

REORIENTATION OF A NEMATIC
IN THE VICINITY OF MECHANICAL
DEFECTS OF THE SILICON SURFACE

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S u m m a r y

We study the reorientation of a nematic liquid crystal in the vicinity of defects of the silicon surface (cracks, scratches) in structures of the Al/Si/nematic/ITO type. It is shown that, in the vicinity of a typical mechanical defect of the silicon surface with linear sizes of the order of tenths of a micron, a localized region of the homogeneously reoriented nematic is formed, whose size depends on the frequency, voltage, and size of the very defect. It is shown that the formation of a domain is defined by the process of nonstationary depletion of the silicon surface, the creation of a high-resistance near-surface layer, and the enhanced currents flowing through the liquid crystal — silicon interface, which hampers the formation of a depleted layer in the vicinity of defects. We demonstrate a method allowing the visualization of a crack on the silicon surface. The method is based on both the simultaneous formation of a Si surface layer depleted by major charge carriers and the generation of nonequilibrium charge carriers, which is inhomogeneous over the surface area, by a laser emission. It is established that the method allows one to detect cracks of several tens of nanometers in depth on the silicon surface.