APROBAT

Agenţia Naţională pentru Cercetare şi Dezvoltare

_____

___ _____ 2023

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AGENŢIA NAŢIONALĂ PENTRU CERCETARE ŞI DEZVOLTARE
COORDONAT
"14" martie 2023

RAPORT ŞTIINŢIFIC

pentru anul 2022

privind executarea proiectului de cercetări ştiinţifice

Program de postdoctorat (2021-2022)

Universitatea Tehnică a Moldovei

Proiectul **„Micro- şi nano-ingineria compuşilor semiconductori în baza tehnologiilor electrochimice pentru aplicaţii electronice şi fotonice". #21.00208.5007.15/PD**

Prioritatea Strategică 5. Competitivitate economica şi tehnologii inovative. Nanotehnologii

termen de executare: 31 decembrie 2022

Rector U.T.M.	**dr. hab. Viorel BOSTAN** *(numele, prenumele)*	*(semnătura)*
Consiliul ştiinţific UTM	**dr. hab. Vasile TRONCIU** *(numele, prenumele)*	*(semnătura)*
Conducătorul proiectului	**Dr. Eduard MONAICO** *(numele, prenumele)*	*(semnătura)*

L.Ş

Chişinău 2023

AGENŢIA NAŢIONALĂ PENTRU CERCETARE ŞI DEZVOLTARE
Nr. 74
17" 01 2023

1. **Scopul şi obiectivele propuse spre realizare în cadrul proiectului în anul 2022**

Scopul major al proiectului constă în dezvoltarea tehnologiilor cost-eficiente pentru sinteza nanomaterialelor, poziţionarea lor dirijată precum şi integrarea acestora în senzori

Obiectivele propuse spre realiare în anul 2022 constau în:

- studiul proprietăţilor magnetice ale nanofirelor cu secţiune transversală diferită, funcţionalizate cu doturi metalice (Fe, Ni, sau aliajul lor FeNi cu diferită proporţie);
- publicarea şi diseminarea rezultatelor obţinute în reviste cu factor de impact şi conferinţe internaţionale;
- editarea monografiei;
- pregătirea tezei de doctor habilitat pentru susţinere

2. **Etapele în anul 2022**

- Elaborarea de nano-micro dispozitive în baza nanofirelor semiconductoare.
- Studiul proprietăţilor optoelectronice şi magnetice ale dispozitivelor şi structurilor elaborate.

3. **Acţiunile planificate pentru realizarea scopului şi obiectivelor**

1. Optimizarea designului platformei cipului cu contacte electrice (lăţimea între contacte, alegerea materialelor pentru contactare, etc).
2. Obţinerea cost-efectivă a nanofirelor cu o calitate îmbunătăţită prin anodizarea electrochimică a cristalelor semiconductoare de InP, GaAs.
3. Elaborarea protocolului de contactare a nanofirelor obţinute.
4. Studiul proprietăţilor magnetice ale nanofirelor de GaAs, cu secţiune transversală diferită, funcţionalizate cu doturi metalice cu proprietăţi magnetice (Fe, Ni, Ni_xFe_{1-x}).
5. Pregătirea monografiei spre publicare şi a tezei de doctor habilitat pentru susţinere.

4. **Acţiunile realizate pentru atingerea scopului şi obiectivelor**

1. A fost optimizat designul formei şi lăţimei contactelor. A fost mărită grosimea stratului de Cr şi Au depus pentru a asigura o contactare mai calitativă îndeosebi la grosimi a nanofirelor cu diametrul de 400 nm.
2. A fost folosită corodarea electrochimică cu parametri optimizaţi pentru obtinerea nanofirelor semiconductoare.
3. Au fost folosite diferite abordări pentru confecţionarea contactelor la nanofire: cu ajutorul fluxului focusat de ioni (FIB); litografia cu flux de laser; litografia electronica; şi poziţionarea pe cip cu contacte prefabricate.
4. Au fost studiate proprietăţile magnetice ale nanofirelor decorate cu nanodote magnetice de Fe, Ni sau Ni_xFe_{1-x} cu ajutorul Vibrating Sample Megnetometer (VSM) în configuraţii diferite: câmpul magnetic orientat paralel sau perpendicular pe nanofirele funcţionalizate. Studiul a fost efectuat în comparaţie cu materialele masive funcţionalizate cu materiale magnetice la aceiaşi parametri de electrodepunere.
5. Au fost elaborate structuri miez-înveliş în baza nanofirelor de GaAs/ZnO şi GaAs/TiO_2 prin depunerea Atomic Layer Deposition.
6. Au fost depuse eforturi pentru a edita monografia în timpul stabilit.

3F

5. Rezultatele obținute (după caz; selectați rezultatul obținut)

Rezultatele principale obtinute au fost publicate în: 6 articole științifice cu factor de impact în acces deschis; 1 articol în revista națională categoria B+; 1 articol în culegerea de conferința editată de Springer; rezultale au fost diseminate la 3 foruri științifice internaționale, unul fiind raport invitat; au fost depuse 2 cereri de brevete; au fost obtinute 3 medalii (două de aur și una de argint) la expozitii internaționale de inventică; 1 capitol în Encyclopedia of Condensed Matter Physics. Rezultatele obtinute în baza programului de postdoctorat (2021-2022) precum și rezultatele obtinute anterior, dar după sustinerea tezei au stat la baza monografiei editate cu titlul " Micro- and nano-engineering of III-V and II-VI semiconductor compounds and metal nanostructures based on electrochemical technologies for multifunctional applications". Lista integrală a contribuțiilor științifice la tema tezei, inclusiv cele din cadrul acestui proiect de postdoctorat sunt prezentate în Anexa 1.

- **Manuscrisul tezei este realizat în volum de 60 %**
- Teza este la etapa de susținere în:
  a) unitatea primară
  b) Seminarul Științific de Profil
  c) Comisia de susținere publică
  d) Confirmare la ANACEC
- Teza a fost susținută și obținut titlul de DH la _____ (data) prin decizia Comisiei de susținere publică din cadrul _____ (Instituția), confirmată prin Decizia Consiliului de Conducere ANACEC nr. _____, din _____

6. Publicațiile la tema tezei de DH

1. **Monografii** (recomandate spre editare de consiliul științific/senatul instituției acreditate la profilul respectiv)

1.1.monografii monoautor

1. **MONAICO, Eduard**. Micro- and nano-engineering of III-V and II-VI semiconductor compounds and metal nanostructures based on electrochemical technologies for multifunctional applications. Technical University of Moldova. – Chisinau: S. n., Bons Offices, 2022, 286 p. ISBN 978-9975-166-63-8. Disponibil: http://cris.utm.md/handle/5014/1634

1.2. monografii colective

2. TIGINYANU, I.; **MONAICO, E.** Self-organized porous semiconductor compounds. Chapter. *Encyclopedia of Condensed Matter Physics*, ECMP 2nd Edition, Elsevier, 2023. In press.

2. **Articole în reviste științifice**

2.1. în reviste din bazele de date Web of Science şi SCOPUS

1. **MONAICO, E.V.**; MORARI, V.; URSAKI, V.V.; NIELSCH, K.; TIGINYANU, I.M. Core–Shell GaAs-Fe Nanowire Arrays: Fabrication Using Electrochemical Etching and Deposition and Study of Their Magnetic Properties. *Nanomaterials* **2022**, *12*, 1506, doi:10.3390/nano12091506. **IF – 5.719**.

2. MOISE, C.C.; MIHAI, G.V.; ANICĂI, L.; **MONAICO, E.V.**; URSAKI, V.V.; ENĂCHESCU, M.; TIGINYANU, I.M. Electrochemical Deposition of Ferromagnetic Ni Nanoparticles in InP Nanotemplates Fabricated by Anodic Etching Using Environmentally Friendly Electrolyte. *Nanomaterials* **2022**, *12*, 3787, doi:10.3390/nano12213787. **IF – 5.719**.

3. **MONAICO, E.V.**; MORARI, V.; KUTUZAU, M.; URSAKI, V.V.; NIELSCH, K.; TIGINYANU, I.M. Magnetic Properties of GaAs/NiFe Coaxial Core-Shell Structures. *Materials* **2022**, *15*, 6262, doi:10.3390/ma15186262. **IF – 3.748**.

4. MONAICO, E.I.; **MONAICO, E.V.**; URSAKI, V.V.; TIGINYANU, I.M. Controlled Electroplating of Noble Metals on III-V Semiconductor Nanotemplates Fabricated by Anodic Etching of Bulk Substrates. *Coatings* **2022**, *12*, 1521, doi:10.3390/coatings12101521. **IF – 3.236**.

5. URSAKI, V.V.; LEHMANN, S.; ZALAMAI, V.V.; MORARI, V.; NIELSCH, K.; TIGINYANU, I.M.; **MONAICO, E.V**. Core–Shell Structures Prepared by Atomic Layer Deposition on GaAs Nanowires. *Crystals* **2022**, *12*, 1145, doi:10.3390/cryst12081145. **IF – 2.670**.

6. URSAKI, V.V.; LEHMANN, S.; ZALAMAI, V.V.; MORARI, V.; NIELSCH, K.; TIGINYANU, I.M.; **MONAICO, E.V**. Planar and Coaxial Core-Shell Nanostructures Prepared by Atomic Layer Deposition on Semiconductor Substrates. *Romanian Journal of Physics* **2023**, published on-line: https://rjp.nipne.ro/accpaps/592CBB8B88F9F759511B4740D7DFADFC7C071BBE.pdf **IF – 1.662**.

2.3. în reviste din Registrul Naţional al revistelor de profil, cu indicarea categoriei

1. **MONAICO, E.V**. Engineering of Semiconductor Compounds via Electrochemical Technologies for Nano-Microelectronic Applications. *J. Eng. Sci.* **2022**, *29*, 8–16, doi:10.52326/jes.utm.2022.29(1).01. Categoria B+.

3. **Articole în culegeri ştiinţifice**

3.2. în lucrările conferinţelor ştiinţifice internaţionale (Republica Moldova)

1. **MONAICO, E.V.**; BUSUIOC, S.; TIGINYANU, I.M. Controlling the Degree of Hydrophilicity/Hydrophobicity of Semiconductor Surfaces via Porosification and Metal Deposition. In Proceedings of the 5th International Conference on Nanotechnologies and Biomedical Engineering; Tiginyanu, I., Sontea, V., Railean, S., Eds.; Springer International Publishing: Cham, 2022; pp. 62–69. https://doi.org/10.1007/978-3-030-92328-0_9

4. **Teze în culegeri ştiinţifice**

3.1. în lucrările conferinţelor ştiinţifice internaţionale (peste hotare)

1. **MONAICO, E.V.** Porous semiconductor compounds: characterization and applications. In: Book of Abstracts of BPU11 CONGRESS. The 11th International Conference of the Balkan Physical Union. 28 August 2022 - 1 September 2022, Belgrade, Serbia. pp. 209-210. S12-PSSAP-100 / Oral presentation Disponibil: https://indico.bpu11.info/event/1/contributions/111/. http://cris.utm.md/handle/5014/1421 **Prezentare – oral.**
2. **MONAICO, E.V.** Porous semiconductor compounds: obtaining and functionalization with metallic nanostructures for multifunctional applications. In: Abstract Book Invited Papers of *The 7th International Colloquium "Physics of Materials" (PM-7)*, 10 — 11 November 2022, Bucharest, Romania. Disponibil: http://www.physics.pub.ro/Site_Conferinta_PM-7/INVITED_PAPERS.pdf. I1, p.1. **Prezentare – oral. Invited.**
3. **MONAICO, E. V.;** COLIBABA, G. V. Impact of the electrolyte and electrochemical parameters upon the morphology of anodized zinc oxide. International Scientific Conference "Materials and Structures of Modern Electronics" MSME-2022, 12 — 14 October 2022, Minsk, Belarus. **Prezentare – oral.**

5. Materiale la saloanele de invenţii

1. **MONAICO, E.V.**, URSAKI, V.V., TIGINYANU, I.M. Procedeu de obţinere a mai multor reţele de pori independente în substrat semiconductor pentru aplicaţii fluidice. Salonul Internaţional al Cercetării Ştiinţifice, Inovării şi Inventicii PRO INVENT, ediţia a XX-a, 26-28 octombrie 2022, Sala Polivalentă BT Arena, CLUJ-NAPOCA. **GOLD Medal.**
2. **MONAICO, E.V.**, URSAKI, V.V., TIGINYANU, I.M. Process for independent pore networks obtaining in semiconductor wafers. Proceedings of the 14th Edition of European Exhibition of Creativity and Innovation, Romania. pp. 150-151, 2022. **GOLD Medal.** EUROINVENT 2022, Iasi, Romania, 26-28 May 2022 http://cris.utm.md/handle/5014/1339
3. **MONAICO, E.V.**, URSAKI, V.V., TIGINYANU, I.M. Process for obtaining several non-connected pore networks in a semiconductor wafer for fluidic applications. The 26th International Exhibition of Inventions "INVENTICA 2022" 23-24 June 2022, Iaşi, România. **SILVER Medal.**

7. Protecţia rezultatelor obţinute în formă de obiecte de proprietate intelectuală

1. **MONAICO, E.V.**, URSACHI V.V., MORARI V., TIGHINEANU, I.M. Procedeu de obţinere a nanostructurilor magnetice. Cerere de brevet: a2022 0012 din 22.02.2022.
2. **MONAICO, E.V.**, URSACHI V.V., TIGHINEANU, I.M. Procedeu de obţinere a reţelelor de pori în plachete semiconductoare. Cerere de brevet: a 2022 0001 din 24.01.2022.

8. Diseminarea rezultatelor proiectului

1. **MONAICO, E.V.** Porous semiconductor compounds: characterization and applications. In: Book of Abstracts of BPU11 CONGRESS. The 11th International Conference of the Balkan Physical Union. 28 August 2022 - 1 September 2022, Belgrade, Serbia. pp. 209-210. S12-PSSAP-100 / Oral presentation Disponibil: https://indico.bpu11.info/event/1/contributions/111/. http://cris.utm.md/handle/5014/1421 **Prezentare – oral.**
2. **MONAICO, E.V.** Porous semiconductor compounds: obtaining and functionalization with metallic nanostructures for multifunctional applications. In: Abstract Book Invited Papers of *The 7th International Colloquium "Physics of Materials" (PM-7)*, 10 — 11 November 2022, Bucharest, Romania. Disponibil: http://www.physics.pub.ro/Site_Conferinta_PM-7/INVITED_PAPERS.pdf p.1. **Prezentare – oral. Invited.**
3. **MONAICO, E. V.;** COLIBABA, G. V. Impact of the electrolyte and electrochemical parameters upon the morphology of anodized zinc oxide. International Scientific Conference "Materials and Structures of Modern Electronics" MSME-2022, 12 — 14 October 2022, Minsk, Belarus. **Prezentare – oral.**

9. Concluzii în limba română şi engleză

În perioada de raportare a fost identificată abordarea litografia cu flux de laser ca cea mai potrivită pentru confecţionarea contactelor la nanofire semiconductoare în comparaţie cu ajutorul fluxului focusat de ioni (FIB); litografia electronica; şi poziţionarea pe cip cu contacte prefabricate. A fost optimizat designul formei şi lăţimei contactelor.

Au fost studiate proprietăţile magnetice ale nanofirelor decorate cu nanodote magnetice de Fe, Ni sau Ni_xFe_{1-x} cu ajutorul Vibrating Sample Megnetometer (VSM) în configuraţii diferite: câmpul magnetic orientat paralel sau perpendicular pe nanofirele funcţionalizate. Studiul a fost efectuat în comparaţie cu materialele masive funcţionalizate cu materiale magnetice la aceiaşi parametri de electrodepunere.

Prin depunerea stratului atomic (ALD) au fost obtinute straturi subţiri de ZnO şi TiO_2 pe substraturi semiconductoare, iar morfologiile lor şi proprietăţile de luminiscenţă au fost comparate cu cele ale structurilor coaxiale miez-coaja obţinute prin acoperirea nanofirelor GaAs cu învelişuri de ZnO şi TiO_2. Caracteristicile de polarizare ale benzilor de fotoluminiscenţă legate de diferite canale de recombinare au fost investigate în structurile miez-înveliş.

Rezultatele de bază a tezei de doctor habilitat au fost sistematizate în monografia editată "Micro- and nano-engineering of III-V and II-VI semiconductor compounds and metal nanostructures based on electrochemical technologies for multifunctional applications".

Lista integrală a publicaţiilor la tema tezei poate fi găsită în Anexa 1.

During the reporting period, the laser beam lithography approach was identified as the most suitable for contacts deposition to semiconductor nanowire in comparison with focused ion

beam (FIB); electronic lithography; and positioning on-chip with prefabricated contacts. The design of the shape and width of the contacts has been optimized.

Magnetic properties of the GaAs nanowires decorated with Fe, Ni or NixFe1-x nanodots were studied using a Vibrating Sample Megnetometer (VSM) in different configurations: the magnetic field oriented parallel or perpendicular to the functionalized nanowires. The study was performed in comparison to bulk materials functionalized with the magnetic materials at the same electrodeposition parameters.

Planar structures have been prepared by atomic layer deposition (ALD) of ZnO and TiO_2 thin layers on semiconductor substrates, and their morphologies and the luminescence properties have been compared with those of coaxial core–shell structures obtained by coating of GaAs nanowires with ZnO and TiO_2 shells. Polarization characteristics of PL bands related to different recombination channels have been investigated in core–shell structures.

The main results of the habilitat thesis were systematized in the edited monograph "Micro- and nano-engineering of III-V and II-VI semiconductor compounds and metal nanostructures based on electrochemical technologies for multifunctional applications".

The full list of publications related to the thesis can be found in Appendix 1.

Conducătorul proiectului dr. conf. MONAICO Eduard _____

(nume, prenume, grad, titlu ştiinţific) *(semnătura)*

Anexa 1

Lista publicațiilor la tema tezei de doctor habilitat
Dr. conf. Eduard Monaico

Monografie

1. **MONAICO, Eduard**. Micro- and nano-engineering of III-V and II-VI semiconductor compounds and metal nanostructures based on electrochemical technologies for multifunctional applications. Technical University of Moldova. – Chisinau: S. n., Bons Offices, **2022**, 286 p. ISBN 978-9975-166-63-8. Disponibil: http://repository.utm.md/handle/5014/21913

Capitole în monografii

2. Ion TIGINYANU, **Eduard MONAICO.** Self-organized porous semiconductor compounds. Chapter book. *Encyclopedia of Condensed Matter Physics, ECMP 2nd Edition*, Elsevier, 2023. **In press**.
3. TIGINYANU, I.; URSAKI, V.; **MONAICO, E.** Template Assisted Formation of Metal Nanotubes. In *Nanostructures and Thin Films for Multifunctional Applications: Technology, Properties and Devices*; Tiginyanu, I., Topala, P., Ursaki, V., Eds.; NanoScience and Technology; Springer International Publishing: Cham, 2016; Chapter 15, pp. 473–506. ISBN 978-3-319-30198-3. Disponibil: http://repository.utm.md/handle/5014/9307
4. SERGENTU, V.V.; URSAKI, V.; **MONAICO, Ed.**; TIGINYANU, I.M.; PRISLOPSKI, S.Ya.; GAPONENKO, S.V. Dark Modes Backscattering as Possible Rationale for Anomalous Retroreflection from Strongly Absorbing Porous Nanostructures. In *Physics, Chemistry and Application of Nanostructures*; WORLD SCIENTIFIC, 2017; pp. 30–33 ISBN 978-981-322-452-0. https://doi.org/10.1142/9789813224537_0006

Articol de sinteză

5. **MONAICO, E.**; TIGINYANU, I.; URSAKI, V. Porous Semiconductor Compounds. *Semicond. Sci. Technol.* **2020**, *35*, 103001, 63 pages. doi:10.1088/1361-6641/ab9477. Open Access

Articole în reviste internaționale cotate ISI și Scopus

6. URSAKI, V.V.; LEHMANN, S.; ZALAMAI, V.V.; MORARI, V.; NIELSCH, K.; TIGINYANU, I.M.; **MONAICO, E.V**. Planar and Coaxial Core-Shell Nanostructures Prepared by Atomic Layer Deposition on Semiconductor Substrates. *Romanian Journal of Physics* XX, **2023** Disponibil: https://rjp.nipne.ro/accpaps/592CBB8B88F9F759511B4740D7DFADFC7C071BBE.pdf
7. **MONAICO, E.V.**; MORARI, V.; URSAKI, V.V.; NIELSCH, K.; TIGINYANU, I.M. Core–Shell GaAs-Fe Nanowire Arrays: Fabrication Using Electrochemical Etching and Deposition and Study of Their Magnetic Properties. *Nanomaterials* **2022**, *12*, 1506, doi:10.3390/nano12091506. Open Access
8. MOISE, C.C.; MIHAI, G.V.; ANICĂI, L.; **MONAICO, E.V.**; URSAKI, V.V.; ENĂCHESCU, M.; TIGINYANU, I.M. Electrochemical Deposition of Ferromagnetic Ni Nanoparticles in InP Nanotemplates Fabricated by Anodic Etching Using Environmentally Friendly Electrolyte. *Nanomaterials* **2022**, *12*, 3787, doi:10.3390/nano12213787. Open Access
9. **MONAICO, E.V.**; MORARI, V.; KUTUZAU, M.; URSAKI, V.V.; NIELSCH, K.; TIGINYANU, I.M. Magnetic Properties of GaAs/NiFe Coaxial Core-Shell Structures. *Materials* **2022**, *15*, 6262, doi:10.3390/ma15186262. Open Access
10. URSAKI, V.V.; LEHMANN, S.; ZALAMAI, V.V.; MORARI, V.; NIELSCH, K.;

TIGINYANU, I.M.; **MONAICO, E.V.** Core–Shell Structures Prepared by Atomic Layer Deposition on GaAs Nanowires. *Crystals* **2022**, *12*, 1145, doi:10.3390/cryst12081145. Open Access

11. **MONAICO, E.V.**; MORARI, V.; KUTUZAU, M.; URSAKI, V.V.; NIELSCH, K.; TIGINYANU, I.M. Ferromagnetic Core-Shell Coaxial Nanostructures on Gallium Arsenide Substrates. *Rom J Phys* **2022**, *67*, 611. Disponibil: https://rjp.nipne.ro/accpaps/23773438A554DFDDC177E6DC5EC0288760A92556.pdf.
12. **MONAICO, E.V.**; BUSUIOC, S.; TIGINYANU, I.M. Controlling the Degree of Hydrophilicity/Hydrophobicity of Semiconductor Surfaces via Porosification and Metal Deposition. In IFMBE Proceedings of the 5th International Conference on Nanotechnologies and Biomedical Engineering; Tiginyanu, I., Sontea, V., Railean, S., Eds.; Springer International Publishing: Cham, 2022; pp. 62–69. doi: 10.1007/978-3-030-92328-0_9
13. ZALAMAI, V.V.; COLIBABA, G.V.; MONAICO, E.I.; **MONAICO, E.V.** Enhanced Emission Properties of Anodized Polar ZnO Crystals. *Surf. Engin. Appl. Electrochem.* **2021**, *57*, 117–123, doi:10.3103/S1068375521010166.
14. RUDENKO, M.V.; GAPONENKO, N.V.; CHUBENKO, E.B.; LASHKOVSKAYA, E.I.; SHUSTSIKAVA, K.V.; RADYUSH, Yu.V.; ZHIVULKO, V.D.; MUDRYI, A.V.; WANG, M.; **MONAICO, E.V.**; STEPIKHOVA, M.V.; YABLONSKIY, A.N. Erbium Upconversion Luminescence from Sol-Gel Derived Multilayer Porous Inorganic Perovskite Film. *J. Adv. Dielect.* **2022**, *12*, 2150031, doi:10.1142/S2010135X21500314.
15. SERGENTU, V.V., **MONAICO, E.V.**, URSAKI, V.V. Scattering Indicatrix for Absorbing Porous Medium with Dark Modes. In: Tiginyanu, I., Sontea, V., Railean, S. (eds) 4th International Conference on Nanotechnologies and Biomedical Engineering. ICNBME 2019. IFMBE Proceedings, vol 77, pp. 775-778, 2020. Springer, Cham. https://doi.org/10.1007/978-3-030-31866-6_137
16. **MONAICO, E.**; MOISE, C.; MIHAI, G.; URSAKI, V.V.; LEISTNER, K.; TIGINYANU, I.M.; ENACHESCU, M.; NIELSCH, K. Towards Uniform Electrochemical Porosification of Bulk HVPE-Grown GaN. *J. Electrochem. Soc.* **2019**, *166*, H3159, doi:10.1149/2.0251905jes. Open Access
17. WOLFF, N.; JORDT, P.; BRANISTE, T.; POPA, V.; **MONAICO, E.**; URSAKI, V.; PETRARU, A.; ADELUNG, R.; MURPHY, B.M.; KIENLE, L.; TIGINYANU, I. Modulation of Electrical Conductivity and Lattice Distortions in Bulk HVPE-Grown GaN. *ECS J. Solid State Sci. Technol.* **2019**, *8*, Q141, doi:10.1149/2.0041908jss.
18. GAPONENKO, S.V.; **MONAICO, E.**; SERGENTU, V.V.; PRISLOPSKI, S.Y.; TIGINYANU, I.M. Possible Coherent Backscattering of Lightwaves from a Strongly Absorbing Nanoporous Medium. *J. Opt.* **2018**, *20*, 075606, doi:10.1088/2040-8986/aac841.
19. PRISLOPSKI, S.Ya.; GAPONENKO, S.V.; **MONAICO, E.**; SERGENTU, V.V.; TIGINYANU, I.M. Polarized Retroreflection from Nanoporous III–V Semiconductors. *Semiconductors* **2018**, *52*, 2068–2069, doi:10.1134/S1063782618160248.
20. **MONAICO, E.V.**; TIGINYANU, I.M.; URSAKI, V.V.; NIELSCH, K.; BALAN, D.; PRODANA, M.; ENACHESCU, M. Gold Electroplating as a Tool for Assessing the Conductivity of InP Nanostructures Fabricated by Anodic Etching of Crystalline Substrates. *J. Electrochem. Soc.* **2017**, *164*, D179, doi:10.1149/2.1071704jes.
21. BRANISTE, T.; CIERS, J.; **MONAICO, Ed.**; MARTIN, D.; CARLIN, J.-F.; URSAKI, V.V.; SERGENTU, V.V.; TIGINYANU, I.M.; GRANDJEAN, N. Multilayer Porous Structures of HVPE and MOCVD Grown GaN for Photonic Applications. *Superlattices and Microstructures* **2017**, *102*, 221–234, doi:10.1016/j.spmi.2016.12.041.
22. BRANISTE, T.; **MONAICO, E.**; MARTIN, D.; CARLIN, J.-F.; POPA, V.; URSAKI, V.V.; GRANDJEAN, N.; TIGINYANU, I.M. Multilayer Porous Structures on GaN for the Fabrication of Bragg Reflectors. In Proceedings of the Nanotechnology VIII; SPIE, May 30 **2017**; Vol. 10248, 102480R, pp. 83–89. doi:10.1117/12.2266280

23. PRISLOPSKI, S.Y.; NAUMENKO, E.K.; TIGINYANU, I.M.; GHIMPU, L.; **MONAICO, E.**; SIRBU, L.; GAPONENKO, S.V. Anomalous Retroreflection from Strongly Absorbing Nanoporous Semiconductors. *Opt. Lett., OL* **2011**, *36*, 3227–3229, doi:10.1364/OL.36.003227.
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Rapoarte invitate/plenare

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Expoziţii

1. MONAICO, E.V., URSAKI, V.V., TIGINYANU, I.M. Procedeu de obţinere a mai multor reţele de pori independente în substrat semiconductor pentru aplicaţii fluidice. Salonul Internaţional al Cercetării Ştiinţifice, Inovării şi Inventicii PRO INVENT, ediţia a XX-a, 26-28 octombrie 2022, Sala Polivalentă BT Arena, CLUJ-NAPOCA. **GOLD Medal.** Disponibil: http://cris.utm.md/handle/5014/1511
2. MONAICO, E.V., URSAKI, V.V., TIGINYANU, I.M. Process for independent pore networks obtaining in semiconductor wafers. Proceedings of the 14th Edition of European Exhibition of Creativity and Innovation, Romania. pp. 150-151, 2022. **GOLD Medal.** EUROINVENT 2022, Iasi, Romania, 26-28 May 2022. Disponibil: http://cris.utm.md/handle/5014/1339
3. MONAICO, E.V., URSAKI, V.V., TIGINYANU, I.M. Process for obtaining several non-connected pore networks in a semiconductor wafer for fluidic applications. The 26th International Exhibition of Inventions "INVENTICA 2022" 23-24 June 2022, Iaşi, România. **SILVER Medal**. Disponibil: http://cris.utm.md/handle/5014/1494

Brevete de invenţie

1. **MONAICO, E.V.**, URSACHI V.V., MORARI V., TIGHINEANU, I.M. Procedeu de obţinere a nanostructurilor magnetice. Cerere de brevet: a2022 0012 din 22.02.2022.
2. **MONAICO, E.V.**, URSACHI V.V., TIGHINEANU, I.M. Procedeu de obţinere a reţelelor de pori în plachete semiconductoare. Cerere de brevet: a 2022 0001 din 24.01.2022.
3. GOLOGAN Viorel, IVAŞCU Sergiu, SIDELINICOVA Svetlana, **MONAICO Eduard.** Procedeu de depunere a acoperirilor din electrolit pe bază de nichel. AGEPI. Brevet de inventie Nr. 4721 din 2020.10.31.

Anexa nr. 2.3
la Contractul de finanțare a proiectului
de postdoctorat nr. ____din _____ 2021

UNIVERSITATEA TEHNICĂ A MOLDOVEI

DEVIZUL DE CHELTUIELI PENTRU ANII 2021-2022

Postdoctorandul Dr., conf. Eduard MONAICO

Denumirea codurilor economice	Codul economic	Total	Inclusiv:	
		mii lei	Buget I an	Buget II an
Bunuri și servicii	**22**	**191.0**	**95.5**	**95.5**
Servicii energetice și comunale	2221			
Energia electrică	222110			
Energia termica	222113			
Apă și canalizare	22211			
Servicii de telecomunicații	222220			
Deplasări de serviciu	**2227**			
Deplasări de serviciu în interiorul țării	222710			
Deplasări de serviciu peste hotare	222720			
Alte servicii	**2229**			
Servicii editoriale	222910			
Servicii de cercetări științifice contractate	222930			
Servicii neatribuite altor alineate	222990			
Burse	**281200**	**191.0**	**95.5**	**95.5**
Bursele pentru studenții autohtoni	281211	191.0	95.5	95.5
Majorarea valorii materialelor pentru scopuri didactice, științifice și alte scopuri	**3351**	**49.0**	**24.5**	**24.5**
Procurarea materialelor pentru scopuri didactice, științifice și alte scopuri	335110	49.0	24.5	24.5
Majorarea valorii materialelor de uz gospodăresc și rechizitelor de birou	**3361**			
Procurarea materialelor de uz gospodăresc și rechizitelor de birou	336110			
Total		**240.0**	**120.0**	**120.0**

Rector U.T.M. **dr. hab. Viorel BOSTAN**
(numele, prenumele) *(semnătura)*

Director al proiectului **dr. Eduard MONAICO**
(numele, prenumele) *(semnătura)*

Economist (contabil) **Victoria IOVU**
(numele, prenumele) *(semnătura)*

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