

A photoisomerizable fatty acid (containing an azobenzene unit) was adsorbed at the nematic liquid crystal (LC) / water interface and induced reorientation of the LC phase upon exposure to different irradiation wavelengths. Homeotropic, tilted, and planar anchoring were all observed under various thermodynamic and illumination conditions. Lateral coexistence between regions displaying different anchoring was often observed, as were dynamic and reversible transitions between the various states. These observations suggest that adsorbed monolayers of the azobenzene-fatty acid display a rich binary phase diagram, where the relative fractions of *cis* and *trans* isomers are determined by the stationary state associated with the illumination wavelength. The morphology of this phase diagrams was determined as a function of three variables – concentration, temperature, and composition – and six distinct phases were identified, including five condensed phases and a dilute interfacial vapor phase.