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Study of the nano-and biostructured liquid crystal mesophase: Possible applications in material sciences, photophysics, chemistry and biology

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The unique special electrical, magnetic, thermooptical, and nonlinear optical features of the liquid crystals (LCs) mesophase permit to apply them in optical information processing schemes, laser physics, display technique, and medicine. LC modulates the laser beam, converts the frequency, attenuates the light signals and orients particles suspended in them. Thus, LC systems act as molecular matrices, which are easily controlled by an external field. Moreover, because of the interaction between the matrix and the particles suspended in it, the latter become sensitive to the external field, with the result that the orientation of the LC matrix also changes. Recent ten years show the new approaches based on the nanostructurizationprocess which permit to study and apply the LC materials with good advantage. In the present paper the structural, spectral, optical, and photorefractive features of the liquid crystal organic materials are studied under the nano- and biostructurization conditions. The main accent is given to show the perspective of the different types of the nano- and boiobjects to modify the structural and photorefractive properties. Basic matrix, namely, liquid crystal one from cyanobiphenyl groups is chosen as the good model to increase the local volume polarizability via intermolecular charge transfer complex formation. Special role of the dipole moment as a macroscopic parameter of a medium accounts for a relationship between the photorefraction and the photoconductivity characteristics and it can be considered as an indicator of following dynamic parameters change. Moreover, some mechanical achievement of the nanoobjects-containing network is observed and the aligning of the DNA molecules is shown to support the old our idea to align theerythrocytes cells in the LCs. Possible applications of these organic nano- and bioobjects-doped liquid crystal composites are discussed to apply them in the material sciences, photophysics, chemistry, and biology.

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Environmental, health and safety engineering

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The purpose of the Radiation Safety Officer (RSO) is to develop measures to control radiological hazards, manage the radiation safety program; monitor personnel and facilities to ensure permissible limits of health hazards are met. The Excel program is the current method for control and tracking of radioactive materials in the Nuclear Science Facility (NSF). With the current system, two significant problems arise. First, not all of the files for a given isotope are linked to related files for tracking purposes; this poses a security concern and a compliance issue. Second, the volume of the collected data is not viewable in a meaningful way. Furthermore, generating printed reports for a given isotope will generate long spreadsheets with multiple listings. To that end, implementing an inventory management database program to store data and allow users to quickly and accurately analyze the information collected will assist the Radiation Safety Officer (RSO) in securing and controlling the large quantities of radiation material housed on campus. The control and security of radioactive sources needs improvement in many facilities in order to protect the public and the environment from the radiological effects of possible orphaned sources. Radioisotope Tracking System (RTS) database program from African Institute of Science and technology is the key strategy in keeping the Nuclear Science Facility adaptive to a changing regulatory environment.

Biography

Nwagbara Emmanuel Chidozie has PhD degree from Federal University of Science and Technology Owrri, Imo State, Nigeria. In 2008, He became a Full Professor in Environmental, Health and Safety Engineer after exceptional promotion. Since 2011, he has been an Environmental, Health, and Safety Engineer, African Institute of Science and Technology. He has published more than 100 journal and conference papers as the first author. He is a Member of Society of Petroleum Engineer.

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