

REZUMAT
Raport stiintific final

privind implementarea proiectului

**Dezvoltarea unei noi generatii de agenti
antimicrobieni cu schelet hibrid azaheterociclic prin metode ecologic prietenoase**

in perioada ianuarie 2021 - decembrie 2023

Grant nr.: **contractul nr. PCE 115/2021, incheiat pentru implementarea proiectului – cod PN-III-P4-ID-PCE-2020-0371**

Director: Prof. Dr. Ionel Mangalagiu, **Universitatea "Al. I. Cuza", Bd. Carol 11, 700506 Iasi, Romania.**

Rezultatele semnificative au fost incluse pe pagina de web a proiectului:
<https://teclu.chem.uaic.ro/antimheteco/>

• **Obiectivele prevăzute si realizate:**

O1. S-a realizat sinteza noilor azaheterocicluri hibride (tip Q1 si Q2) continind in aceiasi molecula un heterociclu azinic (π -sarace in electroni) si unul sau doua heterocicluri imidazolice / benzimidazolice (π -bogate in electroni), legate intre ele prin diversi spatiatori / conectori alifatici.

O2. S-a realizat sinteza noilor azaheterocicluri hibride (tip Q3 pina la Q7) continind in aceiasi molecula un heterociclu azinic (π -sarace in electroni) si unul sau doua heterocicluri triazolice (π -bogate in electroni), legate intre ele prin diversi spatiatori / conectori alifatici si/sau aromatici.

O3. S-a realizat sinteza de noi hibrizi azaheterociclici (tip Q8 și Q9) având în moleculă atât heterocicli diazinici deficitari în electroni π (piridazina, ftalazina) și triazoli (bogați în electroni π), legate intre ele prin diversi spatiatori / conectori, inclusiv fluoroforul antracen si a azaheterociclurilor hibride (tip Q10) continind in aceiasi molecula un heterociclu bis-pyridazinic (π -sarace in electroni), heterocicluri triazolice (π -bogate in electroni), legate intre ele prin diversi spatiatori / conectori, incluzând și fluoroforul antracen.

O4. S-a realizat sinteza noilor azaheterocicluri hibride (tip Q11, Q12) continind in aceiasi molecula un heterociclu azinic si bis-pyridazinic (π -sarace in electroni), heterocicluri triazolice (π -bogate in electroni), legate intre ele prin diversi spatiatori / conectori.

O5. S-a realizat sinteza de noi hibrizi azaheterociclici (tip Q13) având în aceiasi moleculă o unitate acetofenonica, doua unitati azinice si doua unitati triazolice.

O6. S-a realizat sinteza noilor azaheterocicluri hibride (tip Q14, Q15) având în aceiasi moleculă o unitate acetofenonica, doua unitati azinice si doua unitati heterociclice imidazolice si/sau oxazolice.

O7. Sinteza ansamblurilor supramoleculare de tip gazda-oaspete (host-guest) bazate pe complexii de incluziune ai β -cyclodextrinei si azaheterociclurilor, ca si sisteme de eliberare controlata a unor potentiale medicamente.

O8. S-a determinat activitatea antimicrobiala si antifungica a noilor compusi, s-au investigat mecanismele de actiune, s-au efectuat corelatii structura - activitate (SAR), s-au efectuat studii ale

complexilor de incluziune ai β -cyclodextrinei si azaheterociclorilor ca sisteme de eliberare controlata a unor potentiale medicamente.

O9. S-au elaborat noi proceduri experimentale ecologic prietenoase prin folosirea tehnologiei MW si/sau US.

O10. S-au dezvoltat abilitatile de cercetare pentru studentii masteranzi si doctoranzi.

O11. S-a crescut vizibilitate cercetarii romanesti prin publicarea unui numar apreciabil de lucrari ISI.

O12. S-au stabilit noi relatii de colaborare cu parteneri interni si internationali.

- **Impactul estimat al rezultatelor obtinute, cu sublinierea celui mai semnificativ rezultat obtinut.**

- s-a contribuit la cresterea patrimoniului stiintific mondial prin obtinerea de noi clase de hibrizi azaheterociclici de tip Q1-Q15 cu activitate antimicrobiana si prin elaborarea unor proceduri experimentale de sinteza ecologic prietenoase;

- s-a crescut vizibilitate cercetarii romanesti prin publicarea unui numar apreciabil de lucrari, 15 lucrari ISI Web of Science in cvartilele Q1 si Q2.

- s-au dezvoltat abilitatile de cercetare pentru studentii masteranzi si doctoranzi.

Valorificarea rezultatelor:

- **Total Lucrari stiintifice publicate - 41**

- **Total Lucrari ISI Web of Science publicate: 17**

- (3 in cvartila Q1, 13 in cvartila Q2, 1 in cvartila Q4)**

1. Antoci, V.; Oniciuc, L.; Amariuca-Mantu, D.; Moldoveanu, C.; Mangalagiu, V.; Amarandei, A.M.; Lungu, C.N.; Dunca, S.; Mangalagiu, I.I.; Zbancioc, G. Benzoquinoline Derivatives: A Straightforward and Efficient Route to Antibacterial and Antifungal Agents, *Pharmaceuticals* **2021**, 14, 335 (1-21). MDPI, ST ALBAN-ANLAGE 66, CH-4052 BASEL, SWITZERLAND ISSN: eISSN: 1424-8247.

Pharmacology & Pharmacy- **Q1**- 49/271; <https://doi.org/10.3390/ph14040335>

FI=5.86

2. Bucur, S.; Niculaua, M.; Ciobanu, C.I.; Lungu, N.C.; Mangalagiu, I.I.* A Simple Synthesis Route for Selectively Methylated β -Cyclodextrin Using a Copper Complex Sandwich Protecting Strategy. *Molecules* **2021**, 26, 5669 (pp. 1-6). Publisher: Molecular Diversity Preservation International, CODEN: MOLEFW ISSN: 1420-3049.

Chemistry, Multidisciplinary-**Q2**, 67/152;

<https://doi.org/10.3390/molecules26185669>

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3. Moldoveanu, C.; Mangalagiu, I.I.; Zbancioc, G. Fluorescent Azasteroids through Ultrasound Assisted Cycloaddition Reactions. *Molecules* **2021**, 26, 5098 (pp. 1-13). Publisher: Molecular Diversity Preservation International, CODEN: MOLEFW ISSN: 1420-3049.

Chemistry, Multidisciplinary-**Q2**, 67/152; <https://doi.org/10.3390/molecules26165098>

FI= 4.41

4. Amariuca-Mantu, D.; Mangalagiu, V.; Mangalagiu, I.I.* [3 + n] Cycloaddition Reactions: A Milestone Approach for Elaborating Pyridazine of Potential Interest in Medicinal Chemistry and Optoelectronics. *Molecules* **2021**, 26, 3359 (pp. 1-17). Publisher: Molecular Diversity Preservation International, CODEN: MOLEFW ISSN: 1420-3049.

Chemistry, Multidisciplinary-**Q2**, 67/152; <https://doi.org/10.3390/molecules26113359>

FI= 4.41

5. Al-Matarneh, M.C.; Amarandi, R.M.; Mangalagiu, I.I.; Danac, R. Synthesis and Biological Screening of New Cyano-Substituted Pyrrole Fused (Iso)Quinoline Derivatives. *Molecules* **2021**, *26*, 2066 (pp. 1-19). Publisher: MDPI, CODEN: MOLEFW ISSN: 1420-3049. Chemistry, Multidisciplinary-**Q2**, 67/152; <https://doi.org/10.3390/molecules26072066>
FI= 4.41
6. Diaconu, D.; Amariuci-Mantu, D.; Mangalagiu, V.; Antoci, V.; Zbancioc, Ghe.; Mangalagiu, I.I. Ultrasound assisted synthesis of hybrid quinoline-imidazole derivatives: a green synthetic approach. *RSC Advanced (RSC Adv.)* **2021**, *11*, 38297–38301. Publisher Royal Society of Chemistry (United Kingdom), ISSN: 2046-2069, eISSN:2046-2069. Chemistry, Multidisciplinary (JCR)-**Q2**, 67/152; / Chemistry, Multidisciplinary (JCI)-Q2, 93/224; DOI: [10.1029/d1ra07484a](https://doi.org/10.1029/d1ra07484a)
FI= 4.03
7. Amariuca-Mantu, D.; Mangalagiu, V.; Bejan, I.; Aricu, A.; Mangalagiu, I.I.* Hybrid Azine Derivatives: A useful Approach for Antimicrobial Therapy. *Pharmaceutics* **2022**, *14*, 2026. MDPI, ST ALBAN-ANLAGE 66, CH-4052 BASEL, SWITZERLAND. ISSN:1999-4923 Pharmacology & Pharmacy (JCR)-**Q1**, 39/279 / Pharmacology & Pharmacy (JCI)-Q1, 30/361 <https://doi.org/10.3390/pharmaceutics14102026.6.52/5>
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8. Diaconu, D.; Antoci, V.; Mangalagiu, V.; Amariuca-Mantu, D.; Mangalagiu, I.I.* Quinoline -imidazole/benzimidazole derivatives as dual- / multi- targeting hybrids inhibitors with anticancer and antimicrobial activity. *Scientific Reports* **2022**, *12*, 16988 (pp 1-15). Publisher: Nature Publishing Group, ISSN: 2045-2322 Multidisciplinary Science (JCR)-**Q2**, 19/73; / Multidisciplinary Sciences (JCI)-Q1, 19/134; <https://doi.org/10.1038/s41598-022-21435-6>
FI= 4.99
9. Zbancioc, G.; Mangalagiu, I.I.; Moldoveanu, C. A Review on the Synthesis of Fluorescent Five- and Six- Mem-bered Ring Azaheterocycles. *Molecules* **2022**, *27*, 6321. Publisher: Molecular Diversity Preservation International, CODEN: MOLEFW ISSN: 1420-3049 Chemistry, Multidisciplinary (JCR)-**Q2**, 65/179; / Chemistry, Multidisciplinary (JCI)-Q2, 82/224; <https://doi.org/10.3390/molecules27196321>
FI= 4.92
10. Zbancioc, G.; Ciobanu, C.I.; Mangalagiu, I.I.; Moldoveanu, C. Ultrasound-Assisted Synthesis of Fluorescent Azatetracyclic\Derivatives: An Energy-Efficient Approach. *Molecules* **2022**, *27*, 3180 (pp 1-10). Publisher: Molecular Diversity Preservation International, CODEN: MOLEFW ISSN: 1420-3049. Chemistry, Multidisciplinary (JCR)-**Q2**, 65/179; / Chemistry, Multidisciplinary (JCI)-Q2, 82/224; <https://doi.org/10.3390/molecules27103180>
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11. Oniciuc, L.; Amăriucăi-Mantu, D.; Diaconu, D.; Mangalagiu, V.; Danac, R.; Antoci, V.; **Mangalagiu, I.I.*** Benzoquinoline Derivatives: An Attractive Approach to Newly Small Molecules with Anticancer Activity, *International Journal of Molecular Sciences (Int. J. Mol. Sci.)* **2023**, *24*, 8124. Publisher: Molecular Diversity Preservation International, ISSN: 1422-0067 <https://doi.org/10.3390/ijms24098124>
FI= 5,6 (cvartila **Q1**)
12. Amărandi, R.-M.; Al-Matarneh, M.-C.; Popovici, L.; Ciobanu, C.I.; Neamțu, A.; **Mangalagiu, I.I.**; Danac, R. Exploring Pyrrolo-Fused Heterocycles as Promising Anticancer Agents: An Integrated Synthetic, Biological, and Computational Approach. *Pharmaceutics* **2023**, *16*, 865. MDPI, ST ALBAN-ANLAGE 66, CH-4052 BASEL, SWITZERLAND ISSN: eISSN: 1424-8247. <https://doi.org/10.3390/ph16060865>
FI= 4,6 (cvartila **Q2**)
13. Lungu, C.N.; Mangalagiu, V.; **Mangalagiu, I.I.***; Mehedinti, M.C. Benzoquinoline Chemical Space: A Helpful Approach in Antibacterial and Anticancer Drug Design. *Molecules* **2023**, *28*,

1069. Publisher: Molecular Diversity Preservation International, CODEN: MOLEFW ISSN: 1420-3049
<https://doi.org/10.3390/molecules28031069>

FI= 4,6 (cvartila Q2)

14. Mangalagiu, V.; Danac, R.; Diaconu, D.; Zbancioc, G.; **Mangalagiu, I.I.*** Hybrids diazine: Recent Advancements in Modern Antimicrobial Therapy, *Current Medicinal Chemistry (Curr. Med. Chem.)* **2023**, **000**, -. Bentham Science Publishers, ISSN (Print): 0929-8673; ISSN (Online): 1875-533X. DOI:10.2174/0929867330666230418104409

FI= 4,1 (cvartila Q2)

15. **Mangalagiu, I.I.*** Huisgen 3+n Dipolar Cycloaddition Reactions: An Accessible and Useful Tool in Modern Organic and Heterocycle Synthesis. *Molecules* **2023**, **28**, 5692. <https://doi.org/10.3390/molecules28155692>

FI= 4,6 (cvartila Q2)

16. Diaconu, D.; Amariuci-Mantu, D.; Antoci, V.; Ciorteanu, R.; Mangalagiu, V.; Mangalagiu, I.I.* DESIGN AND SYNTHESIS OF NEW HYBRID PYRIDINE-IMIDAZOLIUM/BENZIMIDAZOLIUM SALTS WITH ANTIBACTERIAL ACTIVITY, *Revue Roumaine de Chimie* **2022**, **67**(1-2), 85–88. Publisher: Editura Academiei Romane, CODEN: RRCHAX ISSN: 0035-3930. Chemistry, Multidisciplinary (JCR)-Q4, 175/179; / Chemistry, Multidisciplinary (JCI)-Q4, 210/224; <https://doi.org/10.33224/rch.2022.67.1-2.07>

FI= 0.41

17. Amariuca-Mantu, D.; Antoci, V.; Sardaru, M. C.; Al Matarneh, C. M.; Mangalagiu, I.I.; Danac, R. Fused pyrrolo-pyridines and pyrrolo-(iso)quinoline as anticancer agents. *Physical Sciences Reviews* **2022**, **000**, 00 (pp1-64). Publisher WALTER DE GRUYTER GMBH GENTHNER STRASSE 13, D-10785 BERLIN, GERMANY. ISSN 2365-6581; eISSN 2365-659X. (JCI)-0 / Multidisciplinary Sciences (JCI)-Q2, 64/134; <https://doi.org/10.1515/psr-2021-0030>

AIS= 0.34

➤ Total Lucrari publicate in proceedings: 24

1. Ionel I. Mangalagiu, Dorina Amariuca-Mantu, Vasilichia Antoci, Ramona Danac, Violeta Mangalagiu, Costel Moldoveanu, Gheorghita Zbancioc. Hybrid five- and six-member ring azaheterocycles: synthesis and applications. Progress in Organic and Macromolecular Compounds 28-th Ed., Iasi, Romania, October 7-9, 2021. (Plenary lecture, PL, pag. 25-26).

Book of Abstracts / editors: Marcela MIHAI, Radu-Dan RUSU

ISSN 2810 – 2347 ISSN – L 2810 – 2126

<https://icmpp.ro/macroiiasi2021/program.php>

<https://icmpp.ro/macroiiasi2021/proceedings.php>

2. Roxana Ciorteanu, Vasilichia Antoci, Dorina Amariuca-Mantu, Catalina Ciobanu, Violeta Mangalagiu, Ionel I. Mangalagiu. New hybrid quaternary salts with sulfanylamide/benzimidazole skeleton. Progress in Organic and Macromolecular Compounds 28-th Ed., Iasi, Romania, October 7-9, 2021. (Poster presentation, pag. 107-108).

Book of Abstracts / editors:

ISSN 2810 – 2347 ISSN – L 2810 – 2126

<https://icmpp.ro/macroiiasi2021/program.php>

<https://icmpp.ro/macroiiasi2021/proceedings.php>

3. Violeta Mangalagiu, Dumitrela Diaconu, Ionel I. Mangalagiu. Quinoline Derivatives: a NMR Structure Elucidation. Adriatic NMR Conference, Primošten, Croatia, 13–15 September 2021. (Poster presentation, pag. 54).

Book of Abstracts / editors: Nikola Bregović, Danijel Namjesnik, Predrag Novak, Jelena Parlov Vuković

ISSN (print) 2806-6227

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4. Ionel I. Mangalagiu, Gheorghita Zbancioc, Liliana Oniciuc, Violeta Mangalagiu. Fused Benzo-quinoline Derivatives: NMR Insides Concerning Structure Elucidation. Adriatic NMR Conference, Primošten, Croatia, 13–15 September 2021. (Poster presentation, pag. 55).

Book of Abstracts / editors: Nikola Bregović, Danijel Namjesnik, Predrag Novak, Jelena Parlov Vuković

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5. Mangalagiu, I.I.; Violeta Mangalagiu, Costel Moldoveanu, Gheorghita Zbancioc, Ramona Danac, Vasilichia Antoci. ANTIMICROBIAL AND ANTICANCER ACTIVITY OF SOME HYBRID AZINE/AZOLE DERIVATIVES, *New frontiers in natural product chemistry*, June 4-5, 2021, Chişinău, Moldova. (Oral presentation, pag. 14). <http://dx.doi.org/10.19261/nfnpc.2021.ab07>
<https://ichem.md/en/scientific-seminar-new-frontiers-natural-product-chemistry-2021>
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 Editura: Institute of Chemistry
 ISBN 978-9975-3336-7-2 (PDF).
 DOI: 10.19261/nfnpc.2021
6. Vasilichia Antoci, Gheorghită Zbancioc, Liliana Oniciuc, Dorina Amăriucăi-Mantu, Costel Moldoveanu, Ramona Dănac, Cătălina Ciobanu, Vioaleta Mangalagiu, Mangalagiu, I.I. BENZO[F]QUINOLINIUM SALTS: ANTIFUNGAL AND ANTIFUNGAL ACTIVITIES, *New frontiers in natural product chemistry*, June 4-5, 2021, Chişinău, Moldova. (Poster presentation, pag. 21). <http://dx.doi.org/10.19261/nfnpc.2021.ab14>
<https://ichem.md/en/scientific-seminar-new-frontiers-natural-product-chemistry-2021>
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 DOI: 10.19261/nfnpc.2021
7. Roxana Ciorteanu, Dumitrelea Diaconu, Vasilichia Antoci, Dorina Amăriucăi-Mantu, Cătălina Ciobanu, Violeta Mangalagiu, Mangalagiu, I.I. NEW HYBRID QUATERNARY SALTS WITH PYRIDINE/BENZIMIDAZOLE SKELETON, *New frontiers in natural product chemistry*, June 4-5, 2021, Chişinău, Moldova. (Poster presentation, pag. 23). <http://dx.doi.org/10.19261/nfnpc.2021.ab16>
<https://ichem.md/en/scientific-seminar-new-frontiers-natural-product-chemistry-2021>
 Book of Abstracts / editors: Aculina Arîcu, Veaceslav Kulciţki
 Editura: Institute of Chemistry
 ISBN 978-9975-3336-7-2 (PDF).
 DOI: 10.19261/nfnpc.2021
8. Roxana-Maria Amărandi, Maria-Cristina Al-Matarneh, Lacramioara Popovici, Mangalagiu, I.I., Vasilichia Bejan, Catalina-Ionica Ciobanu, Ramona Danac. PYRROLO-FUSED HETEROCYCLIC DERIVATIVES: DESIGN, SYNTHESIS AND ANTICANCER EVALUATION, *New frontiers in natural product chemistry*, June 4-5, 2021, Chişinău, Moldova. (Poster presentation, pag. 24). <http://dx.doi.org/10.19261/nfnpc.2021.ab17>
<https://ichem.md/en/scientific-seminar-new-frontiers-natural-product-chemistry-2021>
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 Editura: Institute of Chemistry
 ISBN 978-9975-3336-7-2 (PDF).
 DOI: 10.19261/nfnpc.2021
9. C.M. Al Matarneh, R.M. Amarandi, I. Mangalagiu, R. Danac, New Fused (Iso)quinoline Heterocycles as Potential Anticancer Agents, *Ahi Evran 2nd International Conference on Scientific Research*, Ahi Evran University, October 21-23, 2022 (oral online presentation).
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10. R. Ciorteanu, C.I. Ciobanu, I.I. Mangalagiu, R. Danac, Synthesis of New Indolizinic Derivatives as Potential Antitumor Agents, *7th International New York Conference on Evolving Trends in Interdisciplinary Research&Practices*, Manhattan, New York City, October 1-3, 2022 (oral online presentation)
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https://www.nyconference.org/files/ugd/614b1f_de2d82c118c944599affa919b58734e1.pdf
11. C.M. Al Matarneh, R.M. Amarandi, I. Mangalagiu, R. Danac, New Pyrrolo-Fused Heterocycles with Anticancer Properties, *SIVAS International Conference on Scientific and Innovation Research*, Sivas, Turkey, October 13-15, 2022. Proceedings Book, ISBN 978-625-8246-21-6, page 97
https://www.iksadkongre.com/files/ugd/614b1f_13da539fb218458981371bfc52ad6752.pdf
12. R. Ciorteanu, R. Danac, V. Antoci, C. Ciobanu, I.I. Mangalagiu, Synthesis of 6, 7 and 8-substituted indolizines as potential anticancer agents, *EGE International Congress on Natural & Medical Sciences*, Izmir, Turkey, September 02-04, 2022 (oral online presentation).
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13. Antoci, V.; Amăriucăi-Mantu, D.; Diaconu, D.; Dănac, R.; Mangalagiu, V.; Mangalagiu, I.I. Novel benzo[f]quinoline compounds with vinyl chain: synthesis, characterization and anticancer evaluation, *INTERNATIONAL SCIENTIFIC RESEARCH CONGRESS-XII*, August 13-14, 2022. Delhi, India (on-line, Oral presentation, nr. 656, pag. 656-657).
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14. Ciorteanu, R.; Danac, R.; Ciobanu, C.; Mangalagiu, I.I.; Amăriucăi-Mantu, D. Synthesis of new indolisinic derivatives as potential anticancer agents, INTERNATIONAL SCIENTIFIC RESEARCH CONGRESS-XII, August 13-14, 2022. Delhi, India (on-line, Oral presentation, nr. 665, pag. 665-666).
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15. Mangalagiu, I.I.; Mangalagiu, V.; Amariuca-Mantu, D.; Antoci, V.; Diaconu, D. New Azaheterocycles Derivatives: Design, Synthesis and Applications, MEDCHEMMEET2022- INTERNATIONAL MEET ON MEDICINAL CHEMISTRY, DRUG DISCOVERY & DRUG DELIVERY, June 23-25, 2022. COPENHAGEN, DENMARK. (Invited (plenary) lecture, I-3, pag. 2).
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16. Mangalagiu, V.; Diaconu, D.; Amariuca-Mantu, D.; Antoci, V.; Mangalagiu, I.I. Hybrid Five and Six Membered Ring Nitrogen Heterocycles with Antimicrobial and Anticancer Activity, MEDCHEMMEET2022-INTERNATIONAL MEET ON MEDICINAL CHEMISTRY, DRUG DISCOVERY & DRUG DELIVERY, June 23-25, 2022. COPENHAGEN, DENMARK. (Poster presentation, P4- pag. 3).
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17. Mangalagiu, V.; Amariuca-Mantu, D.; Antoci, V.; Diaconu, D.; Danac, R.; Moldoveanu, C.; Zbancioc, Ghe.; Mangalagiu, I.I. Ecologically friendly methods used in heterocyclic chemistry, 7th International Conference Ecological and Environmental Chemistry 2022, March 3-4, 2022, Chisinau, Republic of Moldova. (Plenary lecture, PL, pag. 11).
EEC-2022 Abstract Book
Ecological and environmental chemistry, Ediția 7, Vol.1, 2022, pag 52.
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18. Diaconu, D.; Mangalagiu, V.; Mangalagiu, I.I. New Materials Based on Quinoline Sulfonamide - Metals with Antimicrobial Activity. METAL 2022 - 31st International Conference on Metallurgy and Materials, May 18 - 19, 2022. Brno, Czech Republic, (Poster presentation, PE13- pag. 68).
<https://www.metalconference.eu/en/topics/>
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19. Vioaleta Mangalagiu, Dumitrelea Diaconu, Costel Moldoveanu, Gheorghita Zbancioc, Ramona Dănac, Dorina Amăriucăi-Mantu, Vasilichia Antoci, **Mangalagiu, I.I.*** Hybrid and chimeric nitrogen heterocycles with biological activity. In: *New frontiers in natural product chemistry* - Ed. 7, **12-13 octombrie 2023**, Chișinău, Republica Moldova. (Plenary conference).
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Publisher: Moldova State University, Institute of Chemistry, 3 Academiei str., MD-2028, Chișinău, Republic of Moldova
DOI: <https://doi.org/10.19261/nfnpc.2023>
20. Roxana Ciorteanu, Monica Sardaru, Dumitrelea Diaconu, **Mangalagiu, I.I.**; Ramona Danac. Synthesis and anticancer properties of new indolizinic derivatives. In: *New frontiers in natural product chemistry* - Ed. 7, **12-13 octombrie 2023**, Chișinău, Republica Moldova. (Poster, pag. 32).
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Publisher: Moldova State University, Institute of Chemistry, 3 Academiei str., MD-2028, Chișinău, Republic of Moldova
DOI: <https://doi.org/10.19261/nfnpc.2023>
21. Vioaleta Mangalagiu, Dumitrelea Diaconu, **Mangalagiu, I.I.**; QUINOLINE - SULFONAMIDE - COMPLEXES WITH ANTIMICROBIAL ACTIVITY. In: *New frontiers in natural product chemistry* - Ed. 7, **12-13 octombrie 2023**, Chișinău, Republica Moldova.
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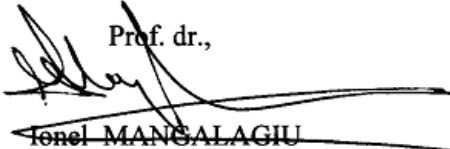
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