

Abstract Submitted
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Small bound polarons for ultrafast holography in dielectric LiNbO₃¹ MIRCO IMLAU, HAUKE BRUENING, HOLGER BADORRECK, ANDREAS BUESCHER, School of Physics, Osnabrueck University, IMLAU RESEARCH GROUP TEAM — Small bound polarons allow for hologram recording with single laser pulses and exceptional photosensitivity in nominally undoped, thermally reduced LiNbO₃ [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. In this contribution we present our latest results on the emerging field of small bound polarons for fs-holography in the visible spectral range as well as the successful application of the effect for holographic imaging. The impact of two-photon absorption and nonlinear index of refraction is highlighted by studying the temporal dynamics of the diffraction efficiency as a function of time-delay between hologram recording and probing ($-6 \text{ fs} < \delta t < 6 \text{ ns}$). The analysis of the temporal dynamics supports our recent approach (see Ref. [2]) to explain the build-up of the space-charge field on the sub-ps-time scale in the model of optical absorption of small polarons: optically induced polaron hopping to next-neighboring lattice sites is responsible for a fast and efficient charge transport on the nanoscale.

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

[2] H. Bruening et al. Opt. Express 20, 13326 (2012)

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