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Electro-optic contribution of optically generated small bound polarons in nominally undoped, thermally reduced $LiNbO_3$[1] MIRCO IMLAU, HAUKE BRUENING, Department of Physics, University of Osnabrueck, Germany — Recently we have shown that a spatial modulation of optically generated densities of small bound polarons can be applied for hologram recording in $LiNbO_3$ [1]. This new type of recording mechanism is of particular interest for the field of nonlinear and ultrafast photonics because of small bound polaron generation on the fs-scale. The grating recording via the photochromic response of small bound polarons was successfully applied to explain gratings recorded with a grating vector aligned orthogonal to the polar c-axis. In this contribution we study the relation of optically generated small bound polarons with pronounced index changes, that were found with values up to 10^{-4} and a grating vector parallel to the c-axis. The Pockels effect that must be driven by an internal electric space-charge field is taken into account. In contrast to the classical photorefractive effect, where slow and long-ranging transport mechanisms must be considered, we discuss the build-up of the space-charge field on the sub-ps-time scale in the model of optical absorption of small polarons, i.e., the optically generated polaron hopping to next-neighboring lattice sites.

[1] M. Imlau et al., Optics Express 19, 15322 (2011)

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