Optical and luminescent properties of the paper filled with $SrAl_2O_4$:Eu,Dy oxide and carbon nanotubes

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Today, the field of the flexible electronics devices production not only occupies a significant place in electronic instrumentation, but it also continues activ developping. The development of new materials for the specified industry is an important task. The demand for environmentally safe materials for flexible electronics is particularly relevant, including cellulose materials for "paper" electronics.

It should be noted that cellulose paper is used as a substrate in most developments for enhancing the urface properties, flexible and transparent films suitable for applying elements of opto-electronic circuits. Those can be thin film transistors, solar cells, energy storage devices, batteries, sensors, etc.

At the same time, in recent years, studies of mixed composites have been actively conducted, where the matrix is paper, and the fillers are electrically conductive, magnetic, thermoelectrical, light-sensitive, etc. components. Their choice determines the functional orientation of the paper composite.

In this work, we investigated the paper, where the luminescent conversion of ultraviolet radiation into long-lasting photo- and mechanoluminescent visible light was the main function of that. For this purpose, the luminescent oxide $SrAl_2O_4$:Eu,Dy was introduced into the composition of the paper. The engineering of the mechanical (density, tensile strength, hardness, flexibility), optical (whiteness, transparency, gloss and dullness) and luminescent characteristics (spectrum and intensity of light) of the paper was carried out by changing the oxide content and introducing another component into the composition of the paper - multi-walled carbon nanotubes (MWCNT).

To obtain the hybrid nanocomposite material, sulfated coniferous bleached cellulose was used as a basis, which was previously ground in a laboratory grinding complex, and first, a suspension of nanocellulose from non-wood plant material and alkyl ketene dimer was added to the fibrous mass, and then luminescent oxide and/or MWCNT were added.

The mechanical, optical/luminescent properties mentioned above were studied in relation with changes in the structure and morphology of the produced materials. For this purpose, the results of XRD, optical and electron microscopy, Raman and infrared spectroscopy were used.

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