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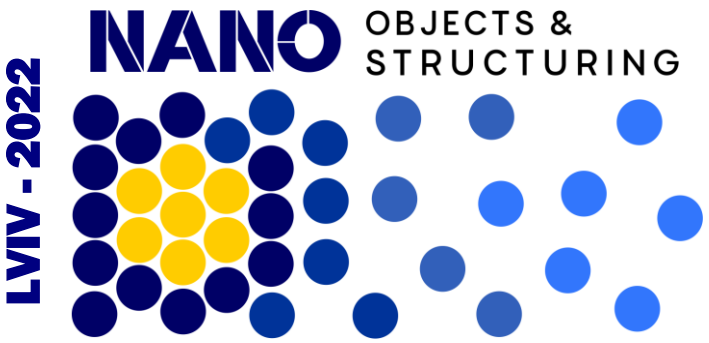

2nd INTERNATIONAL RESEARCH and PRACTICE CONFERENCE «NANOOBJECTS & NANOSTRUCTURING» (N&N–2020)

September 26–28, 2022, Lviv, Ukraine

PROCEEDINGS

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2nd International Research and Practice Conference «Nanoobjects & Nanostructuring» (N&N–2022). September 26–28, 2022, Lviv, Ukraine : Proceedings / Ivan Franko National University of Lviv; Shevchenko Scientific Society; O. Reshetnyak, L. Boichyshyn, I. Marchuk (Eds.). – Lviv: Research and Publishing Center of the Shevchenko Scientific Society, 2022. – 100 + *xii* p.

2nd International Research and Practice Conference «Nanoobjects & Nanostructuring» (N&N–2022) was held at Ivan Franko National University of Lviv on September 26–28, 2022. This Proceedings contains the results of studies, curried out in the Ukrainian universities and research Institutes of the National Academy of Sciences of Ukraine, and also scientific centres of Poland, Slovak Republic, USA, Finland and Hungary in the following fields: physical chemistry of nanosized and nanostructured materials; nanostructuring in 0D–3D systems: thermodynamic and kinetics aspects; synthesis and characterisation of nano-objects; organic and inorganic nanomaterials, supramolecular chemistry; application of nanostructurized systems.

In the author's edition

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[5] G. Zozulya, O. Kuntyi, R. Mnykh, et al. Synthesis of silver nanoparticles by sonogalvanic replacement on aluminium powder in sodium polyacrylate solutions // Ultrasonics Sonochemistry. – 2022. – 84. – 105951.

INFLUENCE OF SPATIAL CONFINEMENTS ON THE GROUP VELOCITIES OF ACOUSTIC PHONONS IN PbI_2 NANOFILMS

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Result of theoretical studies the group velocities of acoustic phonons in the qusi-2D nanosystems such as flat ultra-thin films, based on layer crystal 2H-PbI_2 with hexagonal symmetry, is represented there.

Method is based on the elastic continuum approach [1], method of deformation potential for hexagonal heterostructures [2] and representation the components of polarization vectors for all possible phonon branches in the film of finite thickness as appropriate Fourier series [3]. This made it possible to establish the analytical dependencies of energies and phonons group velocities on the wave vector for all branches of the acoustic phonon spectrum in ultra-thin films, and also on their thickness. Such results can allow an analytical investigations of the electron spectra transformations that caused by electrons interaction with acoustic phonons in the ultra-thin films, whose thickness varies.

Analysis of dispersion curves for energies and group velocities of all – shear, dilatation (SA-polarization) and flexural (AS-polarization) – modes of confined acoustic phonons in the flat nanofilms of 2*H*-PbI_2 with different thickness has been made. It indicates the non-linear nature of changes in these quantities with changes in both the phonon wavelength and the thickness of the nanofilm. The first circumstance can be decisive in determining the influence of acoustic phonons on the processes that are caused by electron-phonon interaction in nanostructures, whose components are 2H-PbI2 nanofilms, and the second one allows tuning the physical properties of such nanostructures by selecting of their thicknesses.

The obtained results can be used to analyze an influence of acoustic phonons on a course of phenomena of thermal and electrical conductivity, carrier scattering and optical absorption in wurtzite-type nanostructures, components of which are thin layers of lead iodide.

1. E.P. Pokatilov, D.L. Nika, A.A. Balandin. Phonon spectrum and group velocities in AlN/GaN/AlN and related heterostructures // Superlattices and Microstructures. – 2003. – 33. – P. 155-171.

2. E.P. Pokatilov, D.L. Nika, A.A. Balandin. Confined electron-confined phonon scattering rtes in wurtzite AlN/GaN/AlN heterostructures // J. Appl. Phys. – 2004. – 95. – P. 5626-5632.
3. Yu.V. Lutsiuk, V.M. Kramar. Analytical calculation of frequency spectrum and group velocities of acoustic phonons in quasi-two-dimensional nanostructures // J. Nano-Electron. Phys. – 2020. – 12. – P. 05033.

INFLUENCE OF MODIFICATION OF CARBON NANOTUBES ON THEIR DISTRIBUTION IN POLYMER MATRIX

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In polymer nanocomposites filled with carbon nanotubes, it is very difficult to ensure uniform distribution of nanotubes in the polymer matrix, as well as the stability of this dispersion over time. Therefore, in such systems, over time, due to the strong van der Waals forces of attraction between individual nanotubes, aggregation of filler particles takes place. It leads to a transition from the nano to the micro level of their structural organization. This transition significantly affects the complex of functional properties of polymer nanocomposites filled with CNTs. Therefore, the development of new approaches to the stabilization of nanoparticles in order to prevent their aggregation to create nanocomposite materials with improved functional characteristics is an actual task.

As a result of this work, the technology of stabilization of CNTs with the help of polyether was developed and their structural organization was studied. A number of stabilized samples of carbon nanotubes using different stabilizers were obtained. It was found that the introduction of the modifier significantly changes the fractal dimension of CNTs. It is shown that the phase structure of CNT units varies depending on the type of stabilizer. Fig. 1 shows microscopic images of unstabilized CNTs and stabilized CNTs. The photographs show that unstabilized CNTs form large and dense aggregates, while stabilized CNTs have a more uniform distribution.

The highest stabilizing effect is exerted by a modifier based on PEG-10000. In this case, CNTs are most evenly distributed over the volume of material. The scheme of interaction of carbon nanotube with polyether molecule is offered. At stabilization by means of polyethers there is a noncovalent interaction of molecules with a CNT surface. It has been suggested that the short PEG-400 molecule interacts with CNTs at one end, the longer PEG-1000 molecule interacts with several links, and the longest PEG-10000 molecule envelops CNTs, so it is the most effective stabilizer.