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Thermal and Electrical Conductivity of Colored Polyvinyl Alcohol Films containing Polyaniline and Metal Nanoparticles

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Nanoparticles (NP) of various nature change the properties of polymeric materials: optical, heat and electrophysical. Polyaniline (PANI) is an electrically conductive polymer, has properties typical for semiconductors, is characterized by high thermal and chemical stability, which allows one to obtain materials with strictly specified properties and therefore, to expand the scope of their application in various optoelectronic devices. The influence of PANI, PANI composites with Fe_2O_3, CeO_2, Ag, as well as Ag/CeO_2 and CeO_2/Ag NPs on the thermal and electrical conductivity of polyvinyl alcohol (PVA) films stained with Chicago Sky Blue 6B (CSB) dichroic commercial dye was studied. The anisotropy of the thermal conductivity of colored film samples containing PANI composites with Fe_2O_3, CeO_2, Ag and the Ag/CeO_2 and CeO_2/Ag composites increases in comparison with the CSB-colored film in 1.1 - 2.2 times and the anisotropy of the electrical conductivity of the films with composites increases significantly (30 - 80 times) compared to the stained sample. Colored films containing PANI composites with Fe_2O_3, Ag and CeO_2/Ag composite are characterized by a high polarizing ability (PS) of 90 - 99% in the expanded spectral compared to Chicago Sky Blue 6B (594 - 690 nm, PS = 90-97%) in the range 561 - 698 nm and films with the addition of the PANI/Fe_2O_3 composite are resistant to UV light (the rate of decolorization of a colored sample with a composite is reduced by 45.4%).

The thermal and electrical conductivity of colored films can be improved by introducing PANI composites with Fe_2O_3, CeO_2, Ag as well as Ag/CeO_2 and CeO_2/Ag which is important when film materials are used in devices operated under the influence of heat and electricity.

Biography:

Liudmila Filippovich, PhD in Chemistry, senior researcher at the Institute of Chemistry of New Materials of the National Academy of Sciences of Belarus.

Research Directions: Development of polymer multifunctional polarizing materials with the addition of organic dyes and metal nanoparticles, the study of their optical, thermophysical, electrically conductive and other properties. L. Filippovich participated in the development of a pilot industrial regulation for the manufacture of a film polarizer for near UV, visible and near infrared spectral regions.