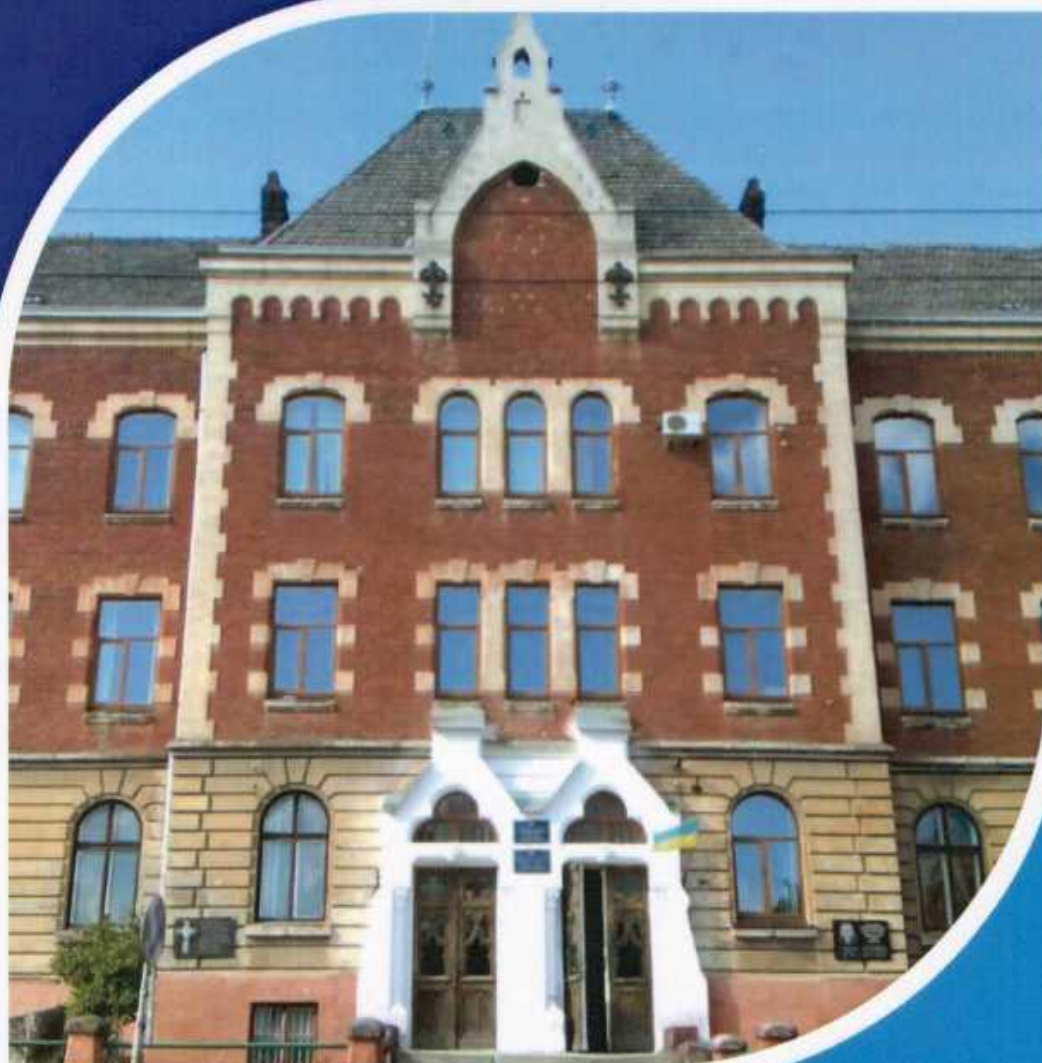


XI-th International Conference
**Topical Problems
of Semiconductor
Physics**



MATERIALS of Conference

Drohobych, UKRAINE
May 27-31, 2024

Ministry of Education and Science of Ukraine

Institute of Physics of NASU

V.E. Lashkaryov Institute of Semiconductor Physics NAS of Ukraine

**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,
Drohobych, UKRAINE
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Actual problems and important achievements of modern semiconductors 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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The effect of dynamic deformation on the nanowires conductivity of AlGaIn/GaN

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AlGaIn/GaN-based devices are being used for both electronic and optoelectronic applications. Lately, they are also studied as biosensors based on nanowires (NWs). Their interfaces are extremely sensitive to surrounding substances and environmental conditions. In our case, AlGaIn/GaN NWs contain one-dimensional electron gas (1 DEG). In previous works [1-2], we studied a dependence of NWs current-voltage characteristics (CVCs) on wavelength and intensity of ultraviolet excitation for the depletion widths and space charge-limited transport control in NWs. Also we have investigated the effect of ultrasound vibrations for the adjustment of AlGaIn/GaN transport properties. Nanowires with near critical width (185 nm) appear to be especially sensitive to the UV excitation due to space-charge-limited current. All nanowires demonstrated persistent photoconductivity. Ultrasound loading leads to similar effects as UV excitation, such as persistent conductivity.

The purpose of the study was the influence of acoustic loading on the current-voltage characteristics of nanowires based on GaN/AlGaIn heterostructure with different wire thickness of 280, 470, 720, 930 and 1100 nm. Temperature dependence of CVCs under the ultrasound loading was obtained in the range of 200 – 300 K in the dark conditions. The ultrasound amplitude on piezotransducer was 22 V, the frequency was 4 MHz. Measurements were done for both heating and cooling cycle, and the dependence of current on temperature at fixed bias was plotted. The time dependences of the current change when the ultrasound is turned on and off were studied. It was found that there is a decrease in the current due to the acoustic loading. The magnitude of the effect depends on both the temperature and the width of the nanowires.

1. Naumov A.V., Kaliuzhnyi V.V., Vitusevich S.A., Hardtdegen H., Belyaev A.E. Electron transport in AlGaIn/GaN HEMT-like nanowires: Effect of depletion and UV excitation. *SPQEO*. 2021. V. 24, No 4. P. 407-412.
2. Kaliuzhnyi V.V., Liubchenko O.I., Tymochko M.D., Olikh Y.M., Kladko V.P., Belyaev A.E. Investigation of traps in AlGaIn/GaN heterostructures by ultrasonic vibrations. *Ukr. J. Phys.* 2021. V. 66. No 12. P. 1058-1062.