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HASIL PENILAIAN SEJAWAT SEBIDANG ATAU PEER REVIEW
KARYA ILMIAH : JURNAL ILMIAH

Judul Jurnal Ilmiah (Artikel) : Trace metal analysis of element on material surface using pulse CO₂ laser-induced breakdown spectroscopy applying vaporization technique

Nama/ Jumlah Penulis : 5 Orang

Status Pengusul : Penulis pertama/ Penulis ke / Penulis Korespondensi **

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- c. Vol, No., Bln Thn : Vol. 6, No. 8, Agustus 2020
- d. Penerbit : Elsevier
- e. DOI artikel (jika ada) : 10.1016/j.heliyon.2020.e04670
- f. Alamat web jurnal : <http://www.cell.com/heliyon>
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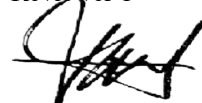
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Semarang, 20 April 2021

Reviewer 1



Prof. Dr. Suryono, S.Si., M.Si.

NIP. 197306301998021001

Unit Kerja : Fisika

Bidang Ilmu: Fakultas Sains dan Matematika

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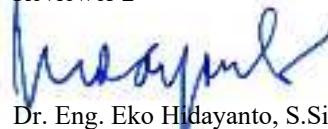
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Total = (100%)	40			39,9
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- Ruang lingkup dan kedalaman pembahasan:**
Paper ini membahas tentang analisis trace element pada permukaan material dengan spektroskopi laser-induced breakdown dengan batas deteksi Cr sekitar 100 ppb.
- Kecukupan dan kemutakhiran data/informasi dan metodologi:**
Data-data/informasi serta metodologi yang digunakan sangat mutakhir.
- Kelengkapan unsur dan kualitas terbitan:**
Karya ini diterbitkan dalam jurnal berkualitas Q1 dengan SJR 0,46 oleh Elsevier BV dengan unsur-unsur yang lengkap serta kualitas yang sangat baik.

Semarang, 02 Juli 2021

Reviewer 2



Dr. Eng. Eko Hidayanto, S.Si., M.Si.

NIP. 197301031998021001

Unit Kerja : Fisika

Bidang Ilmu: Fakultas Sains dan Matematika

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a. Kelengkapan unsur isi jurnal (10%)	3,5	3,6	3,55
b. Ruang lingkup dan kedalaman pembahasan (30%)	11,3	11,7	11,5
c. Kecukupan dan kemutakhiran data/informasi dan metodologi (30%)	11,4	11,6	11,5
d. Kelengkapan unsur dan kualitas penerbit (30%)	11,5	11,5	11,5
Total = (100%)			38,05
Nilai untuk Pengusul : (60% x 38,05) = 23,1			

Semarang, 24 Februari 2021

Reviewer 1



Prof. Dr. Suryono, S.Si., M.Si.
NIP. 197306301998021001

Bidang ilmu/Unit kerja : Fakultas Sains dan Matematika/Fisika

Reviewer 2



Dr. Eng. Eko Hidayanto, S.Si., M.Si.
NIP. 197301031998021001

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Trace metal analysis of element on material surface using pulse CO₂ laser-induced breakdown spectroscopy applying vaporization technique

Khumaeni A.^a [✉](#), Budi W.S.^a, Kurihara K.^b, Kurniawan H.^c, Kagawa K.^d

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^a Department of Physics, Faculty of Science and Mathematics, Diponegoro University, Semarang, 50275, Indonesia

^b Department of Physics, Faculty of Education, University of Fukui, Bunkyo 3-9-1, Fukui, 910-8507, Japan

^c Maju Makmur Mandiri Research Center, Kembangan, Jakarta Barat, Indonesia

^d Fukui Science Education Academy, Takagi Chuo 2 chome, Fukui, 910-0804, Japan

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(2019) *Journal of Physics: Conference Series*

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Abstract

Trace elemental analysis on a surface of material has been recently imperative to be carried out especially in material industries. In this study, sophisticated setup of laser-induced breakdown spectroscopy has been arranged and demonstrated by employing vaporization technique for the trace elemental analysis on a surface of material without ablating the material itself. Experimentally, a pulse transversely excited atmospheric CO₂ laser was directed and defocused at +5 mm on a Si surface at inclining degree of approximately 25° to vaporize the trace metal element from the Si surface to the Pt mesh combined with Cu plate. The vaporized trace metal element then attached and deposited on the

mesh surface. The trace metal attached-Pt mesh was then bombarded by focused laser beam to induce a luminous plasma and finally the trace element was identified. Results certified that sensitive trace elemental analysis of Cr deposited on the Si surface has been successfully carried out without any ablation of Si surface. Good linear calibration curve of Cr with an intercept zero was produced, which results in limit of detection of Cr of approximately 100 ppb. © 2020

Analytical chemistry; Optics; Analysis of trace metal elements; Material surface; Laser-induced breakdown spectroscopy; Vaporization technique; Pulse TEA CO₂ laser © 2020

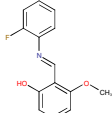
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Analysis of trace metal elements; Analytical chemistry; Laser-induced breakdown spectroscopy; Material surface; Optics; Pulse TEA CO₂ laser; Vaporization technique

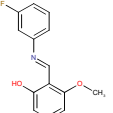
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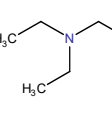
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Agriculture

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Dr. Athanasios Damialis

Dr. Athanasios Damialis is a multi-disciplinary scientist working for more than 20 years on the fields of plant and fungal ecology, environmental sciences, biometeorology, climate change and environmental health. His particular focus lies on the reproductive biology of plants (flowering phenology, atmospheric circulation of airborne pollen) and on endophytic fungi. He uses an inter-disciplinary research approach with environment-environment interactions and human-environment interactions. This includes mainly those interactions including, but not limited to, the detection of bio-climatic indicators and spatiotemporal patterns of plant, forest and agricultural habitats and ecosystems, in relation to ongoing and simulated climate change. His research goal is to comprehend the responsive ability of organisms under stress conditions, ultimately, attempting to promote sustainable growth and environmental quality.

Arts and humanities

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Biochemistry, molecular biology and cell biology

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Prof. Nicola Zambrano

Nicola Zambrano is professor of Molecular Biology at the University of Naples Federico II, and group leader at CEINGE Advanced Biotechnologies, Naples, Italy. He holds a M.Sc. degree in biological sciences and a Ph.D. in biotechnologies, acquired within a joint doctoral program from the Universities of L'Aquila and Naples, Italy. He was a visiting fellow at National Cancer Institute, NIH in Bethesda from 1991 to 1994, and visiting scientist at EMBL in Heidelberg, Germany in 1997. His academic career at the Federico II University in Naples started with an assistant professor position in biochemistry (1996), before being enrolled as an associate professor (2002) and then, as a full professor in molecular biology (2010).

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Prof. Jinrong Min

Professor Jinrong Min received his Ph.D. degree in physics from the Institute of Physics, Chinese Academy of Sciences in China, and carried out his post-doctoral training in chromatin structural biology at the Cold Spring Harbor Laboratory, USA. He is currently the principal investigator of the Chromatin Structural Biology Group at the Structural Genomics Consortium (SGC), University of Toronto, and an associate professor in the Department of Physiology at the University of Toronto.

Biology

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Business and economics

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Dr. Larisa Yarovaya

Professor Larisa Yarovaya received her doctorate in finance from Northumbria University in England. Currently, she is a lecturer in finance, Programme Director BSc Finance, and deputy head of Centre for Digital Finance at the Southampton Business School, University of Southampton.

Prof. Yarovaya is a researcher the fields of international finance, digital finance, financial integration, Islamic finance, energy economics, information transmission, and international business. She has published her research in peer-reviewed academic journals and is an associate editor of the *International Review of Financial Analysis*, *Journal of International Financial Markets Institutions and Money*, *Heliyon*, and *Data-in-Brief*.



Dr. Pavlos Delias

Pavlos Delias is a tenured faculty member at the [International Hellenic University](#), Department of Accounting and Finance. He holds a jointly supervised PhD from both [Technical University of Crete](#) and [University Paris Dauphine](#), under a cotutelle agreement.

Pavlos Delias has been invited as a visiting professor in several universities (national as well as international). He has contributed to numerous research projects, focusing on applying the principles of business analytics and operational research to decision support systems design and use. He is also a member of the coordination board for the EURO working group on decision support systems. His research interests are in the areas of business process analytics, business analytics and operational research, and multiple criteria analysis.

Chemical Engineering

Meet the full editorial team for [Heliyon Chemical Engineering](#).



Prof. Bart Van der Bruggen

Bart Van der Bruggen received his PhD in chemical engineering from KU Leuven in 2000. He currently works as full professor at KU Leuven (Belgium) and extraordinary professor at Tshwane University of Technology (South Africa). He has vast experience as an editor for various journals and is a also very active author and reviewer, with over 600 publications, cited more than 25,000 times. His expertise is in separation processes in classical and non-classical chemical engineering applications, with a focus on membrane science and technology.

Chemistry

Meet the full editorial team for [Heliyon Chemistry](#).



Dr. Francesco Epifano

Prof. Epifano obtained his degree in medicinal chemistry and pharmaceutical technology in 1993 from the University of Perugia, Italy. In 1998, he obtained his Ph.D. in agricultural entomology at the Faculty of Agricultural Sciences of the University of Perugia. Currently, he is an associate professor of medicinal chemistry at the Department of Pharmacy of the University Gabriele D'Annunzio of Chieti-Pescara. His recent work is concerned with synthesis and pharmacological properties of secondary metabolites from plants, fungi, and bacteria. Dr. Epifano was the recipient of the 2010 IADR / Glaxo Smith Kline Innovation in Oral Care Award as the co-investigator of the project entitled "Therapeutic potential of Citrus auraptene for periodontal disease", the 2012 Apivita Award for Phytochemistry, and the 2017 Pierre Fabre – Phytochemical Society of Europe Innovation Award.

Clinical research

Meet the full editorial team for [Heliyon Clinical research](#).



Dr. Carolyn Mackintosh-Franklin

Dr. Carolyn Mackintosh-Franklin has had an extensive career in both clinical practice and higher education working at the University of Bradford, University of Liverpool, University of Hull and currently working at the University of Manchester. She received her first degree from the University of Newcastle Upon Tyne, her MSc from the University of Manchester and doctorate from the University of Bradford. She is also a registered nurse specializing in the assessment and management of acute and chronic pain. Her research interests are broad ranging; encompassing work on health care professionals' attitudes towards those in pain, aspects of pain assessment and management, and pedagogic research into learning needs of mature students, with a range of highly cited publications and conference presentations in these areas.



Prof. Giuseppe Musumeci

Giuseppe Musumeci received a BS, MS and PhD in Human Movement and Sport Sciences from the University of Catania, Italy. Currently, he works as a Professor of Sports Sciences at the Department of Biomedical and Biotechnological Sciences, School of Medicine, University of Catania, Italy. He is also an Adjunct Professor at the Temple University's College of Science and Technology, Philadelphia, USA and at the Faculty of Sport Sciences, Fujian Normal University, Fuzhou, China. Prof. Musumeci is the Director of the Research Center on Motor Activities (CRAM), the Director of School of Posturology and Physical Exercise Sciences, the Dean of the Human Movement Sciences Faculty and the Head of the Movement Innovation PosturaLab at the University of Catania. He is currently Editor-in-Chief of "Journal of Functional Morphology and Kinesiology". Musumeci's research interests are centered on morphological, molecular, biochemical and clinical aspects of osteoarthritis and musculoskeletal disorders and the relative effects of diet, ageing and physical activity. Other research topics of interest are tissue engineering and mechanobiology related to the musculoskeletal system in the clinical context.



Prof. Graham Pawelec

Graham Pawelec received an MA in natural sciences and a PhD in transplantation immunology from the University of Cambridge, UK. He is currently professor of experimental immunology in the Department of Immunology, University of Tübingen, Tübingen, Germany. He is a visiting professor at Nottingham Trent University, UK and at King's College London, UK, holds an honorary chair at Manchester University, UK. He is a member of the Cancer Solutions Program at the Health Sciences North Research Institute of Canada, Sudbury, Ontario, Canada. He is currently co-editor-in-chief of "Immunity and Aging". Graham's research interests are centred on alterations to immunity, especially T cell-mediated immunity, in ageing and cancer in man, and the influence these have on the outcome of vaccination and immunomodulatory antibody therapies. The impact of polypathogenicity (including multiple infections, cancer, Alzheimer's, diabetes, autoimmunity) as well as stress (psychological, nutritional) on immune signatures reflecting individual immune status is of particular interest in the clinical context.

Computer science

Meet the full editorial team for [Heliyon Computer science](#).



Dr. Jonathan Chan

Dr. Jonathan H. Chan is an associate professor of computer science and a co-founder of D-Lab at the School of Information Technology, King Mongkut's University of Technology Thonburi, Thailand. Jonathan holds a Ph.D. from the University of Toronto, where he has also served as a visiting professor. In addition to his role as the section editor of *Heliyon Computer science*, Dr. Chan is an action editor of *Neural Networks*, and a member of the editorial boards of *International Journal of Machine Intelligence and Sensory Signal Processing*, *International Journal of Swarm Intelligence*, and *Proceedings in Adaptation, Learning and Optimization*.

Dr. Chan is a founding member and a current VP of the IEEE-CIS Thailand Chapter, and a senior member of IEEE, ACM, and INNS, a member of the Professional Engineers of Ontario (PEO), and a governing board member of APNNS. He also holds an NVIDIA Deep Learning Institute (DLI) University Ambassadorship and is a certified DLI instructor. His research interests include intelligent systems, biomedical informatics, and data science and machine learning in general.

Earth science

Meet the full editorial team for [Heliyon Earth science](#).

**Prof. Andrew S. Hursthouse**

Professor Hursthouse is a professor of environmental geochemistry at the University of the West of Scotland (UWS) and holds a Ph.D. in environmental radioactivity from University of Glasgow and a B.Sc. degree in geochemistry from University of Reading. He holds a 100 talent high-end expert fellowship at Hunan University of Science & Technology, Xiangtan, PRC. He has editorial roles in several earth and environmental science journals and has worked in academic and industrial research environments.

Professor Hursthouse's areas of interest and expertise are in earth process interactions and the environmental geochemistry of metallic elements, resource exploitation and implications for human health, and this approach also applied to environmental pollution, industrial processes, economic development and society; remediation and treatment of chemical pollution; chemical and environmental hazards, waste and environmental management and regulation.

Education

Meet the full editorial team for [Heliyon Education](#).

**Prof. David González-Gómez**

Heliyon Education is led by Section Editor David González-Gómez, Ph.D. Dr. González-Gómez is a Professor in the Department of Science and Mathematics Education and the Dean of the Teaching Trainer School at the University of Extremadura (Spain). Dr. González-Gómez is known internationally for work in science education; science, technology, engineering, and mathematics (STEM); active learning methodologies for teaching science; affective domain in the science learning process; education for the sustainability; SDGs. Currently, he is an advisory council of the Science, Technology, and Innovation of Extremadura government in Spain.

Energy

Meet the full editorial team for [Heliyon Energy](#).

**Dr. Socrates Kaplanis**

Prof. Socrates Kaplanis obtained his degree in physics from University Thessaloniki, a MSc in nuclear reactors from Aston University, and a PhD in radiation detection and modelling from the University Patra. He has held academic positions including professor of renewable energy systems at the Technological Educational Institute of Patra, head of the renewable energy systems laboratory, honorary professor and doctor honoris causa at the Transylvania University in Brasov, and as a visiting professor at the University of Applied Sciences in Aachen, Germany.

Prof. Kaplanis has a research background in solar radiation, prediction modelling, zero and intelligent energy buildings, PV systems engineering, solar thermal engineering, and PV based hybrid systems. He has held various posts, including president of the Technological Educational Institute of Patra, president of the Technological Educational Institute of Western Greece, and vice-president and President of the European Institutions in Higher Education (EURASHE).

Engineering

Meet the full editorial team for [Heliyon Engineering](#).



Dr. Andrea Francesco Morabito

Professor Andrea Francesco Morabito received his Ph.D. in computer, biomedical, and telecommunications engineering from the University of Reggio Calabria, Italy, where he has also served as an assistant professor in electromagnetic fields since 2010. His research work is mainly focused on models and effective strategies for the solution of inverse problems, in particular, antenna synthesis, phase retrieval, and electromagnetic inverse scattering.



Prof. Mohammad Mehdi Rashidi

Professor Mohammad Mehdi Rashidi received his Ph.D. in mechanical engineering from Tarbiat Modares University, Iran. He is currently a professor of mechanical engineering at Tongji University in Shanghai, China, and previously taught at Bu-Ali University in Iran. Prof. Rashidi was named a 2018 highly cited researcher by Clarivate Analytics.

Environment

Meet the full editorial team for [Heliyon Environment](#).



Prof. Frederic Coulon

Professor Frederic Coulon holds a chair in Environmental Chemistry & Microbiology at Cranfield University, UK. In addition to his position as section editor for *Heliyon Environment*, Prof. Coulon is an associate editor for *Environment International* and *Science of the Total Environment*. His professional interests include: soil and water chemistry; fate and transport of chemicals in surface and subsurface waters; water and wastewater treatment; soil and sediment treatment; hazardous waste site remediation; energy and environment; population and environment; and public communication of environmental science and engineering. His research achievements address international priorities under the umbrella of the Water-Soil-Waste nexus across sectors and scales. His work is premised on the understanding that environmental resources are inextricably intertwined and therefore there is a need of advancing a nexus approach to enable integrated and sustainable management of water, soil and waste systems.



Prof. Christian Sonne

Professor Christian Sonne, DVM, PhD, DScVetMed, Dipl. ECZM-EBVS, holds a professorship in veterinary ecotoxicology and wildlife medicine at Aarhus University, Denmark. In addition to his position as section editor for *Heliyon Environment*, Prof. Sonne serves as special issues editor for *Environmental Pollution*. Since 1997, Prof. Sonne has specialized in the cross-field of biological effects from exposure to environmental chemicals, diseases and climate change, giving him a unique insight and profile working with a broad range of animals including predatory mammals, raptorial birds, sea birds, fish and humans. He has a broad insight and interest in internal and reproductive organs (histopathology, size, and morphology), skeletal system (bone density and morphology using e.g. DXA scanning), immune system (intra dermal testing of lymphocyte functioning, immune globulin production and cytokine and APP expressions), endocrine system (steroid and peptide hormones), PBPK modelling, blood biochemistry and infectious diseases (zoonosis). Prof. Sonne uses his global network to obtain interdisciplinary research results. Since 2015, he has applied his in-depth knowledge and understanding of biological processes to also include specific un-solved wildlife issues in Denmark (eider duck population declines) and health of raptors. Recently his innovative approaches have led to the first interactions with private industry focusing on natural resources developments and translational medicine within insulation, osteoporosis and metabolic syndrome. Prof. Sonne also specializes in surgical field implantations of intra-coelomic (abdominally) and subcutaneously satellite transmitters (PTTs) in various sea bird species and immobilization of deer spp.

Food science and nutrition

Meet the full editorial team for [Heliyon Food science and nutrition](#).



Prof. Lilian Mariutti

Prof. Lilian R. B. Mariutti received her master and doctorate degrees in food science from the School of Food Engineering - University of Campinas, Brazil, where she currently has a position as assistant professor. She was a researcher fellow in the Laboratory of

Veterinary Drug Residues of the Brazilian Ministry of Agriculture, Livestock and Food Supply. Her research focuses on the identification and bioaccessibility of bioactive compounds and lipids and design of food ingredients from non-conventional sources.

Global Health & Infectious Diseases

Meet the full editorial team for *Heliyon Global Health & Infectious Diseases*.



Dr. Chaisiri Angkurawaranon

Public Health

[Chiang Mai University](#), Chiang Mai, Thailand

Chaisiri Angkurawaranon received his MD from Chiang Mai University and specialises in Family Medicine. He received a Masters in Medical Statistics and a PhD in Non-communicable Disease Epidemiology from the London School of Hygiene and Tropical Medicine. His research focuses on global health issues related to ageing and chronic conditions (both communicable and non-communicable) in primary care.



Dr. Nitika Pant Pai

Infectious Disease

[McGill University](#), Montreal, Canada

Dr. Nitika Pant Pai is a tenured Associate Professor in the Department of Medicine at McGill University. Her global implementation research program for the past twenty years is focused on point-of-care diagnostics for HIV and other sexually transmitted blood borne infections; specifically the innovation, implementation and impact of digital strategies with rapid diagnostics and wearable solution. She develops integrated connected strategies with digital innovations, Bayesian diagnostics, artificial intelligence to plug health service delivery gaps in diagnostics in rapid diagnostics. She serves to inform domestic and global policy on point-of-care diagnostics.

Her research program is based in Canada, India and South Africa. She has led many diagnostic trials, cohort/cross sectional studies, meta-analyses, systematic reviews, modelling studies, to inform the gaps in policies to end the HIV epidemic. Her research has been supported by grants from the Canadian Institutes of Health Research, the FRQS, Grand Challenges Canada, Bill and Melinda Gates Foundation, National Institutes of Health, MRC SHIP, South African DST, IC-IMPACTS, Clinton Health Access Initiative, among others.

She has served on many technical working groups for national and international agencies: WHO, Foundation for Innovative Diagnostics, PSI, The Bill and Melinda Gates Foundation, ASLM, CDC, PHAC, REACH, among others. She has advised the office of the US Congress on multiplex testing. She has also contributed to HIV self-testing guidelines and policy guidance for HIV self-testing for the WHO. She serves the Strategic Advisory Board of the Foundation for Innovative Diagnostics and is on WHO's Roster of Digital Health Experts. She serves on the Editorial Moard for biomedical journals and regularly reviews for key international health agencies.

She is an elected member of the College of New Scholars, Artists & Scientists of the Royal Society of Canada.

Materials science

Meet the full editorial team for *Heliyon Materials science*.



Prof. Luis M. Gandía

Luis M. Gandía is a full professor of chemical engineering at the Public University of Navarre (UPNA) since 2010. Prof. Gandía obtained his Ph.D. in chemistry at the Faculty of Chemistry of the University of the Basque Country in Donostia/San Sebastián in 1993. He is a founding member of the Institute for Advanced Materials (InaMat) at UPNA. He is the head of a multi-disciplinary research team mainly working on renewable resources valorization and the development of catalytic materials for environmental and energy applications. His research interests include: preparation and physico-chemical characterization of heterogeneous catalysts; structured and micro-structured catalysts and chemical reactors; photocatalysis; biofuels and synthetic fuels; hydrogen energy; Li-ion batteries; methane conversion; CO₂ valorization and Computational Fluid Dynamics (CFD).

Mathematics

Meet the full editorial team for *Heliyon Mathematics*.



Prof. Hermann J. Eberl

Dr. Hermann Eberl is a professor in the Department of Mathematics and Statistics at the University of Guelph (Canada), where he is also the director of the Biophysics Interdepartmental Graduate Program. Prior to joining the University of Guelph he obtained his graduate degrees (Dipl.Math., Dr.rer.nat) at the Technical University of Munich (Germany) and was a postdoctoral fellow first at the Delft University of Technology (the Netherlands), and then at the GSF National Research Center for Environment and Health in Oberschleissheim (Germany).

His research is in mathematical modelling, analysis, and simulation of biological systems and their interaction with their physical environment. This encompasses dynamical systems, partial differential equations, numerical analysis and scientific computing. The two primary strands of his research in recent years were the development and application of mathematical methods in biofilm research and mathematical modelling of honeybee colonies and their diseases.

Microbiology

Meet the full editorial team for [Heliyon Microbiology](#).



Dr. Dana Stanley

Associate Professor Dana Stanley was awarded a PhD in molecular microbiology from Victoria University, Melbourne, in 2009. Her PhD project, "Generation and Characterisation of Ethanol-Tolerant *Saccharomyces cerevisiae* Mutants," investigated the molecular and metabolic determinants of ethanol tolerance in yeast and was awarded "the most outstanding PhD in 2009" by the University. Prof. Stanley held a postdoctoral position in CSIRO's Animal Health Laboratories (AAHL), one of the world's most sophisticated animal research laboratories, where she researched poultry intestinal health, specifically gut microbiota and genetics. Currently, Prof. Stanley is a leader of the molecular microbiology research cluster at Central Queensland University, focusing in human and livestock intestinal health, probiotic and next generation antibiotic development and pathogen control. She is working in collaboration with world's leading probiotic companies on research projects aiming to improve intestinal health of agricultural animals and humans. Prof. Stanley's work has been published in *Nature Medicine* (as the first author), *Nature Communications* and *Nature Immunology*.

Neuroscience

Meet the full editorial team for [Heliyon Neuroscience](#).



Dr. Mario Tiberi

Dr. Mario Tiberi is a senior scientist at the Ottawa Hospital Research Institute's Neuroscience Program, and associate professor at the University of Ottawa Faculty of Medicine in the departments of medicine, cellular and molecular medicine, and psychiatry. He is also a member of the University of Ottawa Brain and Mind Research Institute. Dr. Tiberi completed his PhD in Pharmacology (1990) on opioid receptors at the Université de Montréal under the supervision of Dr. Jacques Magnan, before moving on to a very successful post-doctoral training at the Howard Hughes Medical Institutes at Duke University in Dr. Marc Caron's laboratory. It was during his postdoctoral training that Dr. Tiberi refined his area of research expertise in molecular biology and biochemistry of dopamine receptors. His research interests focus on dopamine receptors, G proteins, signal transduction, desensitization and phosphorylation. Dr. Tiberi's work aims to understand complex structure and molecular relationships of dopamine receptor signaling complexes using in vitro cellular systems and pre-clinical in vivo models, with the aim of aiding in the development of novel therapeutic strategies for brain disorders such as Parkinson's disease, stroke, schizophrenia and drug addiction. Dr. Tiberi has published over 50 scientific papers and edited two books. He has wide experience with undergrad and graduate student supervision as well as teaching. Many of his former graduate students have gone on to successful independent research careers.

Pharmaceutical science, pharmacology and toxicology

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Prof. Emilio Clementi

Emilio Clementi graduated in medicine and surgery at the University of Milano, received his doctorate in pharmacotherapy at the University of Brescia to move as research fellow to the University College London. He is currently full professor of pharmacology and director of the clinical pharmacology unit of the National Health System at the University of Milano, co-opted member in the executive committee of the International Union of basic and clinical Pharmacology (IUPHAR).

He has published on the pathophysiology of nitric oxide and its relevance in therapeutic perspective, especially in skeletal muscle, and on pharmacokinetics, pharmacogenetics and pharmacoepidemiology in paediatrics. He is presently the editor in chief of pharmacological research.

**Dr. Dimitrio Lamprou**

Dimitrios Lamprou (Ph.D. MBA) is a reader in pharmaceutical engineering and the MSc programme director in industrial pharmaceuticals at the School of Pharmacy in Queen's University Belfast (UK). He is also the chair at United Kingdom and Ireland Controlled Release Society (UKICRS). Dr. Lamprou specialises in the areas of pharmaceutical manufacturing & emerging technologies and his research and academic leadership have been recognised in a range of awards, including the Royal Pharmaceutical Society Science Award and the Scottish Universities Life Sciences Alliance Leaders Scheme Award. His group is applying nano and microfabrication techniques in pharmaceutical and medical device manufacturing, such as 3D printing & bioprinting, electrospinning and microfluidics.

**Dr. Martin Leonard**

Dr. Leonard obtained his PhD in pharmacology in 2000 from University College Dublin, Ireland. He has over 15 years' experience as a toxicologist focussed to developing and improving on models and methods for assessment of toxicological hazard, including the use of high content omics technology and iPSC in vitro models of the airway. Dr. Leonard is a European registered toxicologist and currently holds a position as principal toxicologist at Public Health England directing research into the mechanisms of allergen and particulate hazard associated with asthma and allergic airway disease. Dr. Leonard has published extensively in the fields of toxicology, cell biology and immunology. In addition to section editor at Heliyon, he is also associate editor for the journal Toxicology in Vitro.

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**Prof. Gerald Cleaver**

Gerald B. Cleaver earned his Ph.D. in early universe cosmology and string theory at Caltech. He is a professor and graduate program director of the department of physics at Baylor University in Waco, Texas. He also heads the Early Universe Cosmology and String Theory (EUCOS) division of Baylor's Center for Astrophysics, Space Physics and Engineering Research (CASPER).

With CASPER colleagues, Prof. Cleaver (i) explores quantum gravity effects in the early universe and the signatures of specific quantum gravity proposals, especially with regard to the cosmic microwave background (CMB), (ii) studies relativistic thermodynamics and physics & cosmology applications to cryptography, (iii) analyzes spacetime curvatures (and their possible divergences) for theorized spacetime wormholes, and (iv) investigates advanced spacecraft propulsion systems. Prof. Cleaver was a member of a NASA blue-ribbon review committee for advanced propulsion system proposals. He has written over 100 journal articles and conference proceedings, is co-author of an elementary particle physics textbook, author of six book chapters, on the editorial board of four science journals, and referee for nine physics journals.

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Research article

In guidelines physicians trust? Physician perspective on adherence to medical guidelines for type 2 diabetes mellitus



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ABSTRACT

Aims: Adherence to treatment guidelines and treatment success are low in Type 2 diabetes mellitus (T2DM). This study aims to capture the physician perspective on T2DM guideline adherence and identify levers for increasing adherence.

Methods: A survey among German physicians captured the perceived value of 4 areas in the national treatment guideline (NVL), 13 possible barriers, and 9 possible enablers for guideline adherence. Perceived value was assessed by ranking 4 NVL areas by implementation difficulty and impact on treatment success. Barriers and enablers were assessed by rating their influence on guideline deviation and adherence. The consistency of results across subgroups was assessed using Fisher's exact test.

Results: Responses from 46 physicians showed a strong consensus about the value of each NVL area. Physicians perceived patient inability and demotivation to be the strongest adherence barriers (93%, 78%). All queried enablers were approved by $\geq 50\%$ of participants. Physicians considered cross-provider collaboration and electronic therapy decision support as strongest enablers (85%, 80%). Consistency was high between subgroups.

Conclusion: This study suggests that physicians consider patient-related factors to be stronger barriers for guideline adherence than physician-related factors. Finding opportunities to increase physician buy-in is important for better guideline adherence. In this study, physicians voiced appreciation for adherence enablers based on digital solutions to support the care process and to reduce the complexity of therapy decisions.

1. Introduction

Treatment success in diabetes is not satisfactory. Glycemic control, i.e. achieving target levels of glycated hemoglobin (HbA1c), is low [1, 2]. Internationally, only about 40–60% of patients are achieving glycemic control [3]. Yet, previous studies have established that even mild hyperglycemia, over a longer period, leads to diabetes complications. Also, early treatment of hyperglycemia has favorable, long term effects on complications [3, 4].

To address hyperglycemia and diabetes complications, medical guidelines have been issued. They aim to embed the latest scientific knowledge and best practices in daily medical practice, to improve treatment success. Guidelines are formally established in most countries but implementation success and monitoring of guideline adherence are lacking [5].

Adherence rates to T2DM guidelines are low, typically at around 40–60%. Often, guideline adherence is measured by assessing which share of participants has received a lab test or examination (e.g. annual

HbA1c screening, foot examination). In some cases, adherence is measured longitudinally by assessing whether a treatment algorithm was followed or by evaluating whether certain structural requirements of the guideline were met [6, 7, 8, 9].

Achieving guideline-adherent disease management depends on patient factors, health care system factors, and physician factors. Patient factors include e.g. health literacy, lifestyle, or awareness of the disease. Health care system factors include e.g. availability of disease registry, collaboration among the interdisciplinary care team, or visit planning and follow-up. Physician factors include e.g. time for patient care, the ability to set clear treatment goals, and reactive vs. proactive approach to care [10, 11, 12]. There is much less information available about physician factors leading to non-adherence than about patient and system factors. Physicians have a significant influence on achieving guideline adherent care, and thus, treatment success [3].

In Germany, 7.5 M adults (20–79 years) are supposed to have diabetes, 90% of them T2DM. An estimated 34% of these cases are

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Research article

Analysis of the distribution of microfractures and micropores within granitic rock using simultaneous polarization–fluorescence microscopy

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ABSTRACT

The analysis of the distribution of microfractures and micropores is important to accurately characterise mass transfer within a rock body. In this paper, a new 'simultaneous polarization–fluorescence microscopy' method is presented, which can be used to analyse the distribution of microscopic voids, including microfractures and micropores, in granitic rock. In this method, thin sections prepared with fluorescent dye are analysed under a polarizing microscope equipped with a fluorescent reflected light source. Using both the transmitted and the fluorescent light sources, both the distribution of microfractures and micropores, and petrographic characteristics (mineral occurrences) can be determined efficiently and simultaneously. The distribution of microfractures and micropores observed in images of granites obtained using simultaneous polarization–fluorescence microscopy is consistent with the distribution observed in backscattered electron images. The low magnification characterisation of the distribution of microscopic voids also provides targeting for subsequent studies including scanning electron microscopy under high magnification, chemical analysis, and image processing.

1. Introduction

The characterisation of mass transfer within granitic rock (e.g. pathway, rate, and direction) contributes to safety evaluations of the geological disposal of nuclear waste and the geological storage of oil and natural gas. Microfractures and micropores in minerals act as migration pathways for mass transfer through granitic rock (e.g. Ishibashi et al., 2014, 2016b; Yuguchi et al., 2019). Therefore, the characterisation of microfractures and micropores deduced from both of low- and high-resolution analyses is important to accurately evaluate mass transfer within a rock body. High-resolution analyses (e.g. SEM analysis) can provide the detailed characterisation of microfractures and micropores (e.g. measurement and parameterization), while lower-resolution analytical techniques are required to understand their distributions. In this respect, this study presents an analytical method for evaluating the distribution of microfractures and micropores based on simultaneous polarization–fluorescence microscopy as lower resolution analytical technique.

In a previous study dealing with the analysis of the distribution of microfractures and micropores, Takagi et al. (2008) described the distribution of open microfractures in granitic minerals, based on polarized

light microscope (POM) and cathodoluminescence images. Li et al. (2017) presented a method of fracture characterisation in carbonate rock using Sony TA-1150 X-ray computed tomography (CT) imagery. Although the X-ray CT imagery can provide three-dimensional information about fractures within a rock sample (e.g. Johns et al., 1993; Ketcham et al., 2010; Cnudde and Boone, 2013). A combination of X-ray CT imagery with the ¹⁴C-labelled-polymethylmethacrylate method can provide three-dimensional distributions of minerals and porosities in granitic rock at a high-resolution (e.g. Voutilainen et al., 2012; Mazurier et al., 2016). Method of confocal scanning laser microscopy also can characterise the three-dimensional fracture network in granite sample (e.g. Montoto et al., 1995; Menéndez et al., 1999). However, their methods can be difficult to get access.

Ishibashi et al. (2016a) employed a fluorescence microscope equipped with a polarization system (Leica M205 FA). Based on this system, they obtained fluorescence microscopy (FLM; excitation wavelength: 450–490 nm, absorption wavelength: >500 nm) and POM images. The distribution of microfractures and micropores, and petrographic information were obtained by overlaying the FLM and POM images using digital image processing. Yuguchi et al. (2019) described the distribution and shapes of micropores within altered plagioclase based on

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