**Modified ITO-conductive coating with carbon nanotubes as the new way to control the liquid crystal cells**

**Andrei Toikka1, Yulia Zubtcova2 , Natalia Kamanina1**,**2**

1 St.-Petersburg Electrotechnical University (“LETI”), Prof.Popova Str.,5, St.-Petersburg, 197376, Russia

2 Vavilov State Optical Institute, Kadetskaya Liniya V.O., dom.5, korpus 2, St.- Petersburg, 199053, Russia.

\*e-mail: atoikka@obraz.pro [nvkamanina@mail.ru](mailto:nvkamanina@hotmail.com)

<http://www.photophysics-lab.org/>

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Liquid crystals (LC) are a special unique mesophase that combines both the properties of a liquid (viscosity and fluidity) and a solid (anisotropy of the refractive index, diffraction, etc.). From one side, the molecules of liquid crystals with the dimension of ~15 angstroms can be considered as the real nano-objects; from the other side they can be ordered by the action of the different external field, including electric field, which allows creating the various electro-optical devices. Electro- and light-addressed spatial light modulators, display elements, biomedical indicators, sensors, etc. can be developed based on the LC mesophase. It should be mentioned that each LC cell includes a direct LC layer, conductive contacts based on indium tin oxides (ITO) or zinc oxide (ZnO), orientation layers, glass or quartz substrates. ITO contacts with the thickness significantly less than the thickness of the LC layer are often destroyed under the influence of intense laser radiation. Changes in the strength parameters of ITO is a problem that can be solved, for example, by various technological approaches, such as: HfO2 deposition using PDV or CVD methods. Among technical methods the laser-oriented deposition (LOD) technique occupies the special place. This method permits to deposit the carbon nanotubes (CNTs) directly in the vertical position on the substrate without essential losses of the carbon materials. The advantage of this method is connected with the fact that modified ITO-conducting layers can predict the novel properties.

In the current report based on this novel nanotechnological approach, it is possible to increase the mechanical and laser strength of ITO contacts, dramatically decrease the resistance, and reduce the number of technological operations when developing an LCD device. In addition, it is important to note that ITO contacts are capable of performing two functions: as an electric conductor and as an orientating layer for the LC molecules. Thus, it is possible to remove a direct orientating high-resistance layer (usually polyimide) from the technological process, reducing the level of the supply voltage applied to the device.

In this paper, a comparative analysis of the physical and technical parameters of pure ITO, ITO structured by hafnium oxides, ITO structured by vertically deposited CNTs is carried out. Preliminarily performed experiments, analytical and quantum-chemical calculations allow us to expand the field of use of LC cells with modified ITO layers not only for the general purposes of optoelectronics, but also for the optical limitation of high-power laser radiation and for the orientation of bio-objects based on DNA and red blood cells.