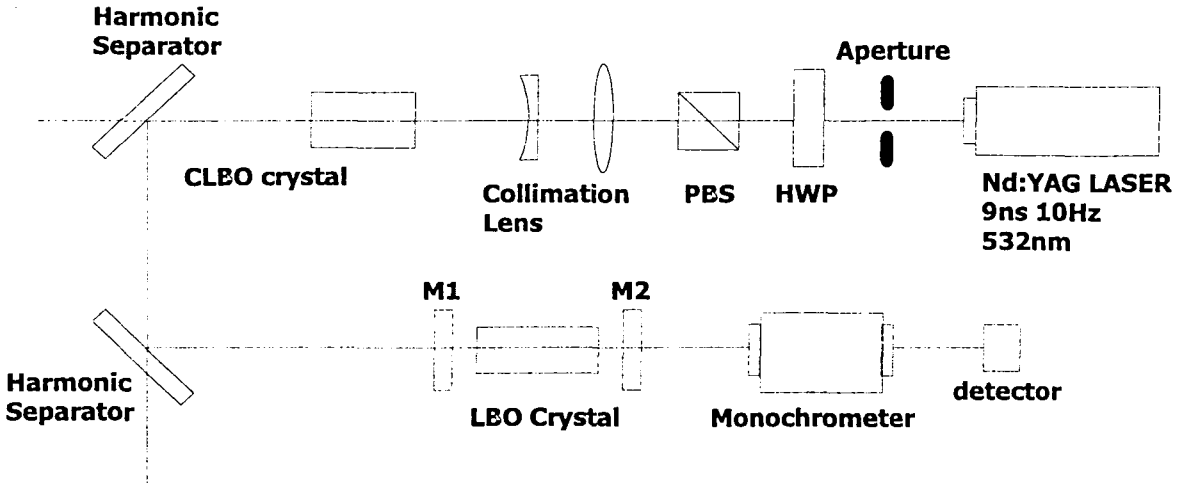


Fig. 1. Experimental setup.

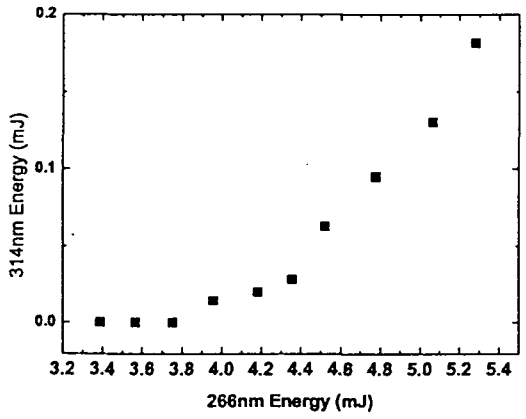


Fig. 2. OPO output energy as a function of pumenergy.

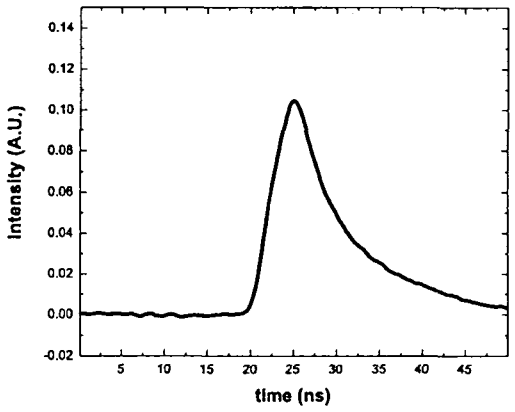


Fig. 3. Temporal profile of the OPO signal (314 nm).

## References

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