

1. Halaman Sampul
2. Panitia Pelaksana
3. Panitia Pengarah
4. Daftar Isi
5. Bukti Kinerja
6. Halaman scimago
7. Halaman Scopus

1. HALAMAN SAMPUL

Matter and Radiation
at Extremes

MRE Young Scientist Award

Recognizing young scholars in their important,
original and innovative achievements

Apply Now




AIP Publishing Conference Proceedings

HOME

BROWSE

MORE ▾



Organizing a conference?

Enjoy fast, cost-effective publication of your meeting's key research.

AIP Conference Proceedings

REQUEST A QUOTE

LIKE AND FOLLOW US



AIP Conference Proceedings has been a trusted publishing partner for more than 40 years, delivering fast, affordable, and versatile publishing for maximum exposure of your meeting's key research. Our conference proceedings program reports the findings presented at scientific meetings from large international conferences to small specialist workshops. Subject areas span the physical sciences, including physics, math, chemistry, materials science, and engineering.

Why publish with us:

- Indexed in leading databases – Web of Science, Scopus, Inspec, Chemical Abstracts Service (CAS), and Astrophysics Data System (ADS)
- Author-friendly license agreement – you retain copyright of your own work
- Global reach – nearly 4,000 institutions in 190+ countries
- Customized publishing options including print-on-demand – best value and flexibility



SIGN UP FOR ALERTS

is the **right choice for your next event.**

[Request a QUOTE today.](#)

Most Recent

MAR 09 2023

Preface: The 4th International Conference on Vocational Education of Mechanical and Automotive Technology (ICoVEMAT) 2021

MAR 09 2023

Preface: Proceedings of the International Conference on Information Technology and Digital Applications 2021 (ICITDA 2021)

MAR 09 2023

Preface: VII International Conference “Safety Problems of Construction Critical Infrastructures” - SPCECI2021

MAR 09 2023

Preface: IV International Scientific Conference on Advanced Technologies in Aerospace, Mechanical and Automation Engineering (MIST: Aerospace-IV 2021)

MAR 09 2023

Committees: Proceedings of the International Conference on Information Technology and Digital Applications 2021 (ICITDA 2021)

[SIGN UP FOR ALERTS](#)

MAR 09 2023

Rate analysis of drawing solid model-based on orthogonal and isometric projection

MAR 09 2023

The development of online instructional design for computational thinking to improve student problem-solving skill

MAR 09 2023

Small and medium enterprises product analysis relevant in CAD

A blue gradient banner with a white pencil icon on the left. The text reads: "Author Services English Language Editing High-quality assistance from subject specialists" and "Learn More!" on the right.

Author Services
English Language Editing
High-quality assistance from subject specialists [Learn More!](#)

A dark blue banner with an illustration of people in a meeting. The text reads: "AIP Publishing Forthcoming Titles For more information regarding our schedule of forthcoming proceedings" and a "SEE MORE" button.

AIP Publishing
Forthcoming Titles
For more information regarding our schedule of forthcoming proceedings [SEE MORE](#)

SIGN UP FOR ALERTS

Most Cited

FEB 02 2018

A solid waste management survey in Davao del Sur (school and household waste management survey)

50353 VIEWS

OCT 03 2017

A review of the motivation theories in learning

46 CITATIONS . 94533 VIEWS

MAY 15 2018

Tensile strength/yield strength (TS/YS) ratios of high-strength steel (HSS) reinforcing bars

7 CITATIONS . 112635 VIEWS

Active Topics

Students

Learning and learning models

Industry

Machine learning

Thin films

SIGN UP FOR ALERTS

[Browse All Topics](#)

Sign up for Journal Alerts!

Keep up to date with the latest research!

[SIGN UP NOW](#)

About AIP Publishing

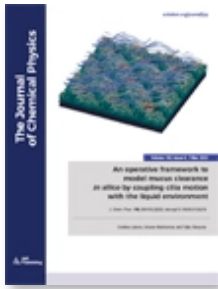
AIP Publishing is a wholly owned not-for-profit subsidiary of the American Institute of Physics (AIP). Our portfolio comprises highly regarded, peer-reviewed journals, including a growing portfolio of Open Access titles, that cover all areas of the physical sciences.

The research published in these titles paves the way for new fields of study, gives rise to new techniques, and provides inspiration to contemporary researchers.



Applied Physics Letters

[SIGN UP FOR ALERTS](#)



The Journal of Chemical Physics



Physics Today



Review of Scientific Instruments



Physics of Fluids

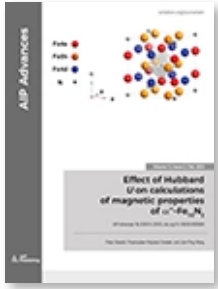


Physics of Plasmas

SIGN UP FOR ALERTS



Journal of Applied Physics



AIP Advances

VISIT PUBLISHER'S WEBSITE

VISIT ALL PUBLICATIONS

Latest Physics Jobs

[SIGN UP FOR ALERTS](#)

Postdoctoral Associate | Florida International University

Fri, 10 Mar 2023 16:48:45 -0500

Miami, Florida, Florida International University is classified by Carnegie as a “R1: Doctoral Universities - Highest Research Activity” and recognized as a Carnegie Community Engaged university. It is a public research university with colleges and schools that offers bachelor’s, master’s and doctoral programs in fields such as business, engineering, computer science, international relations, architecture, law and medicine. As one of South Florida’s anchor institutions, FIU contributes almost \$9 billion each year to the local economy and is ranked second in Florida in Forbes Magazine’s “America’s Best Employers” list. FIU graduates are consistently among the highest paid college graduates in Florida ...

Postdoctoral Position in Ultrafast Optics at The Ohio State University | The Ohio State University

Wed, 08 Mar 2023 11:15:30 -0500

Columbus, Ohio, The National eXtreme Ultrafast Science (NeXUS) Facility is a cutting-edge, ultrafast soft x-ray and extreme ultraviolet user facility under development in Columbus, Ohio, USA. The NeXUS Facility will enable researchers to perform time-resolved studies of chemical, electronic, and material dynamics at femtosecond to attosecond time scales and at angstrom length scales. NeXUS is looking for a postdoctoral researcher for the commissioning phase of the facility. The responsibilities will include contributions to commissioning of high-harmonic generation and XUV beamlines, including reporting the results in scientific conferences and peer-reviewed journals. The successful candidate will be encouraged to contribute to the ...

[SIGN UP FOR ALERTS](#)

Director (f/m/x) at the Jülich Centre for Neutron Science and Peter Grünberg Institute | Forschungszentrum Jülich GmbH

Fri, 10 Mar 2023 09:08:50 -0500

Jülich, Germany, The Jülich Aachen Research Alliance (JARA) is an innovative cooperation model between RWTH Aachen University and Forschungszentrum Jülich. RWTH Aachen University is one of Germany's pre-eminent Universities of Excellence, which entails the highest quality in teaching and world-class research. RWTH addresses bold scientific questions; it also assumes a profound responsibility toward society and transfers its knowledge into meaningful applications. In a dynamic, creative, and international environment, RWTH develops solutions to tackle both current and future challenges. Forschungszentrum Jülich is a member of the Helmholtz Association and conducts research in the fields of information, energy, and bioeconomy on a ...

Research Scientist in Nanophotonics, Microcavities, Single-Molecule Spectroscopy, Quantum Optics | University of Wisconsin Madison

Fri, 10 Mar 2023 19:11:40 -0500

Madison, Wisconsin, The Goldsmith group at the University of Wisconsin Madison has an opening for a research scientist. The group is highly interdisciplinary, blending photonics, spectroscopy, microscopy, plasmonics, photochemistry, nanofabrication, microfluidics, biophysics, and chemical catalysis. Optics and Spectroscopy are core skills. Ongoing projects involve single-molecule spectroscopy and microscopy, nanophotonics (including use of whispering gallery mode and Fabry-Perot microcavities), low-temperature molecular quantum optics, topological photonics, and biophysics investigations. Principle responsibilities will focus on designing and building optical setups driving many ongoing projects, mentoring students, and maintaining complex optical experiments. We are looking for creative people who enjoy tinkering in the ...

Resources

AUTHOR

LIBRARIAN

ADVERTISER

SIGN UP FOR ALERTS

General Information

[ABOUT](#)

[CONTACT](#)

[HELP](#)

[PRIVACY POLICY](#)

[TERMS OF USE](#)

FOLLOW AIP PUBLISHING:



Website © 2023 AIP Publishing LLC.

Article copyright remains as specified within the article.

Scitation

[SIGN UP FOR ALERTS](#)

2. PANITIA PELAKSANA

Details: The 4th Biomedical Engineering's Recent Progress in Biomaterials, Drugs Development, Health, and Medical Devices

Cite as: AIP Conference Proceedings **2193**, 010002 (2019); <https://doi.org/10.1063/1.5139320>
Published Online: 10 December 2019



View Online



Export Citation

ARTICLES YOU MAY BE INTERESTED IN

[Preface: The 4th Biomedical Engineering's Recent Progress in Biomaterials, Drugs Development, Health, and Medical Devices](#)

AIP Conference Proceedings **2193**, 010001 (2019); <https://doi.org/10.1063/1.5139319>

[The 5th Biomedical Engineering's Recent Progress in Biomaterials, Drugs Development, and Medical Devices](#)

AIP Conference Proceedings **2344**, 010002 (2021); <https://doi.org/10.1063/12.0003859>

[Mechanical aspect analysis of dental stone grade IV material for total hip replacement component](#)

AIP Conference Proceedings **2193**, 020001 (2019); <https://doi.org/10.1063/1.5139321>

Time to get excited.
Lock-in Amplifiers – from DC to 8.5 GHz

Find out more

The Zurich Instruments logo, consisting of a blue 'X' shape followed by the text "Zurich Instruments".

CONFERENCE DETAILS

Organizer : **Research Center for Biomedical Engineering**
Universitas Indonesia
Depok, West Java, 16424, Indonesia
Email: isbe@eng.ui.ac.id
Website: isbe.eng.ui.ac.id

ORGANIZING COMMITTEE

General Chair : Dr. Ir. Tomy Abuzairi, ST, M.Sc., MT, Ph. D (Faculty of Engineering Universitas Indonesia)

Co-chair : Dr. Kenny Lischer, S.T., M.T. (Faculty of Engineering Universitas Indonesia)

Advisory Boards

- Prof. Dr. rer. nat Rosari Saleh (Vice Rector of Research and Innovation, Universitas Indonesia)
- Dr. Ir. Hendri Dwi Saptioratri Budiono, M. Eng (Dean, Faculty of Engineering Universitas Indonesia)
- Prof. Dr. dr. Ari Fahrial Syam, Sp.PD-KGEH, MMB (Dean, Faculty of Medicine Universitas Indonesia)
- Prof. Dr. drg. Lindawati S. Kusdhany, Sp.Pros (K) (Dean, Faculty of Dentistry Universitas Indonesia)
- Dr.Eng Muhamad Sahlan, S.Si., M.Eng (Associate Dean for Research & Community Services, Faculty of Engineering Universitas Indonesia)

Steering Committee

- Prof. Dr.–Ing. Ir. Misri Gozan, M.Tech.IPM (Director of RCBE, Faculty of Engineering Universitas Indonesia)
- Dr. Yudan Whulanza, S.T., M. Sc (Faculty of Engineering Universitas Indonesia)
- Dr. Basari, S.T., M. Eng (Faculty of Engineering Universitas Indonesia)

Scientific Committee

- Dr. Ir. Retno Wigajatri Purnamaningsih, M.T. (Faculty of Engineering Universitas Indonesia)
- Sugeng Supriadi, S.T., M.S.Eng., Ph. D (Faculty of Engineering Universitas Indonesia)
- Dr. dr. Siti Farida, M.Kes., Ph.D (Faculty of Medicine Universitas Indonesia)
- dr. Rr. Prasetyanugraheni Kreshanti, SpBP-RE(KKF) (Faculty of Medicine Universitas Indonesia)
- Ghiska Ramahdita, S.T., M.T. (Faculty of Engineering Universitas Indonesia)

Secretary : Nurul Intan (Faculty of Engineering Universitas Indonesia)

Event : Siti Fauziah Rahman, S.T., M.Eng., Ph. D (Faculty of Engineering Universitas Indonesia)

Student Committee:

- Abel Benaya (Faculty of Engineering Universitas Indonesia)
- Achmad Fauzi Trinanda (Faculty of Engineering Universitas Indonesia)
- Alif Muhammad Basyir (Faculty of Engineering Universitas Indonesia)
- Alyssa Adyandra (Faculty of Engineering Universitas Indonesia)
- Faris Bari Issains (Faculty of Engineering Universitas Indonesia)

- Gifrandy Gustiraharjo (Faculty of Engineering Universitas Indonesia)
- Muhamad Aldy M Turang (Faculty of Engineering Universitas Indonesia)
- Muhammad Adli Pratama (Faculty of Engineering Universitas Indonesia)

REVIEWER

Coordinator: Dr. Kenny Lischer, S.T., M.T. (Faculty of Engineering Universitas Indonesia)

Secretary: Nurul Intan (Faculty of Engineering Universitas Indonesia)

Members:

- dr. Abdi Reza, Sp.B.S (Faculty of Medicine Universitas Indonesia)
- Agung Shamsuddin Saragih, S.T., MS.Eng., Ph. D (Faculty of Engineering Universitas Indonesia)
- Dr. Ahmad Zakiyuddin, S.T., M.Eng. (Faculty of Engineering Universitas Indonesia)
- Ajib Setyo Arifin, S.T., M.T., Ph. D (Faculty of Engineering Universitas Indonesia)
- Cindy Dianita, S.T., M.Sc. (Faculty of Engineering Universitas Indonesia)
- Dr. drg. Decky Joesiana Indrani, MDSc (Faculty of Dentistry Universitas Indonesia)
- Dr. Dianursanti, S.T., M.T. (Faculty of Engineering Universitas Indonesia)
- Ghiska Ramahdita, S.T., M.T. (Faculty of Engineering Universitas Indonesia)
- Dr.Eng Mia Rizkinia, S.T., M.T. (Faculty of Engineering Universitas Indonesia)
- Prof. Dr.–Ing. Ir. Misri Gozan, M.Tech., IPM (Faculty of Engineering Universitas Indonesia)
- Dr. Eng. Muhamad Sahlan, S.Si., M. Eng (Faculty of Engineering Universitas Indonesia)
- Ir. Muhammad Hanif Nadhif, S.T., M. Sc (Faculty of Medicine Universitas Indonesia)
- dr. Nandita Melati Putri, SpBP-RE(K) (Faculty of Medicine Universitas Indonesia)
- dr. Rr. Prasetyanugraheni Kreshanti, SpBP-RE(KKF) (Faculty of Medicine Universitas Indonesia)
- Dr. Radon Dhelika, B.Eng, M.Eng. (Faculty of Engineering Universitas Indonesia)
- dr. Rahmat Cahyanur, Sp.PD (Faculty of Medicine Universitas Indonesia)
- Dr. Ir. Retno Wigajatri Purnamaningsih, M.T. (Faculty of Engineering Universitas Indonesia)
- Reza Miftahul Ulum S.T, M.T., Ph. D (Faculty of Engineering Universitas Indonesia)
- Ir. Rita Arbianti, M.Si. (Faculty of Engineering Universitas Indonesia)
- Dr. dr. Robiatul Adawiyah, M.Biomed. (Faculty of Medicine Universitas Indonesia)
- Dr. dr. Siti Farida, M.Kes., Ph.D (Faculty of Medicine Universitas Indonesia)
- Siti Fauziyah Rahman, S.T., M.Eng., Ph. D (Faculty of Engineering Universitas Indonesia)
- Dr. Ir. Sotya Astutiningsih, M. Eng (Faculty of Engineering Universitas Indonesia)
- Dr. Tania Surya Utami, S.T., M.T. (Faculty of Engineering Universitas Indonesia)
- Dr. Ir. Tomy Abuzairi, S.T., M.Sc., M.T., Ph.D. (Faculty of Engineering Universitas Indonesia)
- Dr. Yudan Whulanza, S.T., M.Sc. (Faculty of Engineering Universitas Indonesia)

EDITORIAL TEAM

Advisory Boards:

- Dr. Ir. Hendri Dwi Saptioratri Budiono, M. Eng (Dean, Faculty of Engineering Universitas Indonesia)
- Dr. Ir. Muhamad. Asvial, M. Eng (Vice Dean for Academic, Research and Student Affairs, Faculty of Engineering Universitas Indonesia)
- Dr.Eng Muhamad Sahlan, S.Si., M.Eng (Associate Dean for Research & Community Services, Faculty of Engineering Universitas Indonesia)

Editor in Chief: Dr. Kenny Lischer, S.T., M.T. (Faculty of Engineering Universitas Indonesia)

Technical Program Committee:

- Prof. Dr. –Ing. Ir. Misri Gozan, M.Tech.IPM, (Faculty of Engineering Universitas Indonesia)
- Tomy Abuzairi, S.T., M.Sc. (Faculty of Engineering Universitas Indonesia)
- Dr. Ir. Retno Wigajatri Purnamaningsih, M.T. (Faculty of Engineering Universitas Indonesia)
- Dr. dr. Siti Farida, M.Kes., Ph.D (Faculty of Medicine Universitas Indonesia)
- Muhammad Yusuf Arya Ramadhan, S.T. (Faculty of Engineering Universitas Indonesia)

English Editors:


- Siti Fauziyah Rahman (Faculty of Engineering Universitas Indonesia)
- Nur Imaniati Sumantri, S.Si., M.Biotek. (Faculty of Engineering Universitas Indonesia)
- Rizal, S.Si., M. Biotech., M.Sc. (Faculty of Engineering Universitas Indonesia)
- Ahmad Zakiyudin (Faculty of Engineering Universitas Indonesia)
- Dr.-Ing. Alfian Ferdiansyah, S.T., M.T. (Faculty of Engineering Universitas Indonesia)
- Apriliana Cahya, S.Tp., M.Eng., Ph. D (Faculty of Engineering Universitas Indonesia)
- Rizqa Andika, S.T., Ph. D (Faculty of Engineering Universitas Indonesia)

Layout Editors:

- Abel Benaya (Faculty of Engineering Universitas Indonesia)
- Achmad Fauzi Trinanda (Faculty of Engineering Universitas Indonesia)
- Alif Muhammad Basyir (Faculty of Engineering Universitas Indonesia)
- Alyssa Adyandra (Faculty of Engineering Universitas Indonesia)
- Faris Bari Issains (Faculty of Engineering Universitas Indonesia)
- Gifrandy Gustiraharjo (Faculty of Engineering Universitas Indonesia)
- Muhammad Adli Pratama (Faculty of Engineering Universitas Indonesia)
- Nurul Intan (Faculty of Engineering Universitas Indonesia)

4. DAFTAR ISI

Matter and Radiation at Extremes **MRE Young Scientist Award** Apply Now
Recognizing young scholars in their important, original and innovative achievements




Conference Proceedings

HOME

BROWSE

MORE ▾

Table of Contents

THE 4TH BIOMEDICAL ENGINEERING'S RECENT PROGRESS IN BIOMATERIALS, DRUGS DEVELOPMENT, HEALTH, AND MEDICAL DEVICES: Proceedings of the International Symposium of Biomedical Engineering (ISBE) 2019

< PREV NEXT >



Conference date: 22-24 July 2019

Location: Padang, Indonesia

ISBN: 978-0-7354-1944-5

Editors: Kenny Lischer, Tomy Abuzairi, Siti Fauziyah Rahman and Misri Gozan

Volume number: 2193

Published: Dec 10, 2019

DISPLAY : 20 50 100 all



BROWSE VOLUMES



 Free . December 2019

Preface: The 4th Biomedical Engineering's Recent Progress in Biomaterials, Drugs Development, Health, and Medical Devices

AIP Conference Proceedings **2193**, 010001 (2019); <https://doi.org/10.1063/1.5139319>



 Free . December 2019

Details: The 4th Biomedical Engineering's Recent Progress in Biomaterials, Drugs Development, Health, and Medical Devices

AIP Conference Proceedings **2193**, 010002 (2019); <https://doi.org/10.1063/1.5139320>



BIOMATERIALS

 Free . December 2019

Mechanical aspect analysis of dental stone grade IV material for total hip replacement component

Tresna P. Soemardi, Agri Suwandi, Cholid Badri, Anwar S. Ibrahim and Agus Hadian Rahim

AIP Conference Proceedings **2193**, 020001 (2019); <https://doi.org/10.1063/1.5139321>

[BROWSE VOLUMES](#)

AIP Conference Proceedings **2193**, 030018 (2019); <https://doi.org/10.1063/1.5139355>

SHOW ABSTRACT



 Free . December 2019

Apoptotic activity of alpha-mangostin in acetaldehyde-induced LX2 hepatic stellate cell lines

Novriantika Lestari, Daniel Amartya, Vivian Soetikno and Melva Louisa

AIP Conference Proceedings **2193**, 030019 (2019); <https://doi.org/10.1063/1.5139356>

SHOW ABSTRACT



 Free . December 2019

Oxidation of extracted cholesterol from fatty food by using crude cholesterol oxidase *Streptomyces sp.*

Meka Saima Perdani, Muhammad Faturrohman, Dwini Normayulisa Putri and Heri Hermansyah

AIP Conference Proceedings **2193**, 030020 (2019); <https://doi.org/10.1063/1.5139357>

SHOW ABSTRACT



BROWSE VOLUMES

Determination of LC_{50} value of *Nicotiana tabacum* L. extract against *Tenebrio molitor* and *Zophobas morio* larvae

Yogi Sentosa, Hannah Natasha Andjani, Kori Yati, Mahdi Jufri, Haryuni and Misri Gozan

AIP Conference Proceedings 2193, 030021 (2019); <https://doi.org/10.1063/1.5139358>



SHOW ABSTRACT



 Free . December 2019

The influence of heating process on anticancer activity of *Pterois volitans* (red lionfish) venom extraction against human cervical carcinoma cell

Andy Noorsaman Sommeng, Mustika Sari, Mikael Januardi Ginting, Muhamad Sahlan, Heri Hermansyah and Anondho Wijanarko

AIP Conference Proceedings 2193, 030022 (2019); <https://doi.org/10.1063/1.5139359>

SHOW ABSTRACT



 Free . December 2019

Utilization of *Nicotiana tabacum*'s extract for mosquito extermination with fogging method

Glory Lamria, Misri Gozan, Ahmad Fauzantoro and Kartini Apriliyana Virgine

AIP Conference Proceedings 2193, 030023 (2019); <https://doi.org/10.1063/1.5139360>

BROWSE VOLUMES

5. BUKTI KINERJA

Determination of LC₅₀ value of *Nicotiana tabacum* L. extract against *Tenebrio molitor* and *Zophobas morio* larvae

Cite as: AIP Conference Proceedings **2193**, 030021 (2019); <https://doi.org/10.1063/1.5139358>

Published Online: 10 December 2019

Yogi Sentosa, Hannah Natasha Andjani, Kori Yati, et al.



View Online



Export Citation

ARTICLES YOU MAY BE INTERESTED IN

[Determination of LC₅₀ value of *Nicotiana tabacum* L. extract against *Gryllus bimaculatus* imago and *Galleria mellonella* larvae](#)

AIP Conference Proceedings **2193**, 030024 (2019); <https://doi.org/10.1063/1.5139361>

[The effect of tobacco extracts based biolarvicide emulsion formulation against *Aedes aegypti* larvae](#)

AIP Conference Proceedings **2092**, 030009 (2019); <https://doi.org/10.1063/1.5096713>

[Utilization of *Nicotiana tabacum*'s extract for mosquito extermination with fogging method](#)

AIP Conference Proceedings **2193**, 030023 (2019); <https://doi.org/10.1063/1.5139360>



Time to get excited.
Lock-in Amplifiers – from DC to 8.5 GHz

Find out more

Zurich Instruments

Determination of LC₅₀ Value of *Nicotiana tabacum* L. Extract Against *Tenebrio molitor* and *Zophobas morio* Larvae

Yogi Sentosa¹, Hannah Natasha Andjani¹, Kori Yati^{2,3}, Mahdi Jufri⁴, Haryuni⁵, and Misri Gozan^{1, 6, a)}

¹Department of Chemical Engineering, Faculty of Engineering, Universitas Indonesia, Kampus UI Depok, West Java, 16424 Indonesia

²Faculty of Pharmacy and Science, Universitas Muhammadiyah Prof. DR. HAMKA, Jakarta, 13460 Indonesia

³Faculty of Pharmacy, Universitas Indonesia, Kampus UI Depok, West Java, 16424 Indonesia

⁴Development and Pharmaceutical Technology Laboratory, Faculty of Pharmacy, Universitas Indonesia, Kampus UI Depok, West Java, 16424 Indonesia

⁵Faculty of Agriculture, Tunas Pembangunan University, Balekambang Lor No.1, Manahan Surakarta 57139, Central Java, Indonesia

⁶Research Center for Biomedical Engineering, Universitas Indonesia, Kampus UI Depok, West Java, Indonesia

^{a)}Corresponding author: mgozan@che.ui.ac.id

Abstract. Tobacco has lots of active compounds that can be used as raw material for making natural insecticides. *Tenebrio molitor* and *Zophobas morio* are examples of agricultural pests. The purpose of this study was to determine LC₅₀ values of tobacco extract on *Tenebrio molitor* and *Zophobas morio*. Previous research showed that tobacco extract had neurotoxin activity and nicotine was the highest content contained in the tobacco leaves. Tobacco extract was obtained by the Extended Heat Reflux Extraction method with ethanol solvent. LC₅₀ values of tobacco extract for *Tenebrio molitor* and *Zophobas morio* were 21.1 mg/ml and 71.1 mg/ml, respectively.

Keywords: Tobacco, Extended Heat Reflux Extraction, LC₅₀, *Tenebrio molitor*, *Zophobas morio*

INTRODUCTION

Majority of the population in agricultural countries work as farmers who rely heavily on agricultural products as their primary income. In agricultural sector, pest invasion is one of the frequently encountered issues. Therefore, pest control is necessary to increase the productivity of the sector. *Tenebrio molitor* and *Zophobas morio* are two examples of the agricultural pests that consume crops, especially in the storage. To kill these, natural pesticides must be applied because they leave lesser residues than chemical pesticides. Based on the previous research, tobacco can be utilized as natural pesticides due to its nicotine content [1].

Tobacco is a tropical plant that contains activated compounds which are suitable for making pesticides. Tobacco leaves consist of phenolic compounds, terpenoids, flavonoids, steroids, alkaloids, saponins, and tannins [2]. These compounds exhibit antibacterial activity [3] and insecticidal activity. As an insecticide, tobacco extract can be used as mosquito repellent [4] and larvacide against *Aedes aegypti* larvae [5]. Alkaloids are the compounds that act as toxin in tobacco. The main toxin of the tobacco is nicotine which has been used since at least the 15th century [6]. As a neurotoxin, nicotine is capable of creating imbalance on the central nervous system, the peripheral arrangement of ganglia and the peripheral autonomic nervous system ganglia [7]. These compounds can be obtained from tobacco

leaves by using extraction method. In this research, the LC₅₀ for both *Tenebrio molitor* and *Zophobas morio* larvae were determined by using tobacco extract as the sample.

METHODS

Preparation

Nicotiana tabacum L. leaves used in this research were obtained from Ponorogo. 1000 grams of leaf powder were extracted using Extended Heat Reflux Extraction (EHRE) with 95% ethanol. This technique used the allihn condenser with a height of 30 cm, 500 ml two-neck boiling flask, a heating mantle, and a rotary evaporator. *Tenebrio molitor* and *Zophobas morio* larvae used in this research were approximately three-months-old.

Extended Heat Reflux Extraction

Extended Heat Reflux Extraction (EHRE) method was carried out for 10 times in this research. Each time, 100 grams of tobacco leaf powder and 500 ml of 95% ethanol solutions were placed inside the two-neck boiling flask and stirred using magnetic stirrer. Water was used as the chiller that was circulated within the allihn condenser. Each extraction cycle runs for about 6 hours at 70°C for more optimum result [8]. The subsequent stage after EHRE was vacuum filtration to separate the extract from the tobacco residues.

Evaporation of Extract

After the completion of extraction followed by vacuum filtration, the extract was evaporated using a rotary evaporator to remove the solvent. The rotary evaporator was set at 50°C and 40 rpm. The evaporation run for about 1.5 hours and proceeded with heating the extract in a water bath at 70°C until the extract thickened.

LC₅₀ Test

Tenebrio molitor and *Zophobas morio* were tested with tobacco extract. 10 species of both *Tenebrio molitor* and *Zophobas morio* were put into glass container and sprayed with diluted tobacco extract with certain concentrations (± 1 ml). The mortality of the species was checked for 24 hours. The concentrations of the extract were 15 mg/ml, 20 mg/ml, 25mg/ml, and 30mg/ml for *Tenebrio molitor* and 60mg/ml, 80 mg/ml, 100 mg/ml, and 120mg/ml for *Zophobas morio*.

RESULTS

An extract yield of 23.16 % with water content of 22.96% was obtained by EHRE method. From the value of the water content, it could be concluded that the extract required further evaporation in order to enable preservation for longer duration and to prevent the fungal growth in the extract because the optimum water content in the extract was below 10% according to the previous research [9]. The contents of the tobacco extracts after semiquantitative analysis by GC-MS were shown in Table 1. Based on the results, nicotine was identified as the dominant compound in the tobacco extract (33.08%).

TABLE 1. *Nicotiana tabacum* L. Extract Composition Analysis by GC-MS

Retention Time	Quality	Compounds	Content (%)
18.374	93	Nicotine	2.74
18.588	97	Nicotine	7.58
19.139	97	Nicotine	9.52
19.236	97	Nicotine	1.45
19.691	97	Nicotine	10.53
19.960	97	Nicotine	1.26
20.904	95	Pyridine, 3-(3,4-dihydro-2H-pyrrol-5yl)-	6.62
24.938	96	2,3'-Dipyridyl	4.66
28.303	98	Cotinine	1.85
29.165	80	1-Pyrrolidinecarboxaldehyde,2-(3-pyridinyl)-	6.25
29.572	93	1-Acetyl-2-Pyridinyl-2,3,4,5-Tetrahydropyrrole	1.77
30.523	99	Hexadecanoic Acid	5.34
31.585	94	Cyclopentadecanone, 2-hydroxy-	1.34
41.287	92	Stigmastan-3,5-diene	3.69
46.893	99	gamma-Sitosterol	30.89

LC₅₀ test was the next stage after extraction and analysis of the extract composition by GC-MS. The data of mortality of both *Tenebrio molitor* and *Zophobas morio* larvae were shown in Table 2 and Table 3.

TABLE 2. Mortality of *Tenebrio molitor*

Concentration (mg/ml)	Mortality Test 1 (specimen)	Mortality Test 2 (Specimen)	Standard Deviation
0	0	0	0
Concentration (mg/ml)	Mortality Test 1 (specimen)	Mortality Test 2 (Specimen)	Standard Deviation
15	2	2	0
20	5	4	0.707
25	6	6	0
30	8	9	0.707

TABLE 3. Mortality of *Zophobas morio*

Concentration (mg/ml)	Mortality Test 1 (Specimen)	Mortality Test 2 (Specimen)	Standard Deviation
0	0	0	0
60	2	2	0
80	5	6	0.707
100	9	8	0.707
120	9	10	0.707

From these data, the LC₅₀ could be estimated with the probit analysis. Estimation of LC₅₀ was computed using Analysis tool-pack of Microsoft Excel with a confidence level of 95 % and the alpha value of 0.05. Figure 1 and Figure 2 presented the graphical correlation between the Log Concentration and Probit Number of both *Tenebrio molitor* and *Zophobas morio*.

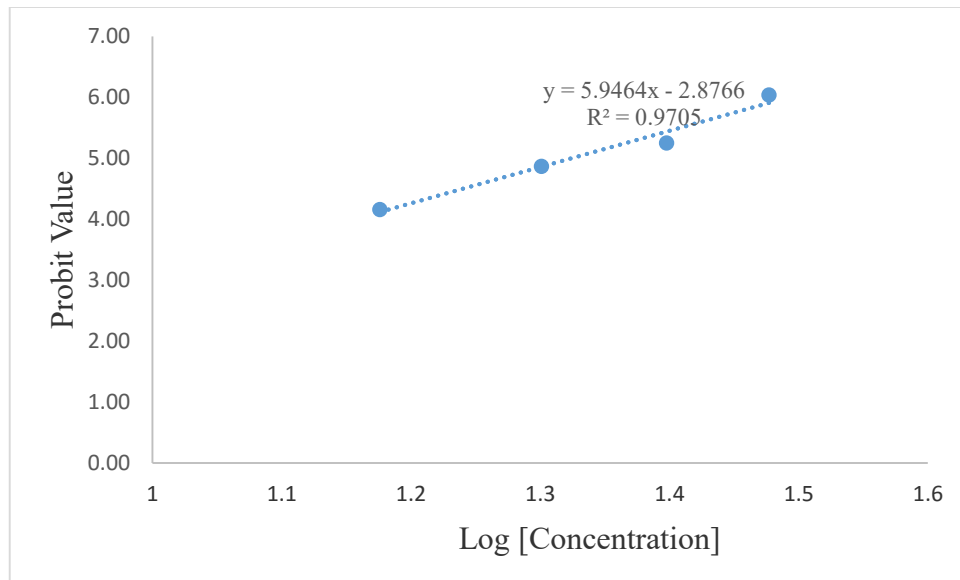


FIGURE 1. Probit Value vs Log Concentration of *Tenebrio molitor* Mortality

The data in Figure 1 had a p-value of 0.0149 ($P \leq 0.05$), which indicated the reliability of the data and the concentration of the extract affected the mortality of the pests. The graph had a line function of $Y=5.95X-2.88$. To obtain the LC_{50} value, the Y value was substituted with 5 (probit value for 50% mortality) then compute the antilog function using the result of X. Based on the calculation, LC_{50} value of the tobacco extract was 21.1 mg/ml for *Tenebrio molitor*.

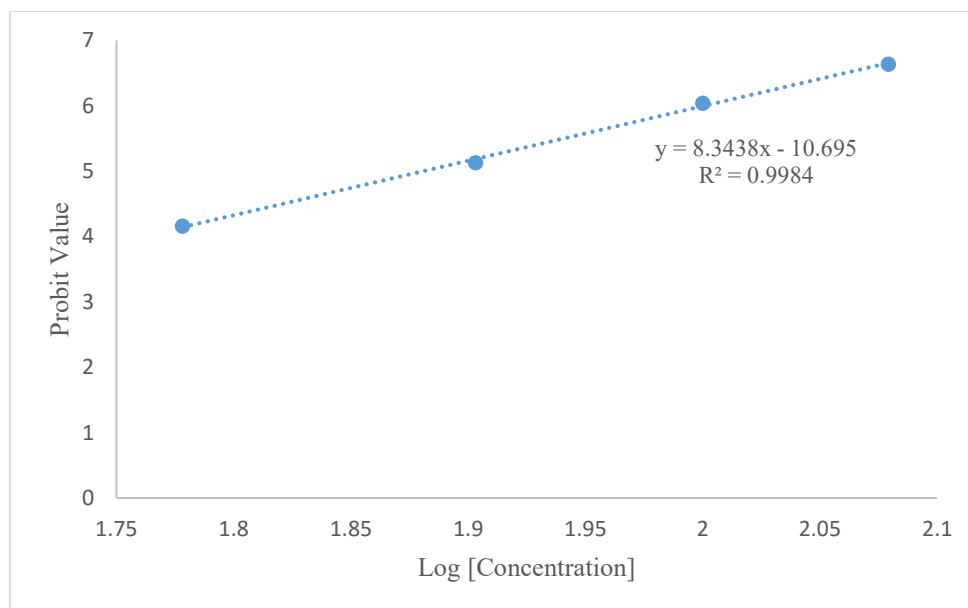


FIGURE 2. Probit Value vs Log Concentration of *Zophobas morio* Mortality

The data in Figure 2 had p-value of 0.0008 ($P \leq 0.05$), so it could be concluded that these results were also reliable and the concentration of the extract had an effect against the mortality of the pests. The graph had a line function of $Y=8.344X-10,695$. Using the same way of calculating LC_{50} as for the data in Figure 1, LC_{50} value of the tobacco extract was 71.1 mg/ml for *Zophobas morio*.

The tobacco extract killed the *Tenebrio molitor* and *Zophobas morio* in two ways, such as neurotoxin and digestive toxin. The effect of neurotoxin was observed from the immediate paralysis of the pest bodies after being sprayed with

tobacco extract. The effect of digestive toxin was visible after 24 hours of contact with the pests whereby the abdomen of the pest blackened [10].

RESULTS AND DISCUSSIONS

There was not any previous research which investigated the effect of tobacco extract against *Tenebrio molitor* and *Zophobas morio*. Therefore in this discussion, the LC₅₀ value of tobacco extract was compared with the LC₅₀ values of the other plants extract in order to evaluate the effectiveness. Table 4 below listed the LC₅₀ values from various extracts against *Tenebrio molitor* larvae.

TABLE 4. LC₅₀ Value Comparison of Various Raw Materials

Raw Material	Food Material	Pest	LC ₅₀	Researcher
<i>Nicotiana tabacum</i> L. Extract (Tobacco)	-	<i>Tenebrio molitor</i>	21.1 mg/ml	Sentosa, 2019
Raw Material	Food Material	Pest	LC ₅₀	Researcher
<i>Capsicum annum</i> L Extract (Bell pepper)	+	<i>Tenebrio molitor</i>	1 mg/ml; also able to kill 95-100% of population	Ngo et al., 2017 [11]
<i>Melia azedarach</i> L. and <i>Pithecellobium jiringa</i> Extracts (Chinaberry and Djenkol)	+	<i>Tenebrio molitor</i>	900 mg/ml; also able to kill 82.5% of population	Arifin, 2014 [12]
<i>Allium sativum</i> Oil (Garlic)	+	<i>Tenebrio molitor</i>	7.7 – 13 mg/ml	Plata Rudea et al., 2017 [13]
<i>Cedrus deodara</i> Oil (Himalayan Cedar)	-	<i>Tenebrio molitor</i>	34 mg/ml	Buneri et al., 2017 [14]

From the research comparison in Table 4, it could be concluded that tobacco extract was relatively good as a natural pesticide. However, the tobacco had a higher value of LC₅₀ compared to bell pepper and garlic.

Capsaicin and dihydrocapsaicin were the active compounds of the bell pepper. Bell pepper extract caused mortality of the pest by affecting the larval growth and retarding the larva [15]. Even though the bell pepper extract had lower value of LC₅₀, the tobacco extract was more effective in killing the pest because tobacco extract acted as neurotoxin which paralyzed the pest in a shorter time. On the other hand. The active compounds contained in garlic oil were the sulfide compounds including *diallyl sulfide*, *diallyl disulfide* dan *diallyl trisulfide*. Similar to bell pepper, garlic oil was able to kill larva by affecting the larval growth and retarding the larva. Furthermore, garlic oil could cause hormonal disbalance, specifically neuroendocrine hormone and juvenile hormone [16], that resulted in retardation of the larva. Unlike bell pepper and garlic, tobacco was not consumable material so its application as natural pesticide would be more beneficial and economically less competitive.

CONCLUSIONS

The results of this research showed that *Nicotiana tabacum* L. extract had insecticidal activity against *Tenebrio molitor* and *Zophobas morio*. The LC₅₀ values were 21.1 mg/ml and 71.1 mg/ml for *Tenebrio molitor* and *Zophobas morio*, respectively. The tobacco extract acted as neurotoxin and digestive toxin because the extract was capable of paralyzing the pest as soon as the extract was sprayed onto the pest and the abdomen of the pest was blackened after 24 hours of being contacted with the extract.

ACKNOWLEDGMENTS

Authors were gratefully thankful for the financial support by Universitas Indonesia through *Hibah Publikasi Internasional Terindeks untuk Tugas Akhir Mahasiswa* (PITTA) UI 2019.

REFERENCES

1. Khalalia, R., *Uji Daya Bunuh Granul Ekstrak Limbah Tembakau (Nicotiana tabacum L.) Terhadap Larva Aedes aegypti*. *Unnes Journal of Public Health*, 2016. **5**(4): p. 366-374.
2. Sharma, Y., D. Dua, and N. Srivastava, *Antibacterial Activity, Phytochemical Screening And Antioxidant Activity Of Stem Of Nicotiana tabacum*. *International Journal of Pharmaceutical Sciences and Research*, 2016. **7**(3): p. 1156-67.
3. Pramono, A., et al., *In Vitro Assay of Ethanolic Heat Reflux Extract of Nicotiana tabacum L. var Virginia Against Nosocomial Bacteria Pathogen*. *Journal of Physics: Conference Series* 2018. **970**(1).
4. Jufri, M., E. Irmayanti, and M. Gozan, *Formulation of Tobacco Based Mosquito Repellent to Avoid Dengue Fever*. *International Journal of PharmTech Research*, 2016. **9**(7): p. 140-145.
5. Ekapratiwi, Y., et al., *The effect of tobacco extracts based biolarvicide emulsion formulation against Aedes aegypti larvae*. *AIP Conference Proceedings*, 2019. **2092**(1).
6. Gozan, M., et al., *Tobacco Leaves Pyrolysis for Repellent Active Compound Production*. *International Journal of Engineering Technology Science and Research*, 2014. **9**(21): p. 9739-9749.
7. Jufri, M., et al., *Formulation, Stability Test and in vitro Penetration Test of Emulgel from Tobacco Leaves Extract*. *Journal of Young Pharmacist*, 2018. **10**(2): p. 69-72.
8. Fauzantoro, A., Y. Muharam, and M. Gozan, *Improvement of Nicotine Yield by Ethanolic Heat Reflux Extraction of Nicotiana tabacum var. Virginia Origin of Ponorogo*. *International Journal of Applied Engineering Research*, 2017. **12**(23): p. 13891-13897.
9. Najib, A., et al., *Standarisasi Ekstrak Air Daun Jati Belanda Dan Teh Hijau*. *Jurnal Fitofarmaka Indonesia*, 2017. **4**(2): p. 241-245.
10. Susanti, L. and H. Boesri, *Toksitas Biolarvasida Ekstrak Tembakau Dibandingkan Dengan Ekstrak Zodia Terhadap Jentik Vektor Demam Berdarah Dengue (Aedes aegypti)*. *Buletin Penelitian Kesehatan*. **40**(2): p. 75-84.
11. Ngo, N.T., et al., *Fraction And Determination Of Capsaicinoids From Red Pepper Fruits With Insecticidal Activity Against Mealworm, Tenebrio molitor, And Superworm, Zophobas morio*. *Vietnam Journal of Science and Technology*, 2017. **55**(4c): p. 57-64.
12. Arifin, R.N., *Pembuatan Pestisida Alami, Campuran Ekstrak Daun Mindi (Melia azedarach L.) Dan Kulit Buah Jengkol (Pithecellobium jiringa) Untuk Pengendalian Ulat Biji (Tenebrio molitor)* 2014, Universitas Muhammadiyah: Surakarta.
13. Plata-Rueda, A., et al., *Insecticidal activity of garlic essential oil and their constituents against the mealworm beetle, Tenebrio molitor Linnaeus (Coleoptera: Tenebrionidae)*. *Sci Rep*, 2017.
14. Buner, I.D., et al., *A comparative toxic effect of Cedrus deodara oil on larval protein contents and its behavioral effect on larvae of mealworm beetle (Tenebrio molitor) (Coleoptera: Tenebrionidae)*. *Saudi Journal of Biological Sciences*, 2017. **26**(2): p. 281-285.
15. Dadji, G.A.F., J.L. Tamesse, and J. Messi, *Insecticidal effects of Capsicum annum on aquatic stages of Anopheles gambiae giles under laboratory conditions* *Journal of Entomology* 2007. **4**(4): p. 299-307.
16. Hamada, H.M., et al., *Insecticidal Activity of Garlic (Allium sativum) and Ginger (Zingiber officinale) Oils on the Cotton Leafworm, Spodoptera littoralis (Boisd.) (Lepidoptera: Noctuidae)*. *African Entomology*, 2018. **26**(1): p. 84-94.

6. HALAMAN SCIMAGO



SJR

Scimago Journal & Country Rank

Enter Journal Title, ISSN or Publisher Name



Home

Journal Rankings

Country Rankings

Viz Tools

Help

About Us

Claim Your Free Trial

Open

American Journal Experts

AIP Conference Proceedings

COUNTRY

United States

Universities and research institutions in United States

Media Ranking in United States

SUBJECT AREA AND CATEGORY

Physics and Astronomy
└ Physics and Astronomy (miscellaneous)



PUBLISHER

American Institute of Physics

H-INDEX

75

16-18 March 2023

Once-in-a-lifetime Experience, No day at Expo is the same. Register Now for Free Entry

China Home

Open



Kelihatan Cuek Ternyata Beli Produk Kesehatan

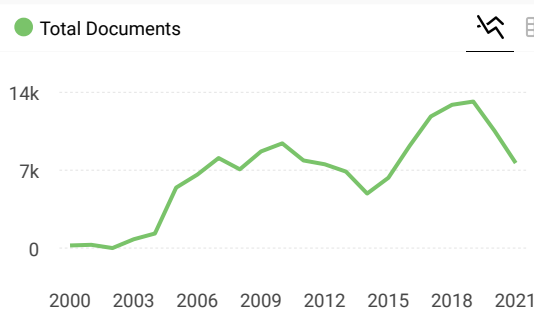
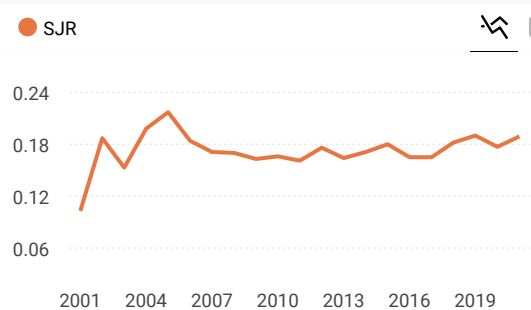
PUBLICATION TYPE	ISSN	COVERAGE	INFORMATION
Conferences and Proceedings	0094243X, 15517616	1973-1978, 1983-1984, 1993, 2000-2001, 2003-2021	Homepage How to publish in this journal confproc@aip.org

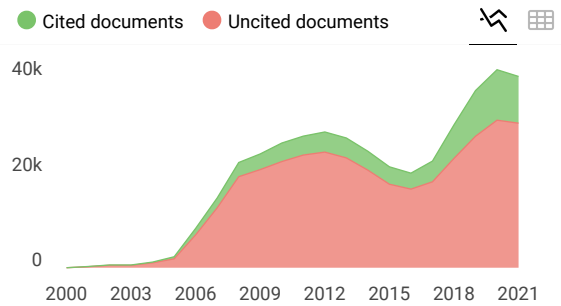
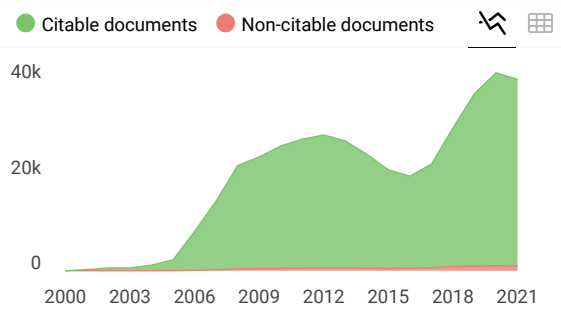
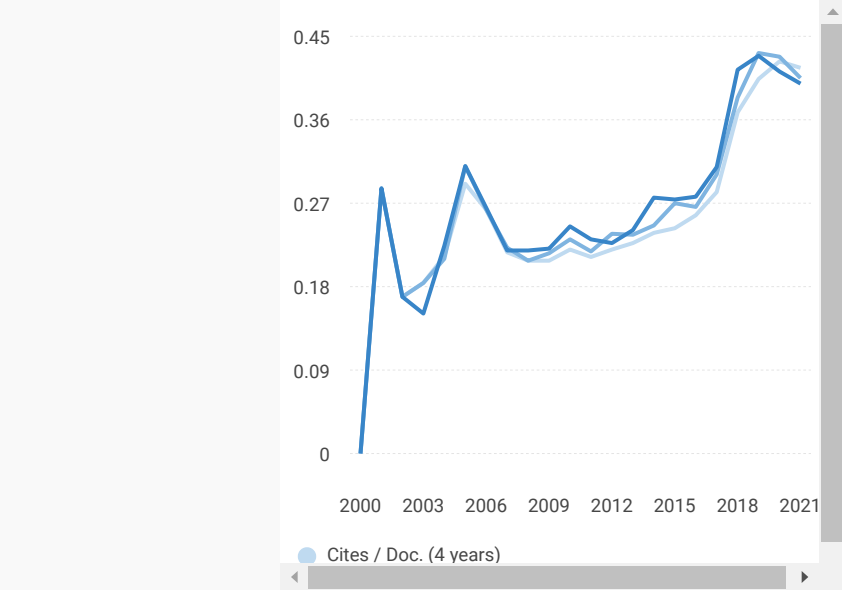
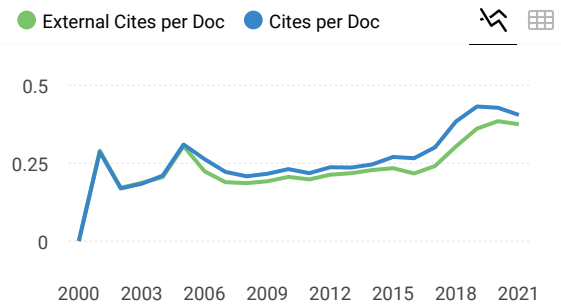
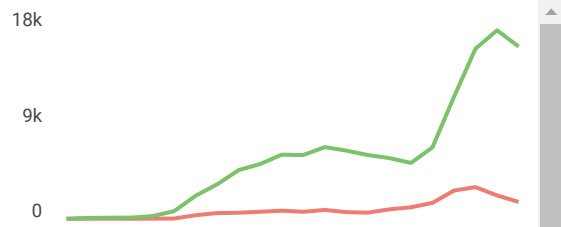


SCOPE

Today, AIP Conference Proceedings contain over 100,000 articles published in 1700+ proceedings and is growing by 100 volumes every year. This substantial body of scientific literature is testament to our 40-year history as a world-class publishing partner, recognized internationally and trusted by conference organizers worldwide. Whether you are planning a small specialist workshop or organizing the largest international conference, contact us, or read these testimonials, to find out why so many organizers publish with AIP Conference Proceedings.

Join the conversation about this journal





AIP Conference Proceedings ← Show this widget in your own website

Not yet assigned quartile

SJR 2021 **0.19**

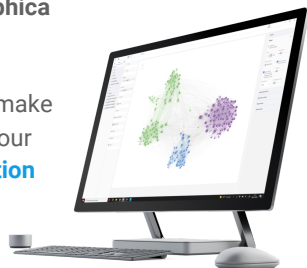
powered by scimagojr.com

Just copy the code below and paste within your html code:

```
<a href="https://www.scimaç
```

SCImago Graphica

Explore, visually communicate and make sense of data with our **new data visualization tool.**



Metrics based on Scopus® data as of April 2022

7. HALAMAN SCOPUS



Source details

AIP Conference Proceedings

Scopus coverage years: from 1973 to 1978, from 1983 to 1984, 1993, from 2000 to 2001, from 2003 to Present

ISSN: 0094-243X E-ISSN: 1551-7616

Subject area: Physics and Astronomy: General Physics and Astronomy

Source type: Conference Proceeding

CiteScore 2021

0.8



SJR 2021

0.189



SNIP 2021

0.262



[View all documents >](#)

[Set document alert](#)

[Save to source list](#)

[CiteScore](#) [CiteScore rank & trend](#) [Scopus content coverage](#)

Improved CiteScore methodology



CiteScore 2021 counts the citations received in 2018-2021 to articles, reviews, conference papers, book chapters and data papers published in 2018-2021, and divides this by the number of publications published in 2018-2021. [Learn more >](#)

CiteScore 2021 ▼

$$0.8 = \frac{34,444 \text{ Citations 2018 - 2021}}{43,453 \text{ Documents 2018 - 2021}}$$

Calculated on 05 May, 2022

CiteScoreTracker 2022 ⓘ

$$0.7 = \frac{31,303 \text{ Citations to date}}{43,418 \text{ Documents to date}}$$

Last updated on 05 March, 2023 • Updated monthly

CiteScore rank 2021 ⓘ

Category	Rank	Percentile
Physics and Astronomy		
General Physics and Astronomy	#194/240	19th

[View CiteScore methodology >](#) [CiteScore FAQ >](#) [Add CiteScore to your site](#)

About Scopus

[What is Scopus](#)

[Content coverage](#)

[Scopus blog](#)

[Scopus API](#)

[Privacy matters](#)

Language

[日本語版を表示する](#)

[查看简体中文版本](#)

[查看繁體中文版本](#)

[Просмотр версии на русском языке](#)

Customer Service

[Help](#)

[Tutorials](#)

[Contact us](#)

ELSEVIER

[Terms and conditions](#) ↗ [Privacy policy](#) ↗

Copyright © Elsevier B.V. ↗. All rights reserved. Scopus® is a registered trademark of Elsevier B.V.

We use cookies to help provide and enhance our service and tailor content. By continuing, you agree to the use of cookies ↗.

