

Photo-aligned perfluoropolyether thin film for uniform liquid crystal alignment

Kiyoaki Usami^a, Akihiko Sugimura^a, Edward T. Samulski^b

a Department of Information Systems Engineering, Osaka Sangyo University, 3-1-1 Nakagaito, Daito-Shi, Osaka 574-8530, Japan.

b Department of Chemistry, University of North Carolina- Chapel Hill, CB 3290 Venable Hall, Chapel Hill, North Carolina 27599, USA.

In liquid crystal displays, weak anchoring of the liquid crystal (LC) molecules at the interface with the alignment layer can in principle lead to lower operating voltages and improved steepness of the electro-optic response [1]. It is reported that Langmuir-Blodgett films of perfluoropolyether (PFPE) can induce weak anchoring [2]. Recently, we have succeeded in inducing a uniform LC alignment by using PFPE films (Fluorocur®, Liquidia Technologies) exposed to linearly polarized ultraviolet (UV) light (LPUVL)[3]. In this study, we have investigated the effect of the LPUVL-irradiation condition on the LC alignment.

The PFPE oligomer films were spin-coated onto the ITO/glass substrates modified with 3-(trimethoxysilyl) propyl methacrylate. In this study, we prepared the photo-aligned PFPE films in 2 ways. In one way, the film was exposed to unpolarized UV light to cure the PFPE oligomer, and then it was exposed to LPUVL ($\lambda = \sim 250$ nm) for photo-alignment treatment in air condition. In the other way, the spin-coated film was directly exposed to LPUVL ($\lambda = \sim 360$ or ~ 250 nm) in nitrogen atmosphere.

The homogenous alignment of LC molecules was induced by the films exposed to LPUVL after UV curing. However, the films directly exposed to LPUVL could not induce uniform LC alignment. From this result, we expected that a lifetime of the radicals induced by UV irradiation strongly affected the photo-alignment of the PFPE films.

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Reference

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