주기적으로 분극 반전된 $KNbO_3$를 이용한 준위상 정합 광 매개 진동자

Quasi-phase matched optical parametric oscillators using periodically poled $KNbO_3$ crystals

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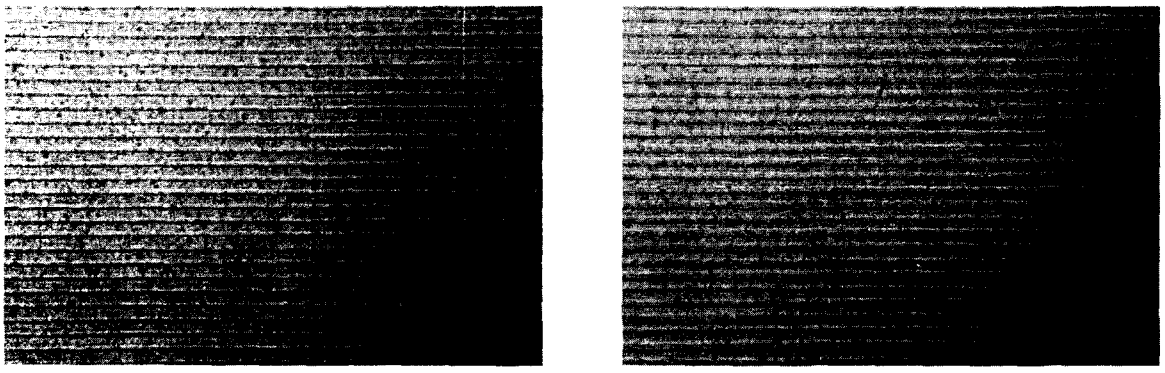
$KNbO_3$ is one of the best materials for efficient nonlinear frequency conversion, due to its large nonlinear optical coefficient (d_{33} = 20.6 pm/V)[1], wide transparency range (0.4 ~ 5 ㎛)[2] and freedom from photorefractive effects. Quasi-phase-matched second harmonic generation using periodically poled $KNbO_3$ (PPKN) crystals has been reported[3, 4]. Here we report on fabrication of PPKN and demonstration of a pulsed optical parametric oscillator (QPM OPO) pumped by an Nd:YAG laser. Single domain $KNbO_3$ crystals of 11×14×6 (a×b×c) mm^3 size were fabricated by applying an electric field of 500 V/mm along the c-axis at 170℃ for 13 hours. Using the single domain $KNbO_3$ crystal plates, periodically poled structures were fabricated by applying a square pulse with a peak intensity of 280 V/mm and a pulse width of 730 ms. A periodically poled $KNbO_3$ of good quality was obtained with a dimension of 5.0×2.2×0.7 (a×b×c) ㎣ and a period of 31.5 ㎛, which is to utilize the d_{33} component of the second-order nonlinear coefficient tensor. Optical parametric oscillation was realized at the signal wavelength of 1.56 ㎛ using an Nd:YAG laser as a pumping source. The result of this work may contribute to the development of coherent radiation sources in mid-IR region.



(a) (b)

Fig. 1 Etched domain patterns of (a) +c, (b) -c faces of PPKN.

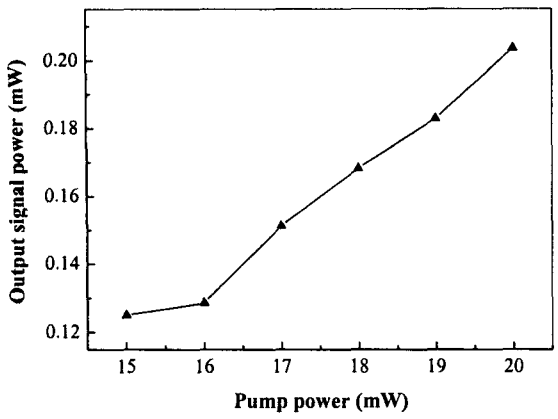


Fig. 2 Signal power of PPKN OPO as a function of pump power.

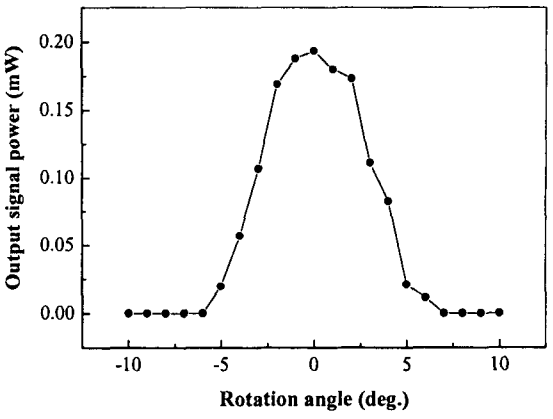


Fig. 3. Tuning curve of PPKN OPO.

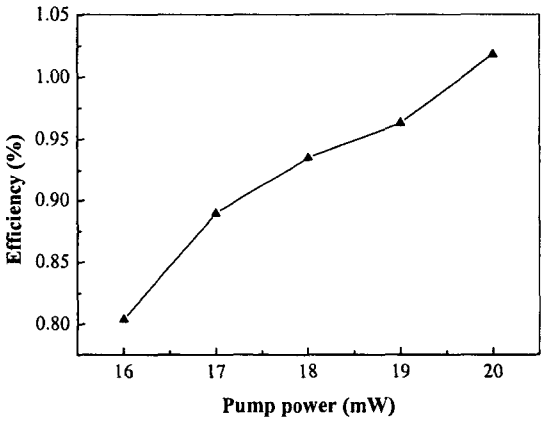


Fig. 4 Efficiency of PPKN OPO

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