Nanostructured surfaces

Nanorelief of Polyimide Films Treated by a Stream of Atmospheric Pressure Plasma Optimized for Liquid Crystal Alignment

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Atmospheric pressure processes [1] initially developed for surface cleaning and deposition find new applications. One of the recently proposed applications is a processing of aligning substrates for liquid crystals (LCs), which provides excellent alignment for conventional LCs and reactive mesogens [2]. Despite a high effectiveness of this method, the mechanism of LC alignment remains poorly investigated. Anisotropic destruction of chemical bonds and anisotropic modification of surface relief are being considered as possible reasons of the alignment.

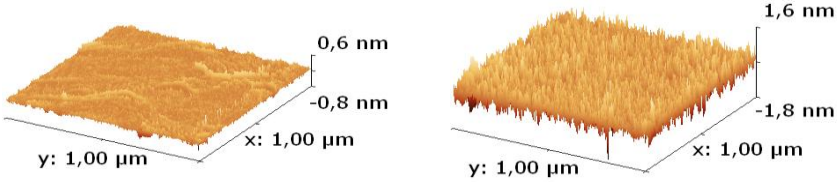

Fig. 1. The three-dimensional reconstructions of surface relief for (a) untreated and (b) treated polyimide film obtained according to AFM data.

This paper studies changes in surface topography of organic films in a course of plasma processing optimized for LC alignment. We used the films of polyimide, since they are commonly used as the alignment layers for LCs. The films were treated in oblique or normal geometry with a stream of argon plasma from capacitive RF discharge [2]. The surface topography of the films was studied by AFM technique working in the mode of periodic contact with a silicon probe.

We have found that the plasma treatment increases surface roughness of the studied films (Fig. 1). The corresponding 2D images were subjected to Fourier transformation to analyze the roughness anisotropy. No clear topographical anisotropy was detected. This suggests that the surface relief plays a minor role in the LC alignment on the studied substrates. In turn, this hints on the important role of surface bonds anisotropy as in case of vacuum plasma aligning processing [3].

1. A. Anders, *Surf. & Coat. Tech.*, **200**, 1893 (2005).
2. V. Bazhenov et al., *Problems of Atomic Science and Technology, Series: Plasma Physics.*, **1**(83), 177 (2013*).*
3. J. Stöhr et al., *Science*, **292**, 2299 (2001).