University of Manitoba
Department of Electrical & Computer Engineering

Phase-matching properties of PPKTP, MgO:PPSLT and MgO:PPcLN for ultrafast optical parametric oscillation in the visible and near-infrared ranges with green pump

Sujith Manjooran
Dept. Electrical & Computer Engineering
University of Manitoba
Email: manjoors@cc.umanitoba.ca

Ultrashort pulse optical parametric oscillator (OPO) with wavelength tunable in the visible-near infrared (VNIR) region is highly useful in microscopy and spectral imaging of biological samples. Solid-state lasers based on Ytterbium (Yb) doped double tungstate (Yb:KGW/KYW) crystals (λ=1040 nm) are being developed in our laser lab.

Frequency doubling of laser output using second harmonic generation (SHG), 1040 nm to 520 nm (green), is needed to work the OPO in VNIR range. The concept of the tunable femtosecond OPOs with green excitation presented here can be a better alternative to the widely used expensive Ti:Sapphire lasers. The theoretical studies here consider the phase-matching conditions of three periodically poled crystals (PPKTP, MgO:PPcLN and MgO:PPSLT) to use for femtosecond optical parametric oscillators (OPO) to generate wavelength tunability in this range. The basic optical properties and the wavelength tuning ranges are calculated with respect to different grating periods and temperature variation. Dispersive properties of crystals relevant to the ultrafast operation regime are also discussed [1]. The results of the accurate analysis of phase-matching properties, wavelength tuning ranges and grating periods presented here are the main requirements in successful design of practical femtosecond OPO devices with 520 nm excitation wavelength.

REFERENCES

[1] S. Manjooran, *et al.*, "Phase-matching properties of PPKTP, MgO:PPSLT and MgO:PPcLN for ultrafast optical parametric oscillation in the visible and near-infrared ranges with green pump," *Laser Physics*, vol. 22, pp. 1325-1330, 2012.

ADVISOR: Arkady Major

Proceedings of the 2012 Graduate Students Conference, GRADCON 2012
Winnipeg, MB, Canada; October 12, 2012