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Achievements of Liquid Crystals Research

/ N. V. Usol'tseva, V. V. Bykova, O. B. Akopova et al.; Ed. by N. V. Usol'tseva. – Ivanovo : Ivanovo State University Publishing House, 2007. – 100 p. : ill.

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The monograph is the next book in the succession of editions on liquid crystals, issued by the Regional Research-Educational Center for Nanomaterials "Liquid Crystals".

In the monograph the overview of the new sections of the liquid crystalline state research is presented, as well as the experimental data, obtained in the recent years in the field of synthesis, research and application of thermotropic and lyotropic mesogens. The main emphasis is put on the influence of the peculiarities of mesogens chemical structure on glassing, segnetoelectric and antisegetoelectric ordering and on the changes in the spin state of the central cation, a part of metal mesogens, during phase transitions. The possibilities to apply mesogenic compounds as triboactive additives are considered.

The book is intended for the wide circles of research workers, teachers, PhD students and undergraduate students of Chemistry, Physics and Technology.

Bibliogr. – 153 ref., 14 tabl., 48 fig .

Reviewer

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ABSTRACTS

New glassing mesogens. *N. V. Usol'tseva, V. V. Bykova, N. V. Zharnikova.*
P. 4 – 26.

The role of glassing low molecular weight mesogens as basic materials for the development of progressive optic technologies is considered. A completely new approach towards the synthesis of materials for optoelectronics – the creation of compounds simultaneously possessing glass formation from mesophase, absorption in the visible part of spectrum and good electrophysical properties – is suggested. Some specific examples of such compounds as porphin derivatives are also considered.

Bibliogr. – 38 ref., 22 fig., 5 tabl.

Banana-shaped mesogens as perspective materials for electronics.
M. A. Zharova, N. V. Usol'tseva, V. V. Bykova. P. 27 – 41.

Data on liquid-crystalline compounds with bent rigid core (so-called banana-shaped mesogens) are presented in the paper. In recent years they have attracted a great interest due to the fact that they reveal ferroelectric and antiferroelectric polar order in smectic and columnar phases. Wide opportunities of their application in electronics are considered. The latest research results on the influence of their molecular structure on mesomorphism are analyzed.

Bibliogr. – 20 ref., 6 fig., 6 tabl.

Synthesis and mesomorphic properties of iron (II) complexes with benzimidazole derivatives. *V. V. Sotsky, E. V. Kudrik, V. V. Bykova, N. V. Usol'tseva.*
P. 42 – 51.

The iron (II) complexes with benzimidazole derivatives which possess spin crossover properties were synthesized. The possibility of mesomorphic state appearance in these compounds was studied. The possibility for tris-(1-*N*-dodecyl-2-(2-pyridyl)benzimidazole) iron (II) diperchlorate to reveal the cubic phase is established. Tris-(2-(2-pyridyl)benzimidazole) iron (II) diperchlorate displays lyotropic mesomorphism in the binary system with DMFA.

Bibliogr. – 10 ref., 7 fig.

Effect of the calamitic and discotic liquid crystals on the phase state of polypropyleneimine dendrimers. *S. V. Blokhina, N. V. Usol'tseva, M. V. Ol'khovich, A. V. Sharapova.* P. 52 – 61.

Thermotropic mesomorphism of polypropyleneimine dendrimers of the 1st, 2nd and 3rd generations has been studied by polarized thermomicroscopy and differential scanning calorimetry. Phase diagrams of the binary systems based on the den-

dimers with the calamitic liquid crystalline *p*-amyloxy-*p*'-cyanobiphenyl and discotic liquid crystalline hexa(amyloxy)triphenylene have been obtained. The measurements have been conducted within the whole concentration range at temperatures corresponding to the stable states of the nematic, columnar and isotropic phases. Effect of the chemical nature and molecular geometry of the mesogenes' molecules of the linear and cyclic types on mesomorphism of the dendrimers is discussed.

Bibliogr. – 14 ref., 4 fig., 1 tabl.

Gibbs energy and shape factor of ion micelle in spin Ellipsoid model.

B. S. Kuznetsov, A. P. Blinov, N. V. Usol'tseva. P. 62 – 72.

On the basis of the droplet model of the molecular aggregate and differential geometry, expressions to calculate the surface, electrostatic and spin components of Gibbs energy occurring in an ion spheroid micelle, shaped as a spin ellipsoid, were obtained. The solution of the generalized differential equation of Laplas was carried out numerically. The electrostatic energy of the double electric layer of the micelle surface was estimated by the model of the ellipsoid condensator. The micelle kinetics is presented as a correlation between Gibbs energy and its components and the ellipsoid shape factor. It is shown that the balance shape factor of such micelles in the aqueous solution corresponding to the minimum of Gibbs energy is 1.1 for a Na decylsulfate micelle.

Bibliogr. – 19 ref., 2 fig.

Influence of molecular and supramolecular structure of discotic mesogens on their tribological characteristics. *O. B. Akopova. P. 73 – 79.*

Influence of molecular and supermolecular structure of discotic mesogens - benzene (1), triphenylene (2), biphenyl (3) and triazine (4) derivatives – on tribological characteristics of lubricants is considered. Correlation dependences of friction constant on molecular and supermolecular structures discotic mesogens 1 - 4 are found.

Bibliogr. – 20 ref., 3 fig., 2 tabl.

Mesogenic compounds as triboactive additives. *E. V. Berezina, V. A. Godlevskiy. P. 80 – 94.*

The literature review on theoretical foundation and practical application of different nature mesogens was given. A special accent was concentrated on questions of boundary lubrication layers structure and functioning during extreme friction conditions. It was shown that disc-like mesogen molecules due to their surface structure-building may decrease friction essentially.

Bibliogr. – 32 ref., 4 fig.

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