

Seminar über BioNano-Physik/Medizinische Physik
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Particle manipulation by tailored electric fields induced in ferroelectric crystals

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Particle trapping and manipulation via light-induced electric fields in ferroelectric crystals is a rapidly evolving research area with diverse applications. This presentation provides an overview of the fundamentals, different methods, and recent advancements in the field. The two main mechanisms for generating electric fields in ferroelectric crystals are introduced: the bulk photovoltaic effect and the pyroelectric effect. The bulk photovoltaic effect arises from the absorption of light, leading to charge separation and the generation of an electric field. On the other hand, the pyroelectric effect occurs when the temperature of the crystal is modulated, causing changes in the polarization and the subsequent creation of electric fields. The electric field exerts an electrophoretic or dielectrophoretic force on the particles, depending on whether or not they are charged. By either pre-shaping the induced light field, or by domain engineering, the resulting electric fields can be customized enabling potential applications in microfluidics, biophysics, optoelectronics and photonics.

Overall, this talk aims to provide a comprehensive understanding of particle trapping and manipulation through light-induced electric fields in ferroelectric crystals, focusing on a fundamental understanding and showcasing the current state of the art.