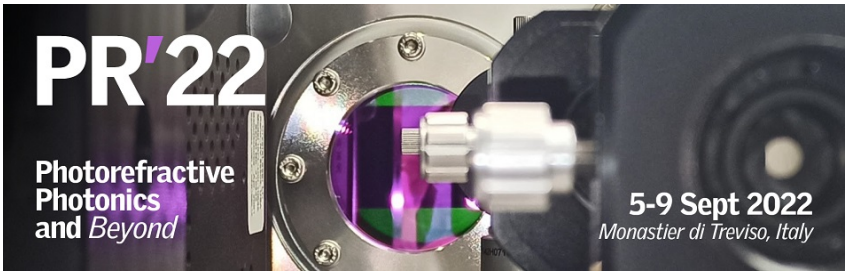

Contribution ID: **39** Type: **Regular Talk**

Light-shaped virtual electrodes on Fe:LiNbO3 to control confined droplets

Thursday, 8 September 2022 09:35 (25 minutes)

Non-centrosymmetric ferroelectric materials serve as optimal substrates for generating local evanescent electric fields for droplet manipulation. Upon illumination, net space charge distributions are induced in the material, acting as virtual electrodes for dielectrophoretic control of droplets. Droplet manipulation using this method is promising due to the high flexibility offered by optical modeling techniques, especially for lab-on-a-chip applications that require multiple functional operations, such as droplet blending, sorting, and mixing, on the same platform. Although the control of liquid droplets has been successfully achieved using virtual electrodes, the confinement of aqueous droplets in micrometer-sized channels, i.e., the most typical configuration in lab-on-a-chip, has never been studied. In particular, these materials have not yet been successfully integrated into microfluidic platforms.

Here, we present the integration in droplet microfluidic devices of Fe:LiNbO3, one of the most commonly used crystals for this application, because of its high photoinduced electric fields. C-cut crystals replace the classical slide used as the bottom layer of a PDMS microfluidic device, allowing photoinduction of the evanescent field within the microfluidic channels. Light patterning techniques were used to shape the electrodes to control the droplets within the channel in different ways, such as sorting or fusing. We use stripe-like electrode patterns to direct droplets along paths that differ from paths in normal Poiseuille flow in the micrometer channel. In addition, arrangements of stripe electrodes perpendicular to the droplet flow are exploited for an on-demand merging of successive droplets.

Primary author: Dr ZAMBONI, Riccardo (University of Muenster)

Co-authors: IMBROCK, Jörg (University of Muenster); DENZ, Cornelia (University of Muenster)

Presenter: Dr ZAMBONI, Riccardo (University of Muenster)

Session Classification: Photorefractive hybrid systems

Track Classification: Materials