

Surface-induced ordering in confined liquid crystals: Influence of alkane

Lijuan Zhang, Günter K. Auernhammer, Michael Kappl, Beate Ullrich, Hans-Jürgen Butt, and Doris Vollmer

Max Planck Institute for Polymer Research, Ackermannweg 10, D55128 Mainz, Germany, phone: (+49) 06131- 379517; E-mail: zhangli@mpip-mainz.mpg.de

The range and strength of molecular alignment of liquid crystals on solid surfaces is significant, both, in fundamental physical and biological research, and for practical applications, such as optoelectronic devices. It is determined by the balance of molecule-molecule and substrate-molecule interactions at the solid-adsorbate interface. In this report, we investigated the dependence of surface induced ordering of 4-*n*-octyl-4'-cyanobiphenyl (8CB) liquid crystals on surface modification and alkane by force distance spectroscopy and differential scanning calorimetry (DSC). Force measurements showed that even in the isotropic phase of 8CB, prenematic and presmectic ordering can be induced on N, N-dimethyl-N-octadecyl-3-amino-propyltrimethoxysilyl chloride (DMOAP) modified glass surfaces. The range and strength of the ordering increase when approaching to isotropic-to-nematic phase transition. More importantly, the presmectic ordering is enhanced extraordinarily if octane is added to the liquid crystal. Maximum enhancement is observed at an octane concentration close to 8.2 wt% percent. Furthermore, it depends on the length of carbon chains of the alkane and the temperature width of the nematic domain. This can be explained by an increased smectic correlation length and amplitude, in agreement with the Landau-de Gennes theory.