UNIVERSITÉ DE GENÈVE
DQMP Department of Quantum Matter Physics

DQMP Forum

Tuesday, November 17th, 2020 - 13h00
Zoom Meeting, Meeting ID: 799 1837 469

Coffee and tea will be available if you make it for yourself at home or in the lab

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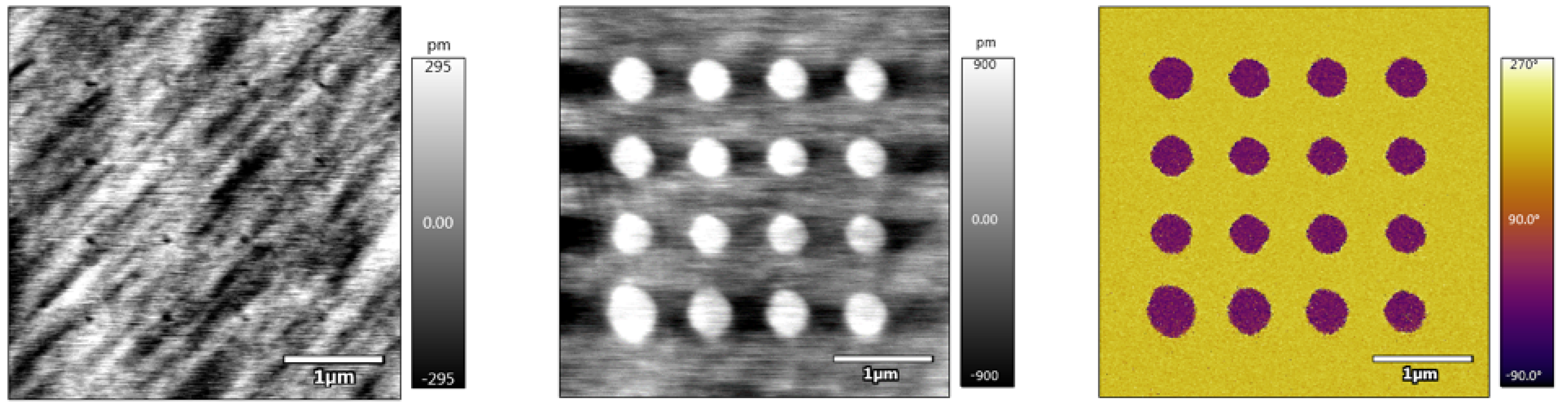
DQMP Department of Quantum Matter Physics

Asymmetric Friction and Wear of Symmetric Ferroelectric Polarization Domains

Seongwoo Cho
(group of Prof. Paruch)

We investigated asymmetric friction and wear of up and down oriented polarization domains in periodically poled lithium niobate single crystals using scanning probe microscopy. Lateral force microscopy was used to visualize the local friction coefficient and topography modification following nanoscale wear in a controlled environment. Our study indicates that ferroelectric up domains have both a higher friction coefficient and faster wear rate than the down domains. We relate these nanotribological asymmetries to the asymmetric contribution of flexoelectric polarization in the up and down domains under a tip contact force. Friction difference in domain enables us to directly and rapidly visualize ferroelectric domains without applying voltage and using additional signal amplifiers. Moreover, exploiting the wear asymmetry combined with the switchable polar nature of ferroelectrics, we developed a resist/chemical/mask-free lithography technique which can be harnessed for potential electronics applications including optical devices, transistors, sensors, and energy harvesters.



Height before milling   Height after milling   PFM Phase

Cavity Quantum Electrodynamics in Solids

Giacomo Mazza
(group of prof. Triscone)

Quantum electrodynamics (QED) describes the interaction between light and matter in the limit in which the quantum nature of the electromagnetic field becomes relevant. This can be achieved by trapping light in confined geometries, termed cavities, in which the vacuum fluctuations of the electromagnetic field get strongly enhanced due to the spatial confinement. So far the effects of the vacuum electromagnetic coupling in cavity QED have been mainly investigated in the context of atomic and molecular physics. In recent years it has been proposed to extend this approach to the realm of solid state physics with the ultimate goal of controlling properties of matter by engineering non-trivial hybrid states of light and matter inside cavities. In this seminar I will briefly introduce the perspectives and the challenges of this field. I will therefore discuss a specific example concerning the shaping of the optical properties of dielectrics placed between cavity mirrors.