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Direct Nanomechanical Measurement of an Anchoring Transition in a Nematic Liquid Crystal Subject to Hybrid Anchoring Conditions BRUNO ZAPPONE, CNR-IPCF, Liquid Crystal Lab., Univ. of Calabria, Italy, MARINA RUTHS, Dept. of Chemistry, Univ. of Massachusetts Lowell — A Surface Forces Apparatus was used to measure the normal force between two solid curved surfaces confining a film of nematic liquid crystal (5CB, 4'-*n*-pentyl-4-cyanobiphenyl) under hybrid planar-homeotropic anchoring conditions. Upon reduction of the surface separation D, we measured an increasingly repulsive force in the range D = 35-80 nm, reaching a plateau in the range D = 10-35 nm, followed by a short-range oscillatory force at $D < 5$ nm. The oscillation period was comparable to the cross-sectional diameter of the liquid crystal molecule and characteristic of a configuration with the molecules parallel to the surfaces. These results show that the director field underwent a confinement-induced transition from a splay-bend distorted configuration at large D, which produces elastic repulsive forces, to a uniform planar configuration with broken homeotropic anchoring, which does not produce additional elastic forces as D is decreased. These findings, supported by measurements of the birefringence of the confined film at different film thicknesses, provide the first direct visualization of an anchoring transition at the nanometer scale.

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