New photocrosslinking polymeric materials for liquid crystal photoalignment

U. Mahilny, A. Trofimova, A. Stankevich, A. Tolstik, A. Murauski, A. Muravsky
Physical Department, Belarusian State University, Minsk, Belarus,
e-mail: trofimova@bsu.by

The photoinduced alignment (photoalignment) of nematic liquid crystals (LC) is of great interest as a contactless technique to create patterned LC aligning layers which have good prospect as basic elements of nonlinear optical devices like controllable waveguide structures with discrete diffraction, statical and dynamical photonic media etc. LC photoalignment on the surface of benzaldehyde polymeric layer caused by photochemical reaction of benzaldehyde side groups is investigated experimentally and by numerical simulations. Arguments are offered to consider the photoalignment as based on formation of photocrosslinks involving anisotropic conjugated molecular structures.

Operation with laser radiation by using of liquid crystal elements

A.A. Kazak, A.L. Tolstik, E.A. Melnikova, A.A. Komar
Physical Department, Belarusian State University, Minsk, Belarus,
e-mail: kazakAA@bsu.by

Proposed and experimentally implemented a new method of creation the electrically controlled diffraction elements, based on a nematic liquid crystal and orienting photopolymer material. They were developed to form singular optical beams with a given topological charge and to transform the linearly polarized light beam into a beam with radial or azimuthal polarization. Also, was investigated the propagation of laser radiation in a spatially structured layers of nematic liquid crystal with an anomalously high value of birefringence and the laws of reflection of light beams at the boundary between the two mesophases were founded. The conditions for total internal reflection, waveguide propagation and polarization separation of light beams were identified.

On one time discretization scheme for SDE of special type

Anatoly Zherelo
Institute of Mathematics NAS, Minsk, Belarus

In this report the equation of the folowing form was considered

$$X_t = X_0 + \int_0^t f(X_{s-}, s)dW_s + \int_0^t \int_{\mathbb{R}} g(X_{s-}, s, v)\ \widetilde{\nu}\ (ds \times dv),$$

where $t \in [0,T]$, $W_s = W(s,\omega)$ - Wiener process, $\widetilde{\nu}_s(B) = \widetilde{\nu}(s \times B, \omega), B \subset \mathbb{R}$ - compensated stochastic Poisson measure. Measure $\pi(B)$ is characteristic of measure $\widetilde{\nu}_s(B)$, $\pi(\mathbb{R}) < \infty$. The main goal of this work is to propose new method of calculation of a value of a functional, which depends on solution of the equation above. The proposed method is based on so called weak approximation, which is exact for polynomials of third degree for Wiener process and compensated Poisson measure.

Some consequences from the Dirac-Kaehler theory: on intrinsic spinor sub-structure of the different boson wave functions

E.M. Ovsiyuk, O.V. Veko, V.M. Red'kov
Institute of Physics NAS, Belarus
Mozyr State Pedagogical University, Mozyr, Belarus

Properties of tensors equivalent to a direct product of two different 4-spinors are investigated. It is shown that tensors obey additional 8 nonlinear restrictions, those are presented in Lorentz covariant form. In the context of the Dirac-Kaehler theory, such a property can be interpreted as follows: if one wishes to consider the the Dirac-Kaehler field as consisting of two 4-spinor fields, one must impose additional restrictions on tensors of the Dirac-Kaehler field the latter leads to a non-linear wave equation for a complex boson field (composed on the base of two 4-spinor fields). Instead, the use of four 4-spinor fields give possibility to construct the Dirac-Kaehler tensor set of 16 independent components. However, the formulas relating the Dirac-Kaehler boson to four fermion fields are completely different from those previously used in the literature. In explicit form, restrictions on four 4-spinor corresponding to separation of different simple boson with spin 0 or 1 and various intrinsic parities, are constructed.

Bjorken sum rule analysis: revised

V.L. Khandramai, O.P. Solovtsova, O.V. Teryaev
International Center for Advances Studies, Gomel State Technical University, Gomel, Belarus, e-mail: v.khandramai@gmail.com

We update and extend results of our previous Bjorken sum rule analysis at low momentum transfers with the four-loop expression for the perturbative QCD correction. We study in detail asymptotic nature of the perturbative expansions in the region Q < 1 GeV and extract information about QCD parameters.