Periodically Poled $KNbO_3$ Crystals for Quasi-Phase-Matching

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Although it was suggested in 1962 that an efficient wavelength conversion could be achieved using ferroelectric crystals of periodic 180° domains, it was not until 1990's that quasi-phase-matching (QPM) became realized, as technology for periodic poling of $LiNbO_3$ crystals was readily available. Since ferroelectric domain inversion brings about change of the sign of second-order nonlinear susceptibility, periodically poled ferroelectric structures provide an ideal way of achieving QPM for second-harmonic generation and optical parametric oscillation. Periodically poled ferroelectric domains can also be utilized for optical devices, such as Bragg electrooptic modulators. Fabrication of stable periodic domain structures depends on a number of poling parameters of a ferroelectric crystal, such as coercive field, internal field and electrical conductivity. We present poling kinetics of $KNbO_3$ crystals, which involve domain nucleation and growth, backswitching, relaxation of internal field. Optimum poling conditions were established by designing a proper wave shape of external field. We demonstrate an efficient second-harmonic generation using QPM in a periodically poled $KNbO_3$ crystal.

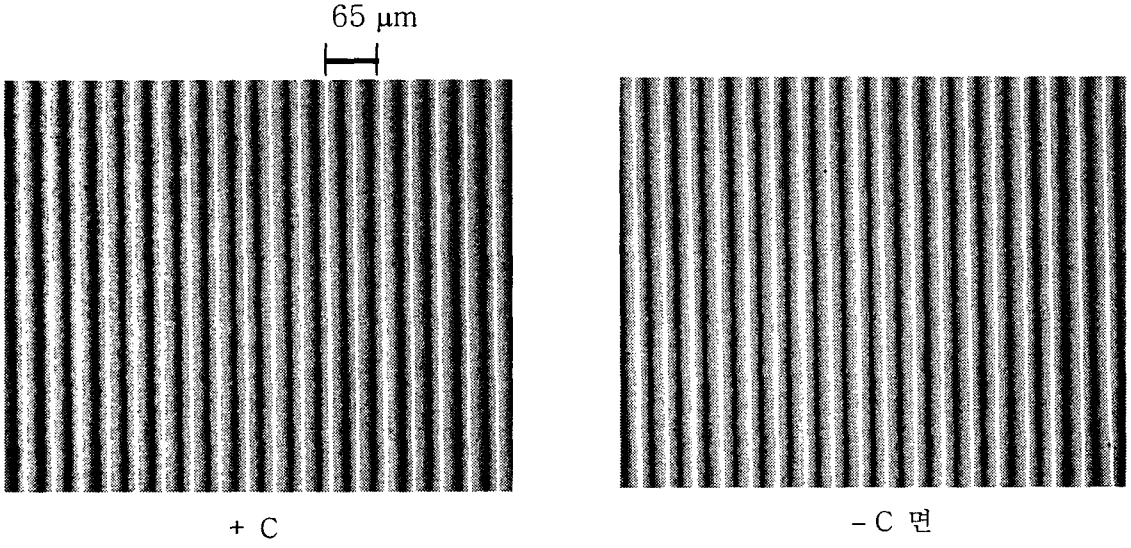

Fig. Periodically poled $KNbO_3$ for quasi-phase-matched second-harmonic generation.