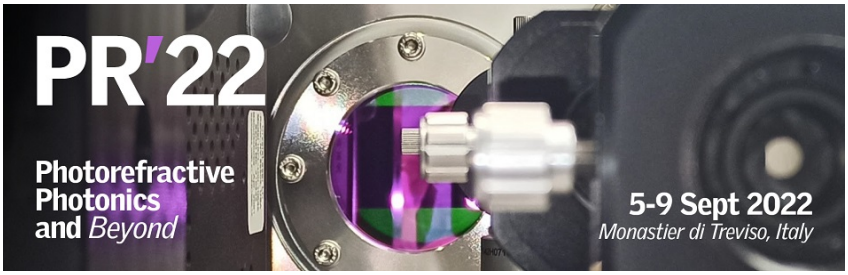

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Photoinduced Displacement of Ferroelectric Nematic Liquid Crystal droplets on the Surface of Lithium Niobate

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The recent discovery of nematic liquid crystal molecules showing a ferroelectric order has marked a breakthrough in liquid crystal science. In nematic liquid crystals the rodlike molecules align parallel to each other. However, the conventional nematic phase is not polar, as in average half of the molecules have their dipoles pointing in each of the two opposite directions associated to the director axis. On the contrary, ferroelectric nematic liquid crystals (FNLC) are polar fluids with alignment of their dipoles. In this work, we studied interaction of FNLCs with photovoltaic and/or pyroelectric fields generated on the surface of iron-doped lithium niobate crystals (LiNbO3:Fe) to induced large electric fields without requiring electrodes. When sessile droplets of a FNLC are placed onto the surface of an illuminated or heated x-cut LiNbO3:Fe crystal, intriguing dynamic processes occur. At first, the droplets change their shape from spherical to extended ellipsoidal. Then, they start to rapidly move preferentially parallel to the direction of the crystal's plus and minus c-axis. During this motion, several droplets merge into running streams extending towards the edges of the crystal. Finally, practically all liquid-crystalline material is transferred from the top surface to the side surface of the crystal. We will discuss the dependence of the described phenomena on the optical field intensity, polarization, and spatial profile, and on the temperature ramp (inducing pyroelectricity). These intriguing behaviors are reproducible and have been tested with two different FNLCs, whose ferroelectric phase exists above or at room temperature.

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