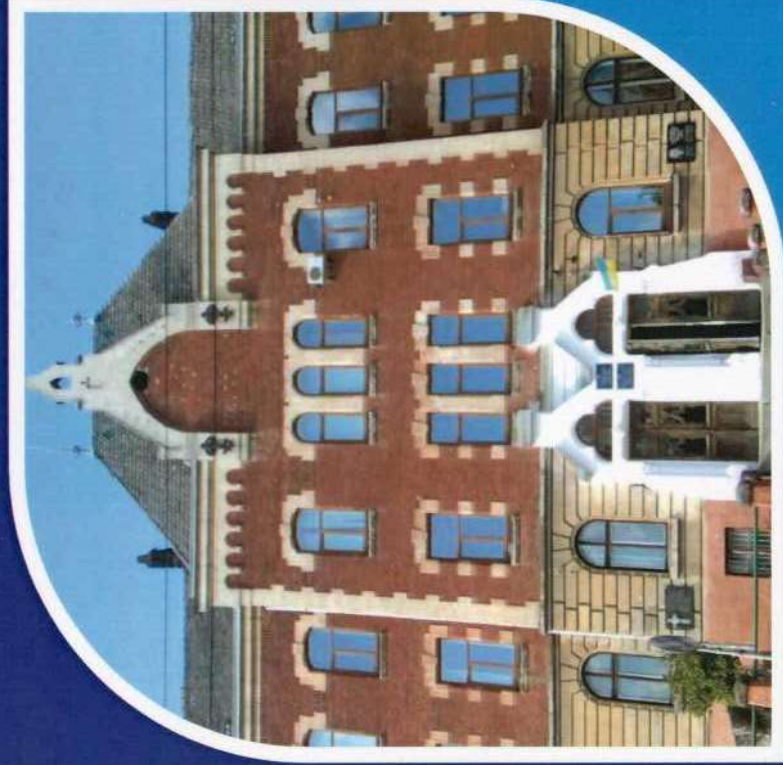


**XI-th International Conference
Topical Problems
of Semiconductor
Physics**



**Drohobych, UKRAINE
May 27-31, 2024**

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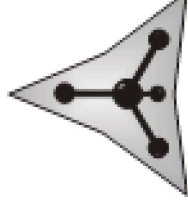
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Scientific Council “Semiconductor and Dielectric Physics”
at Physics and Astronomy Department of NASU

Drohobych Ivan Franko State Pedagogical University

XI-th International Conference

**TOPICAL PROBLEMS OF
SEMICONDUCTOR PHYSICS**



Prykarpattya,

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MAY 27-31, 2024

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Actual problems and important achievements of modern semiconductor physics are presented in the Proceedings of the XI-th International Conference “Topical Problems of Semiconductors Physics”. The abstracts are grouped into 7 sections, according to the Conference Thematic: “Section A. New frontiers in semiconductors and their based structures for electronics, optoelectronics, spintronic and sensing”, “Section B. Semiconductor low-dimensional structures: advances in synthesis, characterization, theoretical modeling and applications”, “Section C. The semiconductors for LEDs, solar and related energy technologies and sensor materials”, “Section D. Synthesis, processing and characterization of multifunctional oxide materials”, “Section E. Advanced strategies for smart functional and multifunctional bionanomaterials and biointerfaces”, “Section F. Laser material processing: from fundamental interactions to innovative applications”, “Section G. Modern computational methods and their applications in materials science: Synergy of theory and experiment”. The Proceedings were prepared for publication by the Conference Program Committee and presented in the author’s edition.

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TABLE OF CONTENTS

SECTION A: NEW FRONTIERS IN SEMICONDUCTORS AND THEIR BASED STRUCTURES FOR ELECTRONICS, OPTOELECTRONICS, SPINTRONIC AND SENSING 10

Chalcogenide glasses: properties and applications in optoelectronics and photonics..... 11
Stronski A.

Optical studies of exciton-plasmon interactions in semiconductor-metal multilayer films and nanostructures 13
Stolyarchuk I.D., Dan 'kiv O.O., Stolyarchuk A.I., Kuzyk O.V.

Half-metallicity and ferromagnetism in two-dimensional Cr₃Te₄ nanosheets ... 14
Kuzma M.

Infrared damping, visible and microwave transparent polymeric films with thin AlN coatings 15
Tsybrii Z.F., Sizov F.F.

Stimulated incoherent radiation of ZnO nanocrystals..... 16
Fedorenko L.L., Korbutyak D.V., Evtukh A.A., Naumov V.V., Yukhymchuk V.O.

Raman spectroscopy and X-ray diffraction studies of Ga-Ge-Te alloys 17
Popovych M., Kochubei H., Shportko K., Lotnyk A., Venger E., Stronski A.

Features of structural transformations during thermal annealing of InSb implanted with beryllium ions..... 18
Sapon S., Kulbachynskyy O., Gudymenko O.Yo., Dubikovskyy O., Maziar D.

Ultrafast inertia-free switching of double magnetic tunnel junctions 19
Dzhezherya Yu., Polynchuk P., Kravets A. and Korenivski V.

Doping-induced extrinsic magnetism in CdTe:Cr crystals 20
Popovych V.D., Dlazewski P., Morawiec K., Zajkowska W., Popovych A.V., Stolyarchuk I.D., Żywczak A., Kuzma M., Shiojiri Makoto

Structural studies of As₂S₃:Mn glasses 21
Kochubei H., Stronski A., Paliuk O., Gudymenko A.

Some peculiarities of structural changes in chalcogenide glasses (GeS₃)_{100-x}Ag_x, (GeS₂)_{100-x}Ag_x and (Ge₄₂S₅₈)_{100-x}Ag_x 22
Lishchynskyy I.M., Kaban I.G., Voitkiv H.V., Poplavskyy O.P., Stronski A.V.

Doping-induced second phases in vapour-grown CdTe crystals 23
Popovych A.V., Rehei M.A., Shakteina I.O., Popovych V.D.

Advanced organic-inorganic ureasil-based and photocross-linked polymers for controlled biosensing 24
Kavetskiy T.S., Kukhazh Y.Y., Hoivanovych N.K., Dyachok D.O., Demkiv O.M., Ostrauskaite J., Zgardzińska B., Šauša O., Kiv A.E.

About decisive role of minority current carriers in the emergence of superconductivity 25
Uhryn Yu.O.

SECTION B: SEMICONDUCTOR LOW-DIMENSIONAL STRUCTURES: ADVANCES IN SYNTHESIS, CHARACTERIZATION, THEORETICAL MODELING AND APPLICATIONS..... 26

Strain stresses in ZnO:Mn nanocrystals..... 27
Kovalenko O.V., Vorovskyy V.Yu., Slavnyi V.V.

Antimonene: from a large scale growth of new structural phase to ferromagnetic heterostructures..... 28
Zdyb R.

Quantum Cluster Embedding Description of Electron Localization in Disordered and Strongly Correlated Systems 29
Terletska H.

Quantum Cone – Nano Source of Light with Dispersive Spectrum, Separated in Time and Space 30
Medvids A., Ščajev P., Kazuhiko H.

Напівровідникові властивості комплексних сполук германію 31
Леніх Я.І.

Perspectives, problems and tasks in the theory of multi-level quasiparticles interacting with phonons in nanostructures..... 32
Tkach M.V., Seti Ju.O., Voitsekhiyvska O.M.

Ultra-small quantum dots: effect of crystal structure disorder	33
<i>Kupchak I.M., Korbutyak D.V.</i>	
Features of surface morphology and defect formation of $Pb_{1-x}Cd_xTe$ thin films prepared by PVD.....	34
<i>Mazur T.M., Naidych B.P., Holovata O.B., Parashchuk T.O., Zamurujeva O.V., Yavorskyi Y.S., Mazur M.P., Nykyriy L.I., Yavorskyi R.S.</i>	
Application of artificial intelligence methods in solving ab initio problems.....	35
<i>Tuzhykov A.V., Kavetskyi T.S., Kiv A.E., Soloviev V.N.</i>	
Synthesis Technology and Optical Characteristics of Ultrasmall CdTe Quantum Dots.....	36
<i>Dremliuzhenko K.S., Kulechyskyi B.N., Korbutyak D.V., Isatava O.F., Trischuk L.I.</i>	
Modelling the electric field effect on the optical characteristics of lens-shaped quantum dots	37
<i>Holovatskyi V.A., Holovatskyi I.V., Makhaneis O.M.</i>	
IV-VI semiconductor low-dimensional structures formed by ion sputtering.....	38
<i>Zayachuk D.M.</i>	
Electric field effect on the absorption coefficient of elliptical quantum wires..	39
<i>Holovatskyi V.A., Yarema V.V.</i>	
The effect of dynamic deformation on the nanowires conductivity of AlGaIn/GaN.....	40
<i>Kaliuzhnyi V.V., Tymochko M.D., Oliikh O.Ya., Belyaev A.E.</i>	
The energy spectrum of nanopod-shaped structures in the form of tetrapods.....	41
<i>Bilynskyi I.V., Melnyk Ya.Yu., Bobyliev D.Ye., Popov M.Yu.</i>	
Control of the structural perfection of functional materials of electronic equipment by the modulation electroreflection spectroscopy method	42
<i>Demchyna L.A., Mynaylo M.A., Pekur D.V., Vuichyk M.V., Kyiak J.P., Gentsar P.O., Vlasenko O.I.</i>	
Energy spectrum of heterogeneous tunnel-coupled quantum dots	43
<i>Bilynskyi I.V., Melnyk Ya.Yu., Slusarenko M.A., Popov M.Yu.</i>	

The influence of impurities and electric fields on light absorption by spherical non-concentric core-shell quantum dots	44
<i>Leshko R.Ya., Leshko O.V., Bilynskyi I.V.</i>	
Photophysical behavior of MeLPPP/SBA-15 nanocomposite.....	45
<i>Mykyryuk T.V., Shcherban N.D., Dmytruk A.M., Dmytruk M., Ostapenko Yu.V., Ostapenko N.I.</i>	
Multifunctional sensor structures based on porous silicon and reduced graphene oxide	46
<i>Olenych I.B., Horbenko Y.Y., Pavlyk M.R.</i>	
Optical spectroscopy of high-resistance CdTe single crystals.....	47
<i>Gentsar P.O., Mynaylo M.A., Pekur D.V., Demchyna L.A., Vuichyk M.V., Kyiak J.P., Zayats M.S., Vlasenko O.I.</i>	
The influence of hydrostatic pressure on the synthesis of colloidal core-shell quantum dots	48
<i>Dan 'kiv O.O., Kuzyk O.V., Peleshchak R.M., Stolyarchuk I.D., Satcyk V.V., Guba S.K.</i>	
Energy Spectrum Analysis of GaAs/AlAs Quantum Dots of Complex Shapes Using Plane Wave Method	49
<i>Bilynskyi I.V., Maturin Yu.P.</i>	
Spectral parameters of an electron in double quantum rings in magnetic and electric fields.....	50
<i>Hnidko I.S., Gutsul V.I., Koziarskyi I.P., Makhaneis O.M., Kuchak A.I.</i>	
Optical properties of germanium doped n-CdTe single crystals in the fundamental optical transition E_0	51
<i>Gentsar P.O., Mynaylo M.A., Pekur D.V., Vuichyk M.V., Strilechuk O.M., Kyiak J.P., Demchyna L.A., Zayats M.S., Trischuk L.I.</i>	
Raman spectroscopy study of the structure of $Cu_2ZnSnSn_4$ and $Cu_2NiSnSn_4$ nanocrystals synthesized by hydrothermal route	52
<i>Ivakhno-Tshehlynyk O., Karnaukhov A., Kotsyubynskyi V.O., Sechyshev O., Boychuk V.M., Dzhegan V.M., Mazur N., Zahn D.R.T.</i>	
The mechanism of the influence of ultrasonic cavitation on the growth of A^2B^6 colloidal nanoparticles	53
<i>Kuzyk O.V., Dan 'kiv O.O., Stolyarchuk I.D., Peleshchak R.M., Kuliivchak V.A., Krisa Ya.P.</i>	

The Energy Spectrum of an Electron in a Linear Quantum Molecule Formed from Four Quantum Dots Nanoparticles 54
Holskiy V.B., Leshko R.Ya., Holska S.V., Karpiy V.R.

Optical reflection of silicon nanowires 57
Demchyna L.A., Myhaylo M.A., Pekur D.V., Vuichyk M.V., Kyiak J.P., Gentsar P.O., Vlasenko O.I.

An ordered array with two different quantum dots in a unit cell 58
Bilynskiy I.V., Leshko R.Ya., Bandura H.Ya.

SECTION C: THE SEMICONDUCTORS FOR LEDS, SOLAR AND RELATED ENERGY TECHNOLOGIES AND SENSOR MATERIALS..... 59

Structural Studies of Semiconductor and Dielectric Materials 60
Shiojiri Makoto, Chen Miin-Jang

Ultraviolet photodetectors based on polymer/zinc oxide nanoparticles hybrid materials 62
Stolyarchuk A.I., Dan'kiv O.O., Bachynsky O.I., Stolyarchuk I.D.

Technological aspects of deposition cadmium sulphide thin films as buffer layer 63
Katanova L.O., Nykyryy L.I., Yavorskyi R.S., Kashuba A.I., Semkiv I.V.

The effect of growth conditions of PbTe layers on their IR properties 64
Vuichyk M.V., Svezhentsova K.V., Tsybrii Z.F.

Thermal conductivity of GeBiTe solid solutions 65
Matkivskiy O.M., Balan V.R., Dadiak I.B., Horichok I.V.

Effect of structure defects on the microhardness of CdTe-ZnTe single crystals grown by sublimation..... 66
Brytan V.B., Tymkiv A.V., Kovalko M.C., Pavlovsky Y.Y., Kovalchuk Yu.V., Uhryn Yu.O.

SECTION D: SYNTHESIS, PROCESSING AND CHARACTERIZATION OF MULTIFUNCTIONAL OXIDE MATERIALS..... 67

Refractive parameters of rubidium sulfate crystals at low temperatures 68
Pryshko I.A., Stadnyk V.Yo., Shtuka O.V., Novosad I.S.

Modelling the electric field effect on the optical characteristics of lens-shaped quantum dots

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Molecular beam epitaxy and colloidal chemistry are the main methods for quantum dots creating. Each of these methods does not exclude the other, but only complements the variety of nanostructures that are used in modern nanoelectronics. Epitaxial quantum dots are a large class of a wide range of semiconductor nanostructures grown on a crystal surface by various technological methods [1]. Depending on the semiconductor materials and growing methods, quantum dots of various sizes and shapes are obtained, which affects their optical characteristics, and therefore significantly complicates theoretical research. For modelling, the finite element method is most often used within the integrated platform for numerical simulation COMSOL Multiphysics. In this work, the energy spectrum and wave functions of an electron in a lens-shaped quantum dot were calculated, based on which the influence of the electric field on the oscillator strength of quantum transitions was investigated.

Two models of a lens-shaped quantum dot are considered: a spherical segment and half of an oblate ellipsoid Fig1. For the second model, there are exact solutions of the Schrödinger equation in the form of spheroidal functions of the first kind that make up the orthonormal basis [1-2], which allows to study the effect of the electric field on the energies and wave functions of the electron in the nanostructure by the matrix method. In this study, calculations of absorption coefficient for both models were performed using the finite element method in COMSOL Multiphysics. Research results obtained by various methods coincide with high accuracy.

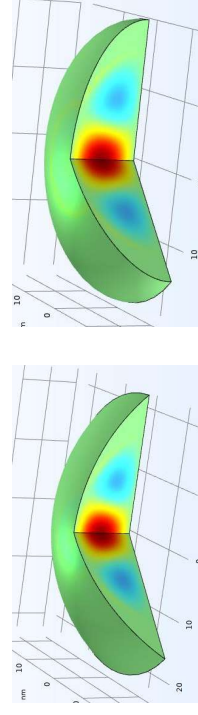


Fig. 1. Models a lens shaped QD: a) spherical segment, b) oblate hemispheroid.

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LIST OF AUTHORS

Atamanyuk A.M.	76
Bachynsky O.I.	62
Balan V.R.	65
Bandura H.Ya.	58
Belyaev A.E.	40
Bilynsky I.V.	41, 43, 44, 49, 58
Blonsky I.V.	78
Bobylyev D.Ye.	41
Boiko V.G.	71
Boychuk V.M.	52
Bratus O.L.	70
Brytan V.B.	66
Cao Z.	80
Chen Miin-Jang	60
Dadiak I.B.	65
Dan'kiv O.O.	13, 48, 53, 62
Demchyna L.A.	42, 47, 51, 57
Demkiv O.M.	24
Dluzewski P.	20
Dmitruk I.M.	78
Dmytruk A.M.	45, 78
Dmytruk M.	45
Dremluzhenko K.S.	36
Dubikovskiy O.	18
Dyachok D.O.	24
Dzhagan V.M.	52
Evtukh A.A.	16, 70
Fedorenko L.	16
Gentsar P.O.	42, 47, 51, 57, 71
Guba S.K.	48, 53
Gudymenko A.	21
Gudymenko O.Yo.	18, 70
Gutsul V.I.	50
Hadzaman I.V.	69
Hnidko I.S.	50
Hoivanovych N.K.	24
Holovata O.B.	34
Holovatsky I.V.	37
Holovatsky V.A.	37, 39
Holska S.V.	54
Holskiy V.B.	54
Horbenko Y.Y.	46
Horichok I.V.	65
Isaieva O.F.	36
Ivakhno-Tsehelnyk O.	52
Ivanichok N.Ya.	73
Kaban I.G.	22
Kadan V.M.	78
Kaliuzhnyi V.V.	40
Karnaukhov A.	52
Karpiv V.R.	54
Kashuba A.I.	63
Katanova L.O.	63
Kavetsky T.S.	24, 35
Kazuhiko H.	30
Kiv A.E.	24, 35
Kochubei H.	17, 21
Kolkovska H.M.	73
Kolkovskiy P.I.	73, 74
Korbutyak D.V.	16, 33, 36
Korenivskiy V.	19
Kotsyubynsky V.O.	52, 73, 74
Kovalchuk Yu.V.	66
Kovalenko O.V.	27

Kovalko M.C.	66	Olikh O.Ya.	40, 83
Koziarskyi I.P.	50	Ostapenko N.I.	45
Kravets A.	19	Ostapenko Yu.V.	45
Krupa M.M.	79	Ostrauskaite J.	24
Kuchak A.I.	50	Padalka I.V.	72
Kuhivchak V.A.	53	Patuk O.	21
Kukhazh Y.Y.	24	Parashchuk T.O.	34
Kulbachynskiy O.	18	Pavlovsky Y.V.	66
Kulehyskyi B.N.	36	Pavlyk M.R.	46
Kupchak I.M.	33	Pekur D.V.	42, 47, 51, 57, 71
Kuzma M.	14, 20	Peleshchak R.M.	48, 53
Kuzyk O.V.	13, 48, 53, 69	Polynchuk P.	19
Kyriak J.P.	42, 47, 51, 57	Poplavskyy O.P.	22
Kykot A.M.	70	Popov M.Yu.	41, 43
Leshko O.V.	44, 76	Popovych A.V.	20, 23, 69
Leshko R.Ya.	44, 54, 58, 76	Popovych M.	17
Levytskyi S.	80, 81	Popovych V.D.	20, 23
Lishchynskyy I.M.	22	Pryshko I.A.	68
Lotnyk A.	17	Rachiy B.I.	73, 74
Makhanets O.M.	37, 50	Rehei M.A.	23
Matkivskiy O.M.	65	Romanyuk B.M.	71
Maturin Yu.P.	49	Sapon S.	18
Maziar D.	18	Satcyk V.V.	48
Mazur M.P.	34	Šauša O.	24
Mazur N.	52	Ščajev P.	30
Mazur T.M.	34	Selyshchev O.	52
Medvids A.	30	Semktiv I.V.	63
Melnyk Ya.Yu.	41, 43	Seti Ju.O.	32
Misiuk O.I.	74	Shakleina I.O.	23
Morawiec K.	20	Shcherban N.D.	45
Mykityuk T.V.	45	Shiojiri Makoto	20, 60
Mynaylo M.A.	42, 47, 51, 57	Shportko K.	17
Naidych B.P.	34	Shuka O.V.	68
Naumov V.	16	Sizov F.F.	15
Novosad I.S.	68	Slavnyi V.V.	27
Nykyruy L.I.	34, 63	Slusarenko M.A.	43
Olenych I.B.	46	Soloviev V.N.	35

Stadnyk V.Yu.	68	Voitsekhivska O.M.	32
Stolyarchuk A.I.	13, 69	Vorovsky V.Yu.	27
Stolyarchuk I.D.	13, 20, 48, 53, 62	Vuichyk M.V.	42, 47, 51, 57, 64
Strilichuk O.M.	51	Yarema V.V.	39
Stronski A.	11, 17, 21, 22, 80, 81	Yaremii I.P.	73, 74
Svezhentsova K.V.	64	Yavorskyi R.S.	34, 63
Terletska H.	29	Yavorskyi Y.S.	34
Tkach M.V.	32	Yukhymchuk V.	16
Trischuk L.I.	36, 51	Zahn D.R.T.	52
Tsybrii Z.F.	15, 64	Zajkowska W.	20
Tuzhykov A.V.	35	Zamurujeva O.V.	34
Tymkiv A.V.	66	Zavhorodnii O.V.	83
Tymochko M.D.	40	Zayachuk D.M.	38
Tymofii T.M.	74	Zayats M.S.	47, 51, 71
Uhryn Yu.O.	25, 66	Zdyb R.	28
Venger E.	17	Zgardzińska B.	24
Virt I.S.	72	Zywczak A.	20
Vlasenko O.I.	42, 47, 57	Лепіх Я.І.	31
Voitkiv H.V.	22		

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