

Photoaligned Azodye Nanolayers : Basic Technology for New Liquid Crystal Devices in Various Applications

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Abstract

Photoalignment and photopatterning has been proposed and studied for a long time [1]. Light is responsible for the delivery of energy as well as phase and polarization information to materials systems. It was shown that photoalignment liquid crystals by azodye nanolayers could provide high quality alignment of molecules in a liquid crystal (LC) cell. Over the past years, a lot of improvements and variations of the photoalignment and photopatterning technology has been made for photonics applications. In particular, the application of this technology to active optical elements in optical signal processing and communications is currently a hot topic in photonics research [2]. Sensors of external electric field, pressure and water and air velocity based on liquid crystal photonics devices can be very helpful for the indicators of the climate change.

We will demonstrate a physical model of photoalignment and photopatterning based on rotational diffusion in solid azodye nanolayers. We will also highlight the new applications of photoalignment and photopatterning in display and photonics such as: (i) fast high resolution LC display devices, such as field sequential color ferroelectric LCD; (ii) LC sensors; (iii) LC lenses; (iv) LC E-paper devices, including electrically and optically rewritable LC E-paper; (v) photo induced semiconductor quantum rods alignment for new LC display applications; (vi) 100% polarizers based on photoalignment; (vii) LC smart windows based on photopatterned diffraction structures; (viii) LC antenna elements with a voltage controllable frequency.

We start to use photoalignment and photopatterning technology for biomedical applications [2].

References

- [1] V.G. Chigrinov, V.M. Kozenkov and H.S. Kwok, Photoalignment of liquid crystalline materials, Wiley, 2008.
- [2] V.G. Chigrinov, Liquid Crystal Photonics, Nova Science Publishers, 2015.