Design and application of anisotropic nanostructured conductive and alignment coatings

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Design and application of nanostructured conductive and alignment coatings are proposed. They include the preparation of novel conductive and alignment coatings and their combination with the anisotropic materials.

The novel technology of high effective transparent conductive and LC alignment layers fabrication is based on nanostructured aluminum made by electrochemical treatment [1]. The technology has a number of advantages:

- anodic alumina acts as a high quality dielectric and provides additional protection of LC molecules from an undesirable chemical reactions near an alignment surface;
- anodic alumina is stable and resistant to external actions including heat, UV radiation and mechanical stress, thus prevailing in this respect over commonly used polymers;
- both Al magnetron sputtering and anodizing are low temperature processes compatible with the use of flexible substrates.
- different size of pores lead to the change of LC-cell threshold voltages.

Advanced anisotropic materials have been prepared by the modification of corresponding 3,6-disubstituted cyclohex-2-enones, 3,5-disubstituted 2-isoxazolines, 5-substituted cyclohexan-1,3-diones [2] and used in combination with anisotropic nanostructured and conductive and alignment coatings. The results demonstrate that the new combinations of alkyl and substituted alkenyl tails, cyclic and bridge fragments, functional groups and the introduction of the lateral substituents in the central core of the anisotropic compounds, and the conjugation of these compounds with anisotropic nanostructured conductive and alignment coatings can provide desirable variations of the properties and parameters of the displays and photonic devices.

We present quite simple and effective technology based on electrochemical method of fabricating anisotropic nanostructured aluminum which can serve not only as alignment layers but as transparent conductive layer as well. Moreover, this technology can be scaled on large-size substrates, including flexible one, i.e. compatible with continuous “roll-to-roll” processes.

References

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