

Photostriction in ferroelectric materials

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Ferroelectrics are intrinsically multifunctional materials with a particular efficiency in electro-mechanical coupling which plays a central role in many devices in telecommunications and sensors technologies (motion-position control, electro-optic and acousto-optic devices). Controlling their acoustic response with ultrashort light pulses would pave the way of non-contact GHz-THz technologies. Among interests, we show in this communication how it is possible to manipulate the lattice dynamic (photostriction, photoinduced-strain) with light [1-4]. Different electron-phonon coupling mechanisms are involved during the light-matter interaction (inverse-piezoelectric effect, deformation potential) which permit to induce either expansion or contraction of the lattice at the picosecond-nanosecond time scale offering exciting perspective for advanced mechatronics. These light-matter interaction processes will be further discussed thanks to recent optical pump-probe experiments [5] combined with optical pump – time-resolved X-ray diffraction [6].

[1] Schick, D. et al., Phys. Rev. Lett. 110, 095502 (2013).

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[4] Lejman M., Vaudel G., Infante I-C., Chaban I., Pezeril T., Edely M., Nataf G., Guennou M., Kreisel J., Gusev V. E., Dkhil B., Ruello P., Nature Comm. 7, 12345 (2016).

[5] Lejman et al, in preparation

[6] Matzen et al, in preparation.