

NUM APPLICATION FOR VISITING SCHOLAR

1	PROJECT TITLE	Advance technology for obtaining nonlinear single crystals with a wide band of terahertz radiation
2	FULL NAME, ACADEMIC DEGREE, TITLE, POSITION, AFFILIATION AND CONTACT ADDRESS OF VISITING SCHOLAR Зочин судлаачийн нэр, эрдмийн зэрэг цол, харьяалал	Igor Pritula, Corresponding Member of NAS of Ukraine, Prof. (Dr. Sci. Hab.), Director of the Institute for Single Crystals of NASU, Head of Department of Nonlinear Single Crystals. 61072, Nauky ave. 60, Kharkov, UA Voice: +38 057 340 2230, +38 057 340 0452 Mob.+38 093 515 09 37, +38 050 302 5430 Fax: (38 057) 340-86-19 igormpritula@gmail.com , pritula@isc.kharkov.ua
3	FULL NAME, ACADEMIC DEGREE, TITLE, POSITION, AFFILIATION AND CONTACT ADDRESS OF HOST PROFESSOR AT THE NATIONAL UNIVERSITY OF MONGOLIA Зочин судлаачтай хамтран ажиллах МУИС-ийн профессор багшийн нэр, эрдмийн зэрэг цол, харьяалал	Лхамсүрэнгийн Энхтөр (Ph.D), профессор МУИС-ийн Шинжлэх ухааны сургуулийн Байгалийн ухааны салбарын физикийн тэнхим enkhtor@num.edu.mn Рагчаагийн Галбадрах (Ph.D), зөвлөх профессор МУИС-ийн Шинжлэх ухааны сургуулийн Байгалийн ухааны салбарын физикийн тэнхим galbadrakh@num.edu.mn
4	RESEARCH EXPERIENCE OF VISITING SCHOLAR AND HOST PROFESSOR (PLEASE ENCLOSE LAST 5 YEARS SCI,SSCI,A&HCI PUBLICATIONS AND GRANTED PATENT LIST) Зочин судлаач, түүнтэй хамтран ажиллах МУИС-ийн профессор багшийн судалгааны ажлын туршлага (Сүүлийн 5 жилд олон улсын импакт фактор бүхий сэтгүүлд хэвлүүлсэн, мэдүүлсэн болон эрхийн хамгаалалт хийгдсэн оюуны өмч зэрэг бүтээлийн жагсаалтыг хавсаргах)	Зочин судлаачийн сүүлийн 5 жилийн бүтээл: 1. N.O. Kovalenko, S.V. Naydenov, I.M. Pritula, S.N. Galkin, II-Sulfides and II-Selenides: Growth, Properties and Modern Applications, In book: Single Crystals of Electronic Materials: Growth and Properties (Editor Roberto Fornari), Elsevier Limited, United Kingdom, 2018, Chapter No. 10, P. 303-330 2. Pritula I., K. Sangwal, Fundamentals of Crystal Growth from Solutions, Chapter 29 in Print Book : Nishinaga T, Rudolph P, editors. Handbook of Crystal Growth, Vol. II. Elsevier; 2015. pp. 1185–227. ISBN: 9780444633033; 3. Pritula I., K. Sangwal, Crystal growth from low-temperature solutions, У кн. «Наука про матеріали: досягнення та перспективи» у 2-х т. Т.1/Редкол.: Л.М. Лобанов (голова) та ін.; НАН України. –Київ: Академперіодика, 2018. – 652 с., 12 с. іл. ISBN 978-966-360-369-8 ISBN 978-966-360-370-4(Т.1), Т.1, с. 613-638; 4. M.Shopa, Y.Shopa, E.Kostenyukova, I.Pritula, O.Bezkrovnaya, Optical activity and electro-optic effect of l-arginine doped KDP single crystals, Optics & Laser Technology Volume 119, November 2019, 105655, IF: 3.319. – https://doi.org/10.1016/j.optlastec.2019.105655 5. Y.V. Taranets, I.M.Pritula, O. N. Bezukrovnaya, P. V. Mateychenko, D. S.Sofronov A. N. Puzan. Effect of Charge State of L-Aspartic and L-Arginine Amino Acids on Morphology of Calcium Oxalate Monohydrate Crystals / Crystal Research and Technology. – 2018. – V.53. – N.4. – P. 1700133-1700139. – IF: 1.122. – https://doi.org/10.1002/crat.201700133 6. J. Borc, K. Sangwal, I.Pritula, E. Dolzhenkova. Investigation of pop-in events and indentation size effect on the (001) and (100) faces of KDP crystals by nanoindentation deformation. / Materials Science and Engineering: A. – 2017. – V.708, – P. 1-10. IF: 2.44. – https://doi.org/10.1016/j.msea.2017.09.069 7. E.F. Dolzhenkova, E.I. Kostenyukova, O.N. Bezukrovnaya, I.M. Pritula. Effect of doping of KDP crystal with amino acid l-arginine on the strength properties and character of laser damage / J Cryst Growth. – 2017. – V.478 – P. 111–116. – IF: 1.742. – https://doi.org/10.1016/j.jcrysgro.2017.08.010 8. A.S. Popov, A.V. Uklein, V.V. Multian, R. Le Dantec, E.I. Kostenyukova, O.N. Bezukrovnaya, I.M. Pritula, V.Ya. Gayvoronsky. Nonlinear optical response of nanocomposites

based on KDP single crystal with incorporated $\text{Al}_2\text{O}_3 \cdot n\text{H}_2\text{O}$ nanofibriles under CW and pulsed laser irradiation at 532 nm / Optics Communications. – 2016. – Vol. 15. – P. 45–53. – **IF: 1.588**, <https://doi.org/10.1016/j.optcom.2016.05.060>

9. V. Grachev, R. Tse, G. Malovichko, **I. Pritula**, O. Bezkravnaya, A. Kosinova, Paramagnetic defects in KH_2PO_4 crystals with high concentration of embedded TiO_2 nanoparticles, Journal of Applied Physics. – 2016. – V.119. – P.034301-6. – **IF: 1.87**, <https://doi.org/10.1063/1.4939731>
 10. **I.M. Pritula**, E.I. Kostenyukova, O.N. Bezkravnaya, M.I. Kolybaeva, D.S. Sofronov, E.F. Dolzhenkova, A.Kanaev, V. Tsurikov, KDP crystal doped with L-arginine amino acid: growth, structure perfection, optical and strength characteristics, Optical Materials. – 2016. – V.57. – P.217-224. – **IF: 2.238**, <https://doi.org/10.1016/j.optmat.2016.04.044>
- МУИС-ийн порофессоын сүүлийн 5 жилийн бүтээл:
1. Л. Энхтор, В. М. Силонов, П. П. Сафронов
Ближний порядок и энергии упорядочения в поликристаллических сплавах золото–медь, богатых золотом. Вестник МГУ. Серия 3. ФИЗИКА. АСТРОНОМИЯ. 2014. № 4.С. 61. /Moscow University Physics Bulletin.2014, No 14, pp.336-339. Alerton Press. Inc. 2014/
 2. Л. Энхтор, В. М. Силонов
Методика расчета упругих постоянных щелочных металлов методом псевдопотенциала.
ИЗВЕСТИЯ РАН. СЕРИЯ ФИЗИЧЕСКАЯ, 2014, том 78, № 11, с. 1431–1436. /Bulletin of the Russian Academy of Sciences^ Physics, 2014, vol. 78, No 11, pp. 1163-1168. Alerton Press. Inc., 2014/
 3. Л. Энхтор, В. М. Силонов, П.П. Сафронов
Упорядочение в твердых растворах $\text{Cu-25at\%Au}$ и $\text{Cu-75at\%Au}$ “Поверхность:Рентгеновские, синхротронные и нейтронные исследования ” 2015, №4, стр. 14 /Journal of Surface Investigation. X-Ray, Synchrotron and Neutron Techniques/.
 4. L.Enkhtor, R.Galbadrakh, V.M.Silonov
New general equations for calculation of elements of dynamical matrix and elastic constants of BCC and FCC metals.
International Journal of Advanced Research in Physical Science (IJARPS) vol.2, 2015, p.10-14.
 5. Л.Энхтор, В.М.Силонов
Ближний порядок в твердых растворах системы железо-рений.
“Поверхность:Рентгеновские, синхротронные и нейтронные исследования ” 2015, №10, стр. 16-22. /Journal of Surface Investigation. X-Ray, Synchrotron and Neutron Techniques, 2015, Vol.9, No.5, pp. 1005-1011/
 6. Л.Энхтор, В.М.Силонов, Р.Галбадрах
Расчет радиальных и тангенциальных силовых постоянных потенциала межатомного взаимодействия цезия из экспериментального фононного спектра.
“Поверхность:Рентгеновские, синхротронные и нейтронные исследования ” 2015 г. №10, , 59-62/Journal of Surface Investigation. X-Ray, Synchrotron and Neutron Techniques, 2015, №10.pp. 1315-1318 ./
 7. Л.Энхтор, В.М.Силонов
Силовые и упругие постоянные металлов и сплавов.
РЭНСИТ. Физика конденс. сост. 2015, №1, т.10, стр. 54- 72. DOI 10.17725.
 8. Enkhtor L. , Silonov V.M.
“ The calculation of radial and tangential force constants of nickel using experimental phonon spectra”. Moscow University Physics Bulletin.71. no.1 (2016) 123-127. Doi: 10.3103/S000271349160110069.

		9. Galbadrakh Ragchaa et. al. Carbon Nanotube Fabrication Based on Animal Red Blood Cells. Solid State Phenomena 2018. ISSN: 1662-9779, Vol. 271, pp 64-69 doi:10.4028/www.scientific.net/SSP.271.64 10. Enkhtor L., Galbadrakh R., Silonov V.M. Short-range order and static displacements in polycrystalline Ni-13.1at. %W alloy. Solid State Phenomena. 2018. Vol. 271.P. 98-105. DOI: 10.4028/www.scientific.net/SSP271.98 11. Galbadrakh Ragchaa, Temujin Enkhbat, Enkhtor Lkhamsuren. Arsenic and Heavy Metals Contamination of Soils Around Oyu Tolgoi and Tavan Tolgoi Mines, located in The South Gobi Desert In Mongolia. International Journal of Engineering and Technology. 2018. 7(2.23) p.260-262. 12. Л.Энхтор, Р.Галбадрах, В.М. Силонов, Б.Б.Дамдинов. К расчету силовых и упругих постоянных металлов с гексагональной плотноупакованной структурой. Вестник Бурятского Государственного Университета. Химия. Физика. 2018. Вып.1, стр. 10-26. 13. Энхтор Л., Силонов В.М., Белов Ю.К. Ближний порядок в сплаве Ni-14 ат.%Ir. РЭНСИТ. Физика конденс. сост. 2018, т.10(1), стр. 53-58. DOI:10.17725/rensit.2018.10.53 14. Enkhtor L., Silonov V.M. Estimation of the critical temperatures of order-disorder phase transitions in Cu-Au alloys using short-range order parameters. Solid State Phenomena. 2018. V.28.P.65-70. DOI:10.4028/www.scientific.net/SSP.288.65 15. Л.Энхтор, В.М.Силонов. Ближний порядок и его энергетические характеристики в сплаве Ni-14 ат. % Pt. ВЕСТНИК МОСКОВСКОГО УНИВЕРСИТЕТА. Серия 3. Физика. Астрономия. 2019. №2.стр. 73-76 16. Kh.Odbadrakh, L.Enkhtor et. al. Electronic and atomic level complexity in Al_{0.5}TiZrPdCuNi high-entropy alloy in glass phase. Journal of Applied Physics. 2019. V.126. Doi: 10.1063/1.5110519.
5	FINANCIAL SUMMARY AND DETAILED PLAN OF EXPENDITURE Судалгааны ажлын төсөв, түүний задаргаа	Total 45 000 thousand. : • Ferry researcher's airfare and travel expenses - 18 000 thousand. • Guest scholarships are 9 000 thousand. • Purchase a computing computer 5 000 thousand. • Sample preparation, purchase and measurement of samples 10 000 thousand. • 3000 thousand for organizing workshops and participation in conference
6	RESEARCH PERIOD AT THE NATIONAL UNIVERSITY OF MONGOLIA /PLEASE ENCLOSE VERIFICATION DOCUMENTS/ МУИС-д ирж ажиллах хугацаа (<i>нотлох баримтыг хавсаргах</i>)	From March 1, 2020 to December 31, 2020.
7	RESEARCH PROJECT BACKGROUND, OBJECTIVES, AND INTELLECTUAL MERIT МУИС-д ажиллах үндэслэл, шаардлага, судалгааны ажлын ач холбогдол	Close cooperation with leading Ukrainian schools and laboratories. The volume of scientific research at the physics department of the National University of Mongolia is necessary to increase the number of studies and improve the quality of the environment.
8	EXPECTED RESULTS (SCIENTIFIC ARTICLES FOR SCI, SSCI, A&HCI JOURNALS, PATENTS) Хүлээгдэж буй үр дүн (импакт фактор бүхий сэтгүүлд хэвлүүлэх өгүүлэл, мэдүүлэх патент)	Publication of more than 2 articles in international journals registered in Web of Science
9	CALENDAR PLAN OF RESEARCH ACTIVITY AT THE NATIONAL UNIVERSITY OF MONGOLIA МУИС-д ирж ажиллах ажлын календарчилсан төлөвлөгөө (<i>судалгааны ажил, хэлэлцүүлэх болон удирдан явуулах семинар гэх мэт</i>)	The results of the project will be presented at two seminars at the National University of Mongolia, where the results of the obtaining of modern nonlinear optical materials for the mid- and farinfrared spectral region will be demonstrated. The importance of such materials for modern photonics will be demonstrated. In the framework of the seminars, young scientists will be shown modern methods of obtaining the advance materials for the terahertz range.

10	VERIFICATION OF EXPECTED FURTHER COLLABORATION WITH HOST PROFESSOR AT THE NATIONAL UNIVERSITY OF MONGOLIA Судалгааны хамтын ажиллагаа цаашид тогтвортой үргэлжлэх нотолгоо	Within the framework of the project, a scientific collaboration between the Department of Nonlinear Crystals of the Institute for Single Crystals of National Academy of Sciences of Ukraine in the person of Professor Prytula Igor and Professor of the National University of Mongolia Lhamserengin Enkhtur (Ph.D) is supposed. The project is supposed to propose new approaches for creating modern materials in the field of nonlinear optics, in particular, new materials based on derivatives of stilbazole salts. An analysis will be made of the nonlinear optical properties of the materials obtained, in particular, the efficiency of generation of second-harmonic laser radiation and the effects of self-interaction. Successful implementation of the project will allow establishing long-term scientific and technical cooperation between the Institute of Single Crystals of the National Academy of Sciences of Ukraine and the National University of Mongolia in the field of creating promising new materials for photonics.
NONECONOMIC, ECONOMIC BENEFITS AND BROAD IMPACT OF EXPECTED RESEARCH OUTPUT		
11	ECONOMIC BENEFIT OF RESEARCH OUTPUTS Төслийн үр дүнгийн эдийн засгийн үр ашиг	The fundamental research project does not have direct economic benefits
12	NONECONOMIC BENEFIT OF RESEARCH OUTPUTS Төслийн үр дүнгийн эдийн засгийн бус үр ашиг	<i>Scientific advantages of this project:</i> The main goal of the planned scientific research is to develop the physicochemical foundations of the synthesis, crystallization and growth of promising nonlinear optical single crystals of organic compounds of DAST derivatives. Prototypes of these crystals are practically absent among modern scientific developments. However, precisely such crystals as nonlinear optical emitters of the broadband THz and IR spectra may turn out to be the most promising for modern photonics. It is assumed that the organic crystals that will be obtained by the project will subsequently occupy a corresponding niche as highly efficient nonlinear optical materials for conversion (frequency doubling, parametric optical oscillator, etc.) and the generation of infrared (IR) laser radiation. The creation of modern technologies for producing high-quality nonlinear optical crystals is highly relevant. The tasks planned within the framework of the project have undoubted novelty and relevance. They are closely related to the problems of creating effective sources of radiation in the IR and THz ranges, and is a consequence of the successes achieved by the researchers, including the scientific group that offers the project in this area.
13	BROAD IMPACT OF RESEARCH OUTPUTS Судалгааны үр дүнгийн нөлөө	To expand the training area for the teachers of the Department of Physics of the National University of Mongolia, gain experience and approaches to obtaining materials for the modern optoelectronics and photonics, increase the number and quality of the scientific papers, improve quality and collaboration with leading materials science centers in Ukraine.
14	RISK FACTORS DURING PROJECT IMPLEMENTATION Төслийн хэрэгжилтэд саад болж болзошгүй эрсдэл, хүчин зүйл	There are no factors that could impede the implementation of the project other than force majeure, such as health, international relations, budget and financial conditions.

SIGNATURE OF VISITING SCHOLAR
Зочин судлаачийн гарын үсэг:

SIGNATURE OF HOST PROFESSOR
Монгол талын профессорын гарын үсэг: