2023 The 4th International Conference on
Novel Functional Materials
&
2023 The 6th International Conference on Sustainable
Development of Water and Environment

Conference Schedule

Hong Kong, China

June 18-19, 2023.

https://www.icsdwe.org/

https://icnfm.net/

Welcome Messages

Dear Colleagues and Friends,

It is our great pleasure and privilege to invite you to 2023 The 6th International Conference on Sustainable Development of Water and Environment, ICSDWE & 2023 4th International Conference on Novel Functional Materials, ICNFM, which will take place in Hong Kong, China, from June 18 to 19, 2023. We are excited about the opportunities of holding these innovative hybrid conferences and reaching the wider audience that conferences can reach. Participants from all around the world are expected to actively participate in these events. This upcoming conference will be held under a set of themes: in Water, Environmental and Novel Functional Materials, etc. We are certain that this will be a platform to gather and disseminate the latest knowledge from recent advancements. During these conferences, which will provide a platform for scholars, engineers, students, etc., Many thanks to the members of the TPC and the Organizing Committee for their input and support.

We hope you can expect a really fruitful and enjoyable time in Hong Kong.

We would like to thank and welcome everyone, and we hope you will enjoy ICSDWE2023 & ICNFM2023!

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For more committees information, please check the website:
https://www.icsdwe.org/pages/committee.html

Committees ICNFM

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Prof. Xibao Li, Nanchang Hangkong University, China

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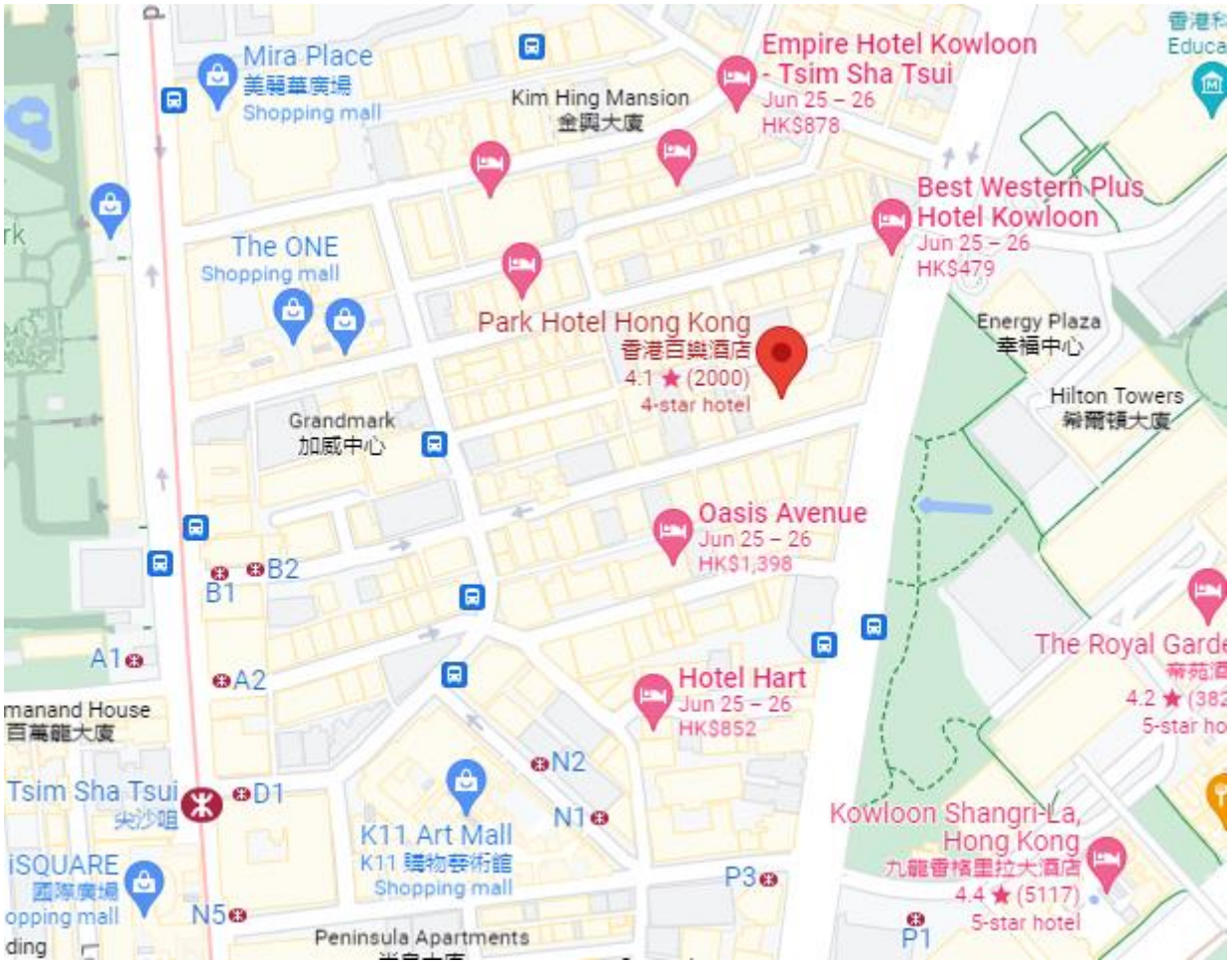
Dr. Abderrazak Boutraminem, Ibn Zohr University Agadir, Morocco

Venue (June 19, 2023)

The Park Hotel

Address: Park Hotel Hong Kong, Chatham Rd S, Tsim Sha Tsui, Hong Kong



ICNFM2023 ICSDWE2023

Time Schedule

(Hong Kong, China, UTC/GMT+8)

June 18, 2023 UTC/GMT+8 (Online in ZOOM)		
Speaker's time slot	**Standard Time (Hong Kong, China, UTC/GMT+8)**	**Presentation Information**
	08:30-08:35 am	**Opening Speech**
	08:35-11:50 am	**Keynote Session**
08:35-09:05 am UTC/GMT+8	08:35-09:05 am	**Prof. Weimin Huang** Nanyang Technological University, Singapore
09:05-09:35 am UTC/GMT+8	09:05-09:35 am	**Prof. Jinlian Hu** City University of Hong Kong, China
09:35-10:05 am UTC/GMT+9	09:35-10:05 am	**Prof. Kirihara Soshu** Osaka University, Japan
	10:05-10:20 am	**Break & Poster Session**
10:20-10:50 am UTC/GMT+8	10:20-10:50 am	**Prof. Laichang Zhang** Edith Cowan University, Perth, Australia
10:50-11:20 am UTC/GMT+8	10:50-11:20 am	**Prof. Sinin bin Hamdan** Universiti Malaysia Sarawak, Malaysia
	11:20-11:50 am	**Dr. Elias Randjbaran**
	11:50-12:50 pm	**Lunch & Poster Session**
	12:50-13:50 pm	**Keynote Session**
12:50-13:20 pm UTC/GMT+8	12:50-13:20 pm	**Dr. Jian Zang** Chongqing University, China
13:20-13:50 pm UTC/GMT+8	13:20-13:50 pm	**Prof. Xiaosheng Qin** Nanyang Technological University, Singapore
	13:50-14:35 pm	**Oral Session**
15:50-16:05 pm UTC/GMT+10	13:50-14:05 pm	Paper ID: SD692 Junmei LI
09:05-09:20 am UTC/GMT+3	14:05-14:20 pm	Paper ID: 318 Mahmoud Sharaan
09:20-09:35 am UTC/GMT+3	14:20-14:35 pm	Paper ID: SD604 Desislava Botseva
	14:35-14:50 pm	**Break & Poster Session**
	14:50-15:50 pm	**Keynote Session**
14:50-15:20 pm UTC/GMT+8	14:50-15:20 pm	**Prof. Peiyue Li** Chang'an University, China
08:20-08:50 pm UTC/GMT+1	15:20-15:50 pm	**Dr. Mujeeb Ahmed** Newcastle University, UK
	15:50-16:50 pm	**Oral Session**
15:50-16:05 pm UTC/GMT+8	15:50-16:05 pm	Paper ID: SD635 Zhiwei Cao
11:05-11:20 am UTC/GMT+3	16:05-16:20 pm	Paper ID:SD605 Veselina Lyubomirova
11:20-11:35 am UTC/GMT+3	16:20-16:35 pm	Paper ID: 302 Alexander Sukhinov
11:35-11:50 am UTC/GMT+3	16:35-16:50 pm	Paper ID: SD606 Elenita Velikova

ICNFM2023 ICSDWE2023

Time Schedule

(Hong Kong, China, UTC/GMT+8)

June 18, 2023 (Sunday), 14:00-16:00 Registration
Lobby of The Park Hotel Hong Kong

June 19, 2023 UTC/GMT+8 (The Park Hotel Hong Kong)

Standard Time (HongKong, China UTC/GMT+8)	Presentation Information
09:00-09:30 am	**Opening Speech & Plenary Talk**
09:00-09:30 am	**Prof. Yun Wang** University of California, Irvine
09:30-10:30 am	**Keynote & Invited Session**
09:30-10:00 am	**Prof. Agostinho Antunes** University of Porto, Portugal
10:00-10:30 pm	**Dr. Bin Liu** Changsha University of Science & Technology, China
10:30-10:45 am	Photo & Coffee Break & Poster Session
10:45-11:00 am	**Oral Session**
10:45-11:00 am	Paper ID: 303 Wong Voon Loong
11:00-11:30 am	**Keynote Session**
11:00-11:30 am	**Prof. Jeffrey Chi-Sheng Wu** National Taiwan University, Taiwan
11:30-12:00 am	**Oral Session**
11:30-11:45 am	Paper ID: 17 Yen-Chun Chen National Taipei University of Technology, Taiwan
11:45-12:00 am	Paper ID: NF418 Xinglan Cui GRINM Resourcesand EnvironmentTech.Co.,Ltd.,Beiing, China
12:00-13:00 pm	Lunch & Break & Poster Session
13:00-13:30 pm	**Keynote & Invited Session**
13:00-13:30 pm	**Dr. Tingting Yang** Southwest Jiaotong University, China
13:30-15:45 pm	**Oral Session**
13:30-13:45 pm	Paper ID: 316 Innocent J. Macha
13:45-14:00 pm	Paper ID: 297 Dan Wang
14:00-14:15 am	Paper ID: SD715 Aaron Paul Ilao Carabbacan
14:15-14:30 am	Paper ID: 300 Ning Jing
14:30-14:45 am	**Coffee Break & Poster Session**
14:45-15:00 pm	Paper ID: 299 Dawei Mu
15:00-15:15 pm	Paper ID: SD716 Franklyn F. Manggapis
15:15-15:30 pm	Paper ID: 301 Yuanhang Wang
15:30-15:45 pm	Paper ID: SD765 Junming Gong

Keynote Speakers

(in chronological order)

Prof. Weimin Huang

Nanyang Technological University, Singapore

Dr. Wei Min Huang is currently an Associate Professor (tenured) at the School of Mechanical and Aerospace Engineering, Nanyang Technological University, Singapore.

With over 25 years of experience on various shape memory materials (alloys, polymers, composites and hybrids), he has published over 200 papers in journals, such as Materials Today, Accounts of Chemical Research, and Advanced Drug Delivery Reviews, and has been invited to review manuscripts from over 300 international journals (including Progress in Polymer Science, Nature Communications, Advanced Materials, and Advanced Functional Materials, etc), project proposals from American Chemical Society, Hong Kong Research Grants Council, etc, and book proposals from Springer, Elsevier and CRC. He has published two books (Thin film shape memory alloys – fundamentals and device applications, Polyurethane shape memory polymers) and is currently on the editorial board of over three dozen of journals.

Speech Title: Rapid additive manufacturing anywhere anytime

Abstract: There is a growing demand for rapid 3D printing technology in challenging working environments such as space, air, sea, or land missions, where gravitational force may be absent, or severe random disturbances may occur continuously. However, reliable techniques for such environments are yet to be developed. This study aims to address this issue by developing a technology that enables rapid 3D printing in the solid state of polymeric materials, thereby eliminating problems in harsh working conditions.

The proposed approach involves cross-linking polymeric materials in the solid state using either UV-light or photo-induced heat for rapid 3D printing. Uncross-linked parts can be removed by melting through heating or cooling, or washing away with solvents, or even by mechanical separation. To ensure high accuracy of the printed items, the shape memory effect (SME) of the cross-linked polymers is applied.

Our successful demonstration of this concept using thermal gel, UV-cross-linkable vitrimer, and other conventional materials provides a promising basis for further development and application of this technology in challenging working environments.

Keynote Speakers

(in chronological order)

Prof. Jinlian Hu

City University of Hong Kong, China

Professor Hu joined in City University of Hong Kong in 2020 and she is the Professor of Department of Biomedical Engineering. She is a Fellow of Royal Society of Chemistry and Fellow of Textile Institute, UK and Fellow of Hong Kong Institution of Textiles and Apparel respectively. Professor Hu has compelling impacts on industries. Specifically, Professor Hu is a pioneer and distinguished academic leader with world-wide impact in shape memory materials and artificial spider silks for textiles and clothing, healthcare and biomedical applications. She has Google H-index of 60 with 15149 citations, published 14 books, 34 book chapters, >120 plenary/keynote conference lectures and >350 refereed journal Papers. Her laboratory in City U currently focuses on unearthing scientific principles and providing solutions to key problems in Healthcare of Wearable Materials in three major areas: Traditional Chinese medical therapies and their materials, energy materials and healthcare as well as spider silks and their relatives as biomaterials as well as personal protective integration.

Speech Title: Innovation and future of functional textile materials

Abstract: With the continuous progress and breakthrough of scientific and technological civilization, human society has entered a subversive, revolutionary and innovative era. Many new materials with multifunctional and high performance are constantly being created, thus changing our lives. As the basic material of our life and the material of many industries, textile materials and textiles are also evolving into a new wave of invention and innovation. Innovative multi-functional textile materials are no longer only to meet the basic wearing needs of human beings like traditional fabrics, but from different aspects to create convenience for our life, improve our quality of life and contribute to new technology innovation such as digital health. This new wave will bring enormous opportunities and prosperity to our textile industry, materials fields, bringing health and happiness to mankind. Therefore, this report will begin with the development history of textile materials, and then enter the development and transformation of textile materials, from natural flax and silk to artificial polyester fiber, from basic practical functions to advanced intelligent applications. The report presents textile materials with memory functions as a key representative and provides knowledge and methods for the connection between the properties, processing methods, basic structures, and their properties in applications of functional textile materials. Through the cooperation of textile material scientists all over the world, functional textile materials will shine new light in various fields.

Keynote Speakers

(in chronological order)

Prof. Kirihara Soshu

Osaka University, Japan

Professor Soshu Kirihara is a doctor of engineering and a professor of Joining and Welding Research Institute (JWRI), Osaka University, Japan.

In his main investigation “Materials Tectonics as Sustainable Geoengineering” for environmental modifications and resource circulations, multi-dimensional structures were successfully fabricated to modulate energy and materials flows effectively. Ceramic and metal components were fabricated directly by smart additive manufacturing, design and evaluation (Smart MADE) using high power ultraviolet laser lithography. Original stereolithography systems were developed, and new start-up company “SK-Fine” was established through academic-industrial collaboration.

Speech Title: Stereolithographic Additive Manufacturing of Practical Components with Functionally Geometric Structures

Abstract: In stereolithographic additive manufacturing (STL-AM), 2-D cross sections were created through photo polymerization by UV laser drawing on spread resin paste including nanoparticles, and 3-D models were sterically printed by layer lamination. The lithography system has been developed to obtain bulky ceramic components with functional geometries. An automatic collimeter was newly equipped with the laser scanner to adjust the beam diameter. Fine or coarse beams could realize high resolution or wide area drawings, respectively. As the row material of the 3-D printing, nanometer sized metal and ceramic particles were dispersed into acrylic liquid resins at about 60 % in volume fraction. These materials were mixed and deformed to obtain thixotropic slurry. The resin paste was spread on a glass substrate with 50 μm in layer thickness by a mechanically moved knife edge. An ultraviolet laser beam of 355 nm in wavelength was adjusted to 50 μm in variable diameter and scanned on the spread resin surface. Irradiation power was automatically changed for an adequate solidification depth for layer bonding. The composite precursors including nanoparticles were dewaxed and sintered in the air atmosphere. In recent investigations, ultraviolet laser lithographic additive manufacturing (UVL-AM) was newly developed as a direct forming process of fine metal or ceramic components. As an additive manufacturing technique, 2-D cross sections were created through dewaxing and sintering by UV laser drawing, and 3-D components were sterically printed by layer laminations with interlayer joining. Through computer-aided smart manufacturing, design, and evaluation (Smart MADE), practical material components were fabricated to modulate energy and material transfers in potential fields between human societies and natural environments as active contributions to Sustainable Development Goals (SDGs).

Keynote Speakers

(in chronological order)

Prof. Laichang Zhang

Edith Cowan University, Perth, Australia

Prof. Laichang Zhang was awarded his PhD of Materials Engineering at the Institute of Metal Research, Chinese Academy of Sciences.

Prof. Zhang has considerable expertise and extensive cross-disciplinary research activities in advanced manufacturing of different types of materials (including nanocrystalline / ultrafine-grained materials, bulk metallic glasses, biomaterials, and high-strength steels) and the understanding of their processing, microstructure and properties (e.g. mechanical properties, fatigue properties, corrosion behavior and catalytic performance). Prof. Zhang has extensively contributed to a number of research grants supported by Australian Research Council, European Union, National Natural Science Foundation of China, Ministry of Science and Technology of China. Prof. Zhang has been serving as Editorial Board Members for many prestigious academic journals such as Advanced Engineering Materials, Materials Science and Technology, Metals, Heliyon and so on. He also has good links to industry both for teaching and research.

Speech Title: Corrosion behavior and mechanisms of 3D-printed biomedical titanium alloys

Abstract: Additive manufacturing technology can efficiently fabricate complex parts in near-net shape because it does not need to process molds and subsequent processing technology in component production. Additive manufacturing technology has become a research hotspot in recent years. Compared with traditionally prepared titanium alloys, 3D printed titanium alloys generally exhibit higher strength and plasticity. Since titanium alloys are often used in working environments with corrosive atmospheres, it is particularly important to study the corrosion behavior of 3D printed titanium alloys. However, there are very few studies on the corrosion behavior of 3D printed titanium alloys. This talk reports the corrosion behavior of various titanium alloys prepared by 3D printing technology (e.g., selective laser melting, electron beam melting). Studies have shown that the corrosion behavior of 3D printed titanium alloys is directly related to the 3D printing process and the microstructure of the fabricated alloy.

Keynote Speakers

(in chronological order)

Prof. Sinin bin Hamdan

Universiti Malaysia Sarawak, Malaysia

Professor Sinin bin Hamdan area of specialization is Materials Mechanics. His Bachelor of Science (BSc) with Honor in Physics was from National University Malaysia, 1984. Master of Science (MSc) in Welding and Adhesive Bonding of Engineering Materials from Brunel University of West London, UK 1986 and Doctor of Philosophy in Materials Mechanics from Loughborough University of Technology, United Kingdom 1994. His main interest in research include wood polymer composite, acoustic of wood, biodegradable composite and gamelan musical instrument. Most work concentrate on physical, mechanical, thermal and acoustic properties of materials. His main expertise is in dynamic mechanical thermal analysis (DMTA), differential scanning calorimetry (DSC), thermal gradient analysis (TGA), x-ray diffraction (XRD), Fourier transform infrared analysis (FTIR) and vibration. He is an Associate member of the Plastic and Rubber Institute Malaysia (PRIM) and a fellow to Malaysian Association of Solid State Science (MASS). He was appointed as a senate member for 3 years from 26th October 2015 to 25th October 2018. Currently he is a senior felo at Faculty of Engineering, Universiti Malaysia Sarawak.

Speech Title: Jute bamboo cellulose composite

Abstract: In general, natural fibers are hydrophilic due to cellulose and hemicellulose causing diffuse and weak interfacial bonding between fibers and matrix. Chemical modification reduced the hydrophilicity and enhance compatibility. Nano-fillers are added to enhance adhesion between fibers by filling the void. Many works on thermal stability and mechanical properties of jute, bamboo, cellulose and their composites. Little works are emphasis on chemical modification using Hexamethylene Diisocynate (HDI) cross-linker monomer. This work concentrates on the effects of HDI, nano-clay (MMT) & tin(iv) oxide nano-powder on thermal, mechanical and morphological properties of treated jute bamboo cellulose composites at various fibers loading. The treatment of fibers is key to successful preparation. Preparation of jute-bamboo hybrid composites only used conventional method. The characterization of composites yields the key to good outcome in research.

Keynote Speakers

(in chronological order)

Dr. Elias Randjbaran

Dr. Elias Randjbaran is a highly experienced Metallurgical Engineer with a PhD and Master's degrees in Materials Engineering from the Department of Aerospace Engineering at Universiti Putra Malaysia (UPM).

With over 20 years of expertise in the Composite Materials Industry, Dr. Randjbaran has developed a strong research interest and focus on Progressive damage analysis of thin-walled composite laminated structures, Buckling and post-buckling of nano composite structures, Structural crashworthiness, and ballistic impact analysis. Furthermore, Dr. Randjbaran is a member of several prestigious societies, including Aerospace Society Malaysia (AEROS Malaysia), American Society of Mechanical Engineers, American Society of Civil Engineers, and Space & Satellite Professionals International. Dr. Randjbaran is a skilled research professional with a proven track record, having led his team in publishing over 30 papers in peer-reviewed academic journals, achieving a citation of more than 430, an h-index of 11, and an i10-index of 15. His areas of expertise include defence, space, and advanced manufacturing.

Title: Offsetting textile waste and cork in the built environment to achieve Net

Abstract: ZeroThis paper explores the potential benefits of offsetting textile waste and cork in the built environment towards achieving Net Zero. Focusing on the defense, advanced manufacturing, and space sectors, the study highlights the need for sustainable practices in these areas to minimize waste and greenhouse gas emissions. The circular economy approach, through the use of recycled textiles and cork-based insulation systems, has the potential to substantially reduce waste and environmental impact in the defense sector. In the advanced manufacturing sector, the study underscores the role of innovative 3D printing technology in minimizing material waste and supporting sustainability. Meanwhile, the space and aerospace industries could benefit from utilizing sustainable cork-based insulation materials and recycled textile.

Keynote Speakers

(in chronological order)

Prof. Jeffrey Chi-Sheng Wu

National Taiwan University, Taiwan

Jeffrey C. S. Wu received his Ph.D. degree in Chemical Engineering from the University of Pittsburgh in the USA. From 1989 to 1994 he was a Senior Research Engineer at the Alumina Company of America (Alcoa), Pittsburgh, Pennsylvania, USA. He joined National Taiwan University (NTU) as an Associate Professor in 1994, and became Distinguished professor in the Department of Chemical Engineering at NTU in 2019. Professor Wu's current research interests are to develop improved strategies and materials for (a) the highly efficient photoreduction of CO2 with H2O to fuel; (b) photocatalytic water splitting for H2 prodution; (c) photocatalytic selective catalytic reduction of NOx air pollutant; and (d) biodiesel systhesis using solid acidic catalysts. Professor Wu was elected a Fellow of the Taiwan Institute of Chemical Engineers in 2022. He received a number of prestigious awards including "Lai Tzai-Der award" of Taiwan Institute of Chemical Engineers in 2009, "Chemical Technology Award" of Taiwan Institute of Chemical Engineers in 2006, "Silver medal of National Invention", Taiwan in 2004, "Outstanding Research Achievement," National Taiwan University in 2004 and "Outstanding Scientist and Engineer, Taiwan Tai-Ching Educational Foundation in 2000. He is currently an editor of Catalysis Communications.

Speech Title: CuZn Oxides Catalysts and Their Performance in Hydrogenation of Carbon Dioxide to Methanol

Abstract: To deal with global warming and climate change, hydrogen is considered green energy to avoid carbon dioxide emission. However, hydrogen is difficult to transport and store due to low energy density by volume at ambient temperature. Nowadays some researchers suggest converting hydrogen into liquid form. Methanol is among the best mediates of high energy density and raw chemicals. This research focuses on the carbon dioxide hydrogenation to methanol using Cu/ZnO-based catalysts in a packed-bed system. We investigated carbon dioxide hydrogenation to methanol reaction. We tried to solve two kinds of problems in the industry: the low catalytic efficiency of commercial catalysts and the high operated pressure. For the catalyst side, we compared with different promoters, Cu:Zn molar ratio, and different dopants, then we found that using 3 mol % Mg as dopant synthesized Cu/ZnO/Ga2O3 with molar ratio Cu:Zn:Ga = 6:3:1 could get highest methanol yield at 230 °C and 4 bar. Furthermore, we designed the new hydrophobic catalysts using Cu, Zn, Al, La loading on h-BN, 20CZALa/hBN showed higher methanol selectivity due to hydrophobic surface. The XRD, SEM, XPS, EDS, H2-TPR, CO2-TPD, and contact angle were used to analyze the catalysts' characteristics and explain the activity test results. In addition, we investigated CO hydrogenation and CO2 hydrogenation with different overall flow rates and H2 partial pressure, respectively. The result indicated that the methanol yield for CO2 hydrogenation was ten times larger than CO hydrogenation under 0 – 4 bar.

Keynote Speakers

(in chronological order)

Dr. Jian Zang

Chongqing University, China

Jian Zang, the young teacher and research associate of SuDBE team in the School of Civil Engineering of Chongqing University. He got his PhD. from Newcastle University civil engineering, he is now a national foreign project leader, a member of the national "Huang Danian type" excellent teacher team, a young research scholar member of the International IWA Water Conservation Association, a special postdoctoral grant winner in Chongqing, and a teacher of the national low carbon Green Building International Joint Research Center, teacher of "Sustainable Building Environment Creation Teacher Team". He was the overall technical designer of the intelligent algorithm team of the General Institute of Civil Products of the 36th Research Institute of China Electronics Technology Group Corporation. He has published his research in the Journal of Environmental Management, Building and Environment, Water Research & Technology and other important international journals. He has edited one international monograph and published about 10 international papers in the area of sustainable and resilient environment.

Assoc. Prof. Xiaosheng Qin

Nanyang Technological University, Singapore

Dr. Xiaosheng Qin is currently an Associate Professor with School of Civil and Environmental Engineering in Nanyang Technological University, Singapore.

He obtained his Bachelor's and Master's degrees from Hunan University, China, and PhD degree from University of Regina, Canada. Dr. Qin mainly teaches Hydrology and Water Resources Engineering at both undergraduate and graduate levels. His research interests focus mainly on the topics of water resource systems modelling and urban environmental resources management. Dr. Qin has served as local panel of experts on climate modeling sponsored by BCA from 2011 to 2014 and worked (as PI or Co-PI) on many research projects supported by Singapore governmental agencies such as MND, BCA, MOE, JTC, NParks, EOS, and EWI. Dr. Qin is currently the Associate Editors for Journal of Environmental Informatics and Water Science and Technology, and serves (or served) as board members, and guest editors for 7 international journals. Dr. Qin was invited as reviewers for over 50 scientific journals and produced over 180 scientific publications (peer-reviewed journal & conference papers) with total citations at 3036 and H-index at 32 according to Web of Science record as of Feb 2023. Dr. Qin's name was featured in World's Top 2% Scientists in 2022 by Stanford University.

Keynote Speakers

(in chronological order)

Dr. Mujeeb Ahmed

Newcastle University, UK

Dr. Mujeeb Ahmed is a senior lecturer in the Secure and Resilient Systems Group at the School of Computing at Newcastle University. Prior to this, he served as a lecturer in cyber security at The Computer and Information Sciences Department at the University of Strathclyde. He completed a Ph.D. in Information Systems Technology and Design at the Singapore University of Technology and Design under the supervision of Professor Aditya Mathur, Professor Jianying Zhou, and Professor Martin Ochoa. During his Ph.D., he worked at SUTD's iTrust Labs and testbeds on the security of cyber-physical systems (CPS). Dr. Mujeeb Ahmed got the opportunity to work with Professor Raheem Beyah at Georgia Tech during his Ph.D. exchange program. He received a Masters in Electrical and Computer Engineering from Seoul National University under the supervision of Professor Saewoong Bahk. At SNU, South Korea, his research was related to wireless communications. In particular, his MS thesis focused on cross-tier interference mitigation in femtocell networks.

Speech Title: Security Challenges and Opportunities in Water CPS

Prof. Peiyue Li

Chang'an University, China

Dr. Li is a full professor in hydrogeology and environmental science. He obtained his Ph.D. from Chang'an University, one of the national key universities in China.

His research interests include hydrogeology, hydrogeochemistry and groundwater modeling. He has been members of IAH, IMWA and NGWA since 2014, and been Guest Editors and Associate Editors for several internationally recognized journals. He has been awarded over ten national and provincial awards such as the Li Siguang Award and Zhang Bosheng Award for recognizing his outstanding achievements in geoscience. He has also been certified as a new start in science and technology by the Shaanxi Department of Science. He has been leader for more than 20 research projects supported by the National Natural Science Foundation of China (NSFC), Ministry of Science and Technology of China (MSTC), Ningxia Departments of Environmental Protection and Shaanxi Department of Science and Technology. He is now working on hydrogeochemical processes of wastewater irrigation, impacts of water-rock interactions on permeability of porous media, and hydrogeological variation of loess areas under urbanization.

Keynote Speakers

(in chronological order)

Prof. Yun Wang

University of California, Irvine

Yun Wang is currently a professor at University of California, Irvine. Prof. Yun Wang obtained his BS from Peking (Beijing) University in China in 1998, and his PhD in Mechanical Engineering from Pennsylvania State University (PSU) in 2006.

Prof. Yun Wang has made numerous seminal contributions to PEM fuel cell, Li-air battery, thermal management, and Two-phase flow in porous media and micro-channels. Prof. Yun Wang received the Outstanding Engineering Educator Award from the Orange County Engineering Council (OCEC) and the Applied Energy Certificate of Excellence: Most Downloaded Authors. Prof. Yun Wang received the OCEC President's Award in 2013; OCEC Outstanding Engineering Merit Award in 2020; the Applied Energy Top Cited Paper Award in 2013; and Highly Cited Paper in the Web of Science for 7 papers. He is currently associate editor of ASME journal of heat and mass transfer. He serves as faculty director for the school's international programs and undergrad advisor for ME program. He chaired the MAE undergrad study committee for a few years and led the program assessments (e.g. ABET, APRB, WASC) for ME in the period of 2013-2021.

Speech Title: On PEM fuel cell: water management

Dr. Bin Liu

Changsha University of Science and Technology, China

Dr. Bin Liu is currently a lecture at Changsha University of Science and Technology, China. He obtained his PhD degree in civil engineering planning and management from Central South University and Nanyang Technological University (exchange).

Dr. Liu mainly teaches water environmental engineering economic evaluation and decision analysis at both undergraduate and graduate levels. His research interests focus mainly on the topics of water resource systems modelling and urban environmental resources management. Dr. Liu has granted as national experts on Consulting Engineer since November 2020 and Class1 Cost Engineer since October 2020. He is currently an IEEE professional member and served as editorial board member of Hydro Science & Marine Engineering since October 2019. Dr. Liu has published 10 papers in the area of sustainable water resources and environmental management, including the Journal of Cleaner Production, Sustainable Cities and Society, Sustainable Development, Advanced Sustainable Systems, Water Resources Management and other important peer-reviewed journals

Invited Speakers

(in chronological order)

Prof. Agostinho Antunes

University of Porto, Portugal

Prof. Agostinho Antunes is the Head of the Evolutionary Genomics and Bioinformatics (https://www2.ciimar.up.pt/research.php?team=1) in the CIIMAR Interdisciplinary Centre of Marine and Environmental Research, University of Porto, and he is a Professor at the Department of Biology at the University of Porto, Portugal. His major research interests include genomics and blue biotechnology of natural resources, from microorganisms to animals, and their environmental interactions, disease and health (one health).

Dr. Tingting Yang

Southwest Jiaotong University, China

Dr. Yang Tingting is currently an associate professor at the School of Mechanical Engineering at Southwest Jiaotong University. Her research focuses on hydrovoltaic energy devices and flexible sensor devices.

She has published over 40 papers in journals such as Nature Communications, Advanced Energy Materials, Advanced Functional Materials, ACS Nano, etc. And she has been invited to review manuscripts including Nature Communications, Nano Energy, and others.

Oral Speakers D1

(in chronological order)

Author: Junmei Li
Affiliation: Yunnan University, China
Paper ID: SD692

Title: Assessment on Recreational Value of the Liming Scenic Spot of Laojun Mountain in Lijiang, China

Abstract: This paper used quantitative method to study the recreational value of tourism resources. The scenic spots have good tourism resources and ecological resources, which need to be protected and managed. Human activities have seriously threatened the ecological resources in the scenic spots. To study the impact of human activities on the environment as well as to estimate the environmental value of scenic spots is very crucial issue for protecting the ecological resources to be sustainable development. The Laojun Mountain Scenic Site in Lijiang, Yunnan Province, P.R.China, is known as the "ancestor of the mountains in Yunnan", which is one of the most representative landscapes of the "Three Parallel Rivers." The evaluation of the recreational value of Laojun Mountain Liming Scenic Spot will provide reference for the protection and management of its tourism resources and ecological environment. This study combined travel cost method (TCM) and contingent valuation method (CVM) to evaluate the recreational value of the Liming Scenic Spot of Laojun Mountain in Lijiang in 2015. Using the TCM method, we calculated its recreational value in 2015 to be 103.9 million yuan RMB. Using the CVM method, we estimated its recreational value in 2015 to be 30.1 million yuan RMB. We got the revised its recreation value in 2015 to be 67.0 million yuan RMB using the improved method based on TCM and CVM, which may reflect the recreation value of the environmental resources more comprehensively. The study also showed that age and family income of tourists had a significant impact on tourists' willingness to pay. The Liming Scenic Spot of Laojun Mountain has high recreational value. It should be rationally developed and maintained to make sustainable use of resources.

Author: Mahmoud Sharaan
Affiliation: Egypt-Japan University for Science and Technology
Paper ID: 318

Title: Learned Lessons from Japanese Experiences in Planning and Managing Fishing Ports

Abstract: This paper comes from a series of studies investigating the Egyptian fishing ports' challenges, opportunities, planning, and environmentally relevant issues since 2015. This study aims to enhance the Egyptian coastal fisheries and im-prove their efficiency, one of Egypt's suggested strategic initiatives for 2030, based on the Japanese experiences and practices in planning and managing their fishing ports, which are acquired during the field visit to some Japanese fishing ports. It was obvious that Japan is implementing strict management procedures and is going straight forward to better operational efficiency of its fishing ports. Promoting the Egyptian coastal fishing ports infrastructure considering the envi-ronmental issues based on proper Japanese experience to our culture is expected to support its operation more eco-efficient and sustainable and enhance the SDGs 8, 9, and 14.

Oral Speakers D1

(in chronological order)

Author: Desislava Botseva
Affiliation: University of National and World Economy
Paper ID: SD604

Title: Water under pressure - a model for evaluating the impact of economic growth on water resources

Abstract: Globalized economies, globalized societies, globalized challenges – human evolu-tion goes hand in hand with the contemporary problems of current societies. Eco-nomic growth takes its elevated price, assembling the topic of sustainable devel-opment multifaceted and binding the wide variety of economic, governance, so-cial, and environmental issues it should cover in the transition to sustainability. One of the modern challenges that await a just answer is the effective manage-ment of water resources. This management is obliged to balance water resource usage in different national and regional economies and between different econom-ic sectors to meet both the needs of modern development and those of future gen-erations. This approach requires all stakeholders – political actors, business, soci-ety, and science to play their fundamental roles and intensify their efforts towards a sustainable green transition of national economies. The present study carried out an independent assessment of the ability of the Bulgarian national and regional economies to walk the path to decoupling economic growth from water usage through the proposed author's methodology.

Author: Zhiwei Cao
Affiliation: Yellow River Engineering Consulting Co. Ltd, Zhengzhou
Paper ID: SD635

Title: River Healthy Assessment in Developing Countries- A Case Study on Yellow River

Abstract: With the rapid economic development of developing countries, river ecosystems are constantly being disturbed and damaged by human activities, and maintaining the healthy life of rivers has received more and more attention. This paper, taking the Yellow River as an example, conducts study to provide new technical support for river governance in developing countries. Since the people ruled the Yellow River, they have achieved world-renowned achievements in its governance, development and protection. However, the ultimate goal of maintaining a healthy life in the Yellow River is facing new challenges. By adopting classic theories such as system theory and information theory, this study optimizes the river health assessment system based on the River Health Index (RHI) through in-depth analysis of the health quality of the Yellow River's life system and its own stability, to provide technical support and theoretical basis for the protection and governance of the Yellow River Basin. The study finds that the overall evolution of RHI is firstly decreasing and then increasing, showing an oscillating upward trend; the total scouring and silting volume (the lower reaches of the Yellow River), the change rate of estuary wetland area, the guarantee rate of ecological base flow of important sections, and the discharge capacity of the main channel (Ningxia-Inner Mongolia Section) are the key factors affecting the healthy life system of the Yellow River.

Oral Speakers D1

(in chronological order)

Author: Veselina Lyubomirova
Affiliation: University of National and World Economy
Paper ID: SD605
Title: Mineral water resources management in the Bulgarian regions

Abstract: The territory of Bulgaria is one of Europe's oldest and richest geothermal spring regions. In the country are currently known hundreds of mineral water deposit fields. State regulations and municipal strategies for exploitation and new investments in mineral water resorts categorized with national significance are analyzed. Based on state legal and local strategic frameworks, opportunities for better planning and development of the mineral water fields and facilities are outlined. The goal is to outline a systematic picture of the local authorities' engagement with the mineral water resources. However, the paper is based on a national case study; the maintenance and impact of the mineral waters with their health support qualities are important regionally for European citizens. Research on the Bulgarian case study in this area has been almost missing in the last decade, and a case study can contribute to further European comparative research. Nationally is the first comparative analysis on that topic.

Author: Alexander Sukhinov
Affiliation: Don State Technical University
Paper ID: 302
Title: 3D Continuous and Discrete Models of Multicomponent Suspended Transport for Coastal Marine Systems: Research and Application

Abstract: Currently, there is increasing interest in research of suspended matter transfer processes. Such interest can be explained by the high applied value of these studies, since the implementation of many engineering projects (for example, laying of deep-water pipelines, construction of drilling platforms, dredging, bridge construction) requires an assessment of the feasibility of the project, the risks associated with natural emergencies, and the impact of planned projects on the environmental situation in the water area. Therefore, it is required to develop calculation models that characterize the transport of suspended matter, considering the granulometric composition of the suspension, the hydraulic fineness of the suspension fractions and the analysis of the processes of transport and sedimentation of particles in the fluid flow. In this article, the authors consider the problem of numerical modeling of the transfer of multicomponent suspended matter in relation to coastal marine systems using the Sea of Azov as an example. Based on the developed software package, experiments were carried out to simulate the transport of suspended matter during dumping of soil during dredging. The results of the computational experiments demonstrated the stability, reliability, and practical significance of the developed model.

Oral Speakers D1

(in chronological order)

Author: Elenita Velikova
Affiliation: University of National and World Economy
Paper ID: SD606

Title: Improving the quality of public transport to achieve environmental sustainability in the city of Sofia, Bulgaria

Abstract: Improving the quality of service in public urban transport is an important prereq-uisite for ensuring environmental sustainability in cities. Quality is part of the so-cial efficiency needed to achieve sustainability in urban development, and increas-ing the use of public transport instead of private vehicles is fundamental to reduc-ing the harmful impact of transport and achieving the environmental component of sustainability. development. The crises of the last three years have created a number of restrictions on the transportation of passengers, and transport opera-tors from the field of public transport had to find new approaches to solving tasks related to its normal functioning. The most important issue facing them is to re-store the confidence of passengers by providing safe and quality services. In this manuscript, based on the analysis of the state of public transport in the city of So-fia, Bulgaria for the period 2019-2022, guidelines are proposed for increasing the quality of the services offered. Improving quality, in turn, will contribute to the preference and use of public transport to a greater extent. Recommendations and measures for the future development of public transport in the city of Sofia, its modernization and sustainable development are presented.

Oral Speakers D2

(in chronological order)

Author: Jing Ning
Affiliation: Chang'an University
Paper ID: 300
Title: Enrichment mechanisms for the co-occurrence of hexavalent chromium-fluoride-manganese in different groundwater environmental units of Weibei Plain, China

Abstract: Less know about the enrichment mechanisms for the co-occurrence of Cr6+, F− and Mn in groundwater under the sedimentary aquifers, and description of relationship between groundwater environment and especially high Cr6+ and F- groundwater is a challenging issue.The 92 groundwater samples were taken from six groundwater environment units (GEUs) to analyzed their environment mechanisms by sedimentary environments, hydrogeochemical process and isotopes. The groundwater was weakly alkaline, main hydrochemical types were HCO3-Na and HCO3-Ca•Mg. The distribution of isotope δ18O demonstrated that irrigationn and atmospheric precipitation was the main recharge source, discharge from southwest to Wei River and Jing River. The distribution of Cr6+, F- and Mn was featured by a clear zonation of GEUs. Cr6+ and F- concentration in VI-GEU (40-300 μg/L, 0.769-1.34 mg/L) and III- GEU (4-131 μg/L, 0.16-3.45 mg/L) of the loess tableland and the pluvial fan has abnormal high value, with exceedance rates of 49.31% and 70.83%, 33.33% and 66.67%, respectively. The enrichment of high Cr6+ is related to alkaline environment (pH 7.8-8.6), oxidation environment (Eh, manganese oxide) and silicate weathering from. Under evaporation, precipitation rate of CaF2 and pH plays key roles in the enrichment of F- in groundwater. Mn in V-GEU (0.93-499 μg/L) of alluvial plain pore aquifer has high value, the exceeding rate was 17.65%. In Weibei plain, sedimentary condition of groundwater environment units is the mian controlling factor for the mobilization of Cr6+, F- and Mn in groundwater.

Author: Aaron Paul Ilao Carabbacan
Affiliation: Polytechnic University of the Philippines
Paper ID: SD715
Title: Effects of Polypropylene Fibers from Single-Used Facemasks on the Microstructure of Normal Cementitious Composites

Abstract: Cementitious composites (CC) have continuously advanced in recent years, owing to their abundant resources, well-established production methods, and remarkable versatility in civil engineering and construction applications. However, one aspect of CC that has received significant attention and improvement is its microstructure, primarily due to its inherent heterogeneity. At the microscale level, incorporating multiple independent polypropylenes (PP) fibers into CC has demonstrated the potential to address its intrinsic weaknesses effectively. A novel research area involves integrating recycled PP fibers from single-use facemasks (SUF) into CC, producing environmentally friendly fiber-reinforced cementitious composites (FRCC) with enhanced microstructure characteristics. This study utilized locally available CC constituents combined with PP fibers sourced from SUF, resulting in a specimen with a fiber volume content of 0.40%. Scanning electron microscopy (SEM) and energy dispersion spectroscopy (EDS) were employed to analyze the microstructure and elemental composition of the specimen. The findings indicate that incorporating PP fibers from SUF resulted in notable improvements in the CC microstructure, effectively reducing micropores and establishing good fiber-matrix compatibility.

Oral Speakers D2

(in chronological order)

Author: Voon-Loong Wong
Affiliation: Heriot-Watt University Malaysia Campus, Malaysia
Paper ID: 303

Title: Direct and Indirect Ultrasonic-Assisted Preparation of Calcium Alginate Monolithic Pellets for the Removal of Methylene Blue from Aqueous Solution.

Abstract: Biosorption offers cost advantages over conventional treatment methods due to technical and financial constraints. In present paper, calcium alginate (CaAlg) monolithic pellets are investigated as biosorbents for the removal of methylene blue (MB) from aqueous solution in a batch mode. Direct and indirect ultrasoni-cation was employed for the preparation of porous CaAlg pellets to enhance their removal efficiency (R%) and adsorption capacity (qe). In preliminary stage, the effectiveness of pure CaAlg pellets were evaluated based on different concentra-tions of sodium alginate (SA) (1wt%, 2wt%, and 3wt%). The synthesis of CaAlg pellets from 3wt% sodium alginate exhibited the highest adsorption capacity of 1.302 mg/g. Surface characterizations were studied to examine the morphology of the pure and ultrasonicated 3wt% CaAlg monolithic pellets using scanning elec-tron microscopy (SEM) before and after adsorption. SEM images revealed that the surface of ultrasonic-assisted CaAlg monolithic pellets exhibits pores and fis-sures. Meanwhile, the experimental results indicated that the R% and qe of CaAlg pellets arranged in a descending order of direct ultrasonicated CaAlg (88.13%, 2.058 mg/g) > indirect ultrasonicated CaAlg (78.61%, 1.657 mg/g) > pure CaAlg (57.06%, 1.302 mg/g) at a batch adsorption condition of 250 rpm at 30oC for 6 hours. These pellets performed at least 21% better for MB removal than those synthesized in the absence of ultrasonic waves. Thus, the adoption of ultrasoni-cation showed a promising potential for the synthesis of CaAlg monolithic pellets with improved adsorption properties to remove organic pollutants from dye wastewaters.

Oral Speakers D2

(in chronological order)

Author: Innocent Macha
Affiliation: University of Dar es Salaam, Tanzania
Paper ID: 316

Title: Potential use of pumice rocks for municipal and industrial wastewater treatment in Tanzania

Abstract: Globally, there are several municipal wastewater treatment technologies that have evidently proved a success. In Tanzania, for instance, the waste stabilization pond is the leading municipal wastewater treatment technology, while industries have different wastewater treatment setups. However, the effluents from most WSPs have been reported to not comply with the statutory discharge limits. This has prompted efforts from scientific and industrial communities to focus on seeking alterna- tive technologies to address this challenge. This research was carried out to assess the potential of pumice rocks as treatment media for textile and municipal wastewater`s biological oxygen demand (BOD) and chemical oxygen demand COD. The study aimed at examining the capacity of pumice rocks in reducing the BOD5 and COD of both municipal and textile wastewater, and colour reduction from textile wastewater. Both effluents were treated in a lab-scale, 4560 cm3 column packed with 800 gm cream, lightweight, porous and high silica content (55.7% (w/w) SiO2) pumice rocks. Based on the column capacity, the 3500 cm3 of effluent was discharged into the column under gravitational force at hydraulic retention time of 24, 48 and 72 h at room temperature. BOD5 and COD were analyzed by the respiratory and closed reflux methods, respectively, while colour reduction from textile wastewater was monitored by UV–vis. Pumice rocks were characterized by FTIR, XRF and XRD. The results showed that pumice is composed of a high content of silica (silicon dioxide) of about 55.7% with some alumina (aluminium oxide) and traces of other oxides. XRD results suggest that pumice is mainly composed of amorphous silica with some crystals of natural zeolite. These results were well complemented with FTIR results. Pumice materials reduced the BOD5 and COD of municipal wastewater initial values by 65.2% and 76.2%, respectively, after 72 h retention time. On the other hand, pumice rocks seemed to be more effective in reducing the BOD5 and COD of textile wastewater. The results show that BOD5 and COD of textile wastewater were reduced by 75.7% and 93.5%, respectively, after 72 h retention time. Moreover, pumice rocks could reduce the colour/turbidity of textile wastewater by 81.8% after 72 h retention time. These results are promising and displayed the potential of pumice, a naturally occurring material, in wastewater treatment. It is envisaged that pumice materials could be integrated into the municipal or industrial wastewater treatment facilities. It is recommended that studies on a continuous flow reactor are conducted to investigate the effect of flow dynamics and adsorp- tion kinetics on the treatment of wastewater by these materials.

Oral Speakers D2

(in chronological order)

Author: Dan Wang
Affiliation: Chang' an University, China
Paper ID: 297
Title: Unraveling biogeochemical processes of nitrate in the vadose zone and groundwater of a typical intensive agricultural area, northwestern China

Abstract: With the increase of agricultural nitrogen input in the vadose zone-groundwater system, groundwater nitrate pollution has become a global problem affecting ecological environment and human health. Identifying the biogeochemical mechanism of nitrate under the influence of agricultural activities is the key to reducing nitrogen pollution load. However, research on how changes in hydrochemistry and microbial communities affect nitrate biogeochemical processes remains inadequate. In this paper, Zhouzhi-Mei County in the northern piedmont of Qinling Mountains was taken as a typical agricultural research area, and the biogeochemical process of nitrate under the influence of agriculture was analyzed by combining hydrogeochemistry, microbial technology and stable isotope. PICRUSt analysis was further performed using 16S rRNA high-throughput sequencing results to predict the functional gene composition and main reaction processes of the nitrogen cycle. Finally, the conceptual model of biogeochemical process of nitrate in the vadose zone-groundwater system in typical agricultural area was constructed. The results of this study show that nitrate pollution was serious, and the concentration of NO3 - in 70.59 % of groundwater samples exceeded 50 mg / L (WHO drinking water limit). The range of DO and Eh indicated that the groundwater environment was not conducive to the occurrence of nitrate denitrification. In addition, the correlation between ln(NO3 -/Cl -) and δ 15N-NO3 -, δ 18O-NO3 - in groundwater is weak, which also indicated that the nitrogen and oxygen isotopes of groundwater nitrate in the study area were less affected by denitrification. Microbial community results showed that Actinobacteriota and Proteobacteria were the dominant Phylum in the vadose zone and groundwater. The abundance of soil nitrogen-related microorganisms was positively correlated with TOC and negatively correlated with sampling depth, while the microbial abundance in groundwater was inversely connected with oxidation-reduction potential and favorably correlated with TOC and EC. In addition, the results of PICRUSt analysis showed that the nitrate transformation process in groundwater and soil was dominated by dissimilatory nitrate reduction and organic nitrogen mineralization. This study shows that hydrochemical, nitrogen and oxygen isotope data combined with microbial techniques can be a powerful tool to identify the NO3 - sources and biogeochemical processes in vadose zones and ground water

Oral Speakers D2

(in chronological order)

Author: Dawei Mu
Affiliation: Chang' an University, China
Paper ID: 299

Title: Assessing groundwater quality using improved EWQI model in Baojixia irrigation district, Northwest China

Abstract: Baojixia irrigation district is the largest artesian diversion irrigation area in the Wei River basin in Shaanxi Province, China. The groundwater quality in the district has attracted widespread attention due to its critical importance for drinking and irrigation. However, the current methods of water quality evaluation in this area are costly, time consuming and homogeneous. Therefore, there is a need to find a convenient and effective method to better assess water quality in the region. In this study, 64 groundwater samples were collected from the Baojixia irrigation district and 12 water quality parameters were considered to evaluate the groundwater quality. In addition, this study proposed the minimum EWQI (EWQImin) model by combining with the key parameters selected by principal component analysis (PCA) and multiple linear regression analysis (MLR), respectively. The results showed that the EWQImin-MLR model, consisting of five key parameters including total dissolved solids (TDS), sodium (Na+), nitrate (NO3-), total hardness (TH) and fluorine (F-), exhibited better performance in the groundwater quality evaluation, with higher coefficient of determination ($R2 = 0.953$, $P < 0.001$) but lower values of Root Mean Square Error (RMSE, 4.948) and Percentage Error (PE, 5.823%), compared to the EWQImin-PCA. Moreover, groundwater quality in the Baojixia irrigation district was considered as "moderate" type, with the eastern part of the study area having poorer water quality than the western part, showing higher F- concentrations. These results indicated that the developed EWQImin model was a suitable and effective method that showed excellent performance in evaluating groundwater quality in the Baojixia irrigation district. The results of the present study would be beneficial for groundwater management and sustainable development of water resources in the future study.

Author: Junming Gong
Affiliation: Wuhan University China Institute of Boundary and Ocean Studies
Paper ID: SD765

Oral Speakers D2

(in chronological order)

Author: Franklyn F. Manggapis
Affiliation: Technological University of the Philippines – Taguig, Philippines
Paper ID: SD716

Title: Advancements in Concrete Incorporation: Harnessing the Potential of Crumb Rubber Tires as Sustainable Alternatives to Fine Aggregates

Abstract: The escalating accumulation of industrial waste presents a formidable challenge in the contemporary era, with the disposal of scrap rubber tires emerging as a signif-icant contributor to environmental degradation. Considering this, leveraging the potential of these discarded tires as essential constituents in construction materials offers substantial advantages. This research paper provides a comprehensive and in-depth overview of recent advancements concerning applying crumb rubber tires as partial substitutes for fine aggregates in construction projects. The paper explores various crucial aspects, including the treatment and characterization of rubber tire waste, the influence of rubber content on material properties, and the impact of rubber on the design mix. By delving into these areas, the study aims to establish a fundamental understanding of the integration of rubber into concrete. Ultimately, the objective is to enhance the environmental sustainability of concrete within the construction industry. Furthermore, by offering insights into the latest innovations in incorporating crumb rubber tires, this paper addresses the pressing need for sustainable solutions in waste management and construction practices. The findings and knowledge presented herein serve as a valuable resource for re-searchers, engineers, and policymakers striving to mitigate industrial waste's ad-verse environmental impacts while promoting more eco-friendly construction ma-terials and practices.

Author: Yuanhang Wang
Affiliation: Chang' an University, China
Paper ID: 301
Title: Characterization of soil salinization and its driving fac-tors in a semi-arid agricultural area, northwest China

Abstract: Salinization of irrigation areas is a global environmental challenge. The uncertainty in the distribution of salinization is increased by the complexity of the natural environment. This study adopted Weining Plain, a typical irrigation area as the study area to study the relationship between soil salinity and groundwater hydrochemical processes. To this effect, 76 soil samples and 145 shallow groundwater samples were collected. The results showed obvious spatial variation in soil salinization in the Weining Plain. The main characteristic ions in the salinized area of the Weinng Plain were SO42−, HCO3−, Ca2+ and Cl−, K++Na+. The rank of ions in terms of change rate with increasing soil salinity was: Cl− > SO42− > Ca2+ > K++Na+ > HCO3− > Mg2+. However, the rank of the ions in terms of their sensitivities to the soil salinization was: HCO3− > K++Na+ > SO42− > Cl− > Mg2+ > Ca2+. Soil salinization in Weinning was mainly sulfate type. And the soil salinity was mostly of natural origin and accumulated salts could leach to deeper soils or aquifers by water percolation during irrigation. Soil salinization is more serious in areas with higher groundwater salinity. The positive δ18O and δ2H content in groundwater was related to the strong evaporation of groundwater with a shallow water table. Groundwater evaporation and quality of recharge water are important factors influencing soil salinization in the Weining plain. In the end, the measures of optimizing drainage, combined irrigation, and improving planting layout were recommended for the effectively and economically controlling of salinization. The results have relevance in improving saline soil and utilization of soil resources in the Weining plain.

Oral Speakers D2

(in chronological order)

Author: Yen-Chun Chen
Affiliation: National Taipei University of Technology, Taiwan
Paper ID: 17
Title: A study on enhancing mechanical properties and reducing shrinkage of geopolymer mortar by adding chopped carbon fiber

Abstract: Natural iron-bearing minerals can promote the extracellular electron transfer of microorganisms and thus affect the microbial remediation of heavy metals. In this study, the characteristics of natural iron-bearing minerals were analyzed and the enhancement effect of natural iron-bearing minerals with different particle size on microbial reduction of Cr(VI) were determined. The XRD results showed that the main components of iron-bearing materials were magnetite and pyrrhotite. The reduction efficiency of Cr(VI) increased with the increasing addition of iron-bearing materials in single mineral system. The reduction efficiency of Cr(VI) in mixed mineral and microorganism system reached 88.54%, which was higher than the sum of that of single mineral system and single microorganism system, indicating the enhanced reduction effect of iron-bearing minerals on chrome-reducing bacteria. The iron-bearing minerals with different particle size (<0.0385 mm, 0.0385~0.054 mm, 0.054~0.154 mm, 0.074~0.154 mm, >0.154 mm) presented different enhancement effect on the reduction of Cr(VI) with different concentrations (200 mg/L to 400 mg/L), and >0.154 mm was determined as the optimal particle size.

Author: Xinglan Cui
Affiliation: GRINM Resources and Environment Tech.Co., Ltd., Beijing,China
Paper ID: NF418

Title: Influence of particle size of natural iron-bearing minerals on enhanced microbial reduction of hexavalent chromium

Abstract: Natural iron-bearing minerals can promote the extracellular electron transfer of microorganisms and thus affect the microbial remediation of heavy metals. In this study, the characteristics of natural iron-bearing minerals were analyzed and the enhancement effect of natural iron-bearing minerals with different particle size on microbial reduction of Cr(VI) were determined. The XRD results showed that the main components of iron-bearing materials were magnetite and pyrrhotite. The reduction efficiency of Cr(VI) increased with the increasing addition of iron-bearing materials in single mineral system. The reduction efficiency of Cr(VI) in mixed mineral and microorganism system reached 88.54%, which was higher than the sum of that of single mineral system and single microorganism system, indicating the enhanced reduction effect of iron-bearing minerals on chrome-reducing bacteria. The iron-bearing minerals with different particle size (<0.0385 mm, 0.0385~0.054 mm, 0.054~0.154 mm, 0.074~0.154 mm, >0.154 mm) presented different enhancement effect on the reduction of Cr(VI) with different concentrations (200 mg/L to 400 mg/L), and >0.154 mm was determined as the optimal particle size.

Poster D2

(in chronological order)

Author: Ju Che
Affiliation: Shanghai Jiao Tong University,China
Paper ID: 89

Title: The effect of electrode voltage on acetylene plasma deposition particles during the preparation of PECVD carbon film based on PIC-MCC simulation

Abstract: At present, the preparation of conductive and corrosion-resistant carbon coatings by plasma-assisted chemical vapor deposition (PECVD) has received extensive research. In this paper, the acetylene plasma model was established by using the Particle in Cell/Monte Carlo method (PIC/MCC) to study the influence of different electrode voltages on the composition and particle energy of deposited particles, and explore the corresponding relationship between acetylene gas and deposited particles. The results show that increasing the electrode voltage can reduce the density of acetylene particles in the plasma, increase the ionization rate of acetylene, and reduce the particle density of C2 and CH groups. The energies of C2H¬2 and CH particles increase with the increase of voltage, while the energies of C2 and H particles are basically stable and not affected by the voltage.

Author: Hu Sun
Affiliation: Shanghai Jiao Tong University, China
Paper ID: 90

Title: Doping effects of metals on electrical conductivity of TiO2 from First-principles calculations

Abstract: Titanium is promising candidates for bipolar plates in fuel cell, electrolysis, etc., due to the excellent corrosion resistance of titanium oxide (TiO¬2). However, TiO2 also possesses poor electrical conductivity and leads to high power losses, so that the conductivity of titanium needs to be further improved. In this work, the effect of thirty-nine metals on the conductivity of TiO2 was studied based on the first-principles merged with the Boltzmann transport equation and Deformation potential theory. The results show that the conductivity meets the target of 100 S·cm-1 proposed by the U.S. Department of Energy when TiO2 doped with Cr, Sb, Ga, etc. The Sb-doped not only enhances carrier concentration, reduces relaxation time, but also improve the chemical bond. The intermediate bands induced by Au, W, Rh, etc. is a special conductivity enhanced mechanism.

Poster D2

(in chronological order)

Author: Hanxu Chen
Affiliation: Southeast University, China
Paper ID: 91
Title: Responsive photonic materials for metal ions screeing

Abstract: Screening of metal ions in body fluid is vital for monitoring human health. Here, inspired by taste sensing functions of human tongue, we reported a novel colorimetric photonic tongue for multiple metal ions screening by using spherical structural color hydrogel particles (SCHPs) as sensory units. As SCHPs were comprised of acrylic acid (AA)-based skeleton, the sensory units could respond to metal ions with color variations like receptors in taste buds. Thus, through analyzing all units' sensory information, a colorimetric "fingerprint" for each metal ion could be obtained in a database. Based on this, we constructed a portable, reusable and biocompatible device by integrating SCHP arrays into a test-strip-microchip for real-time monitoring of metal ions. The target ions could be distinguished by multivariate data analysis for pattern recognition. These features indicated that proposed photonic tongue is valuable for metal ions screening in biological samples and promising for clinical diseases diagnosis.

Author: Lijun Cai
Affiliation: Southeast University, China
Paper ID: 92

Title: Bio-inspired pigment particles with dual-variation modes of structural colors and fluorescence

Abstract: Colorful pigments have demonstrated values in constructing dynamic patterns for different applications. Attempts in this field tend to develop pigments with multiple modes for color variation. Herein, inspired by the color variation mechanism of chameleons, we propose a novel kind of pigments with dual color variations (PDCVs) by integrating hydrophobic carbon dots (HCDs) within photonic crystal (PhC) particles. The HCDs with blue dispersion emission and red aggregation-induced emission are generated via one-pot solvothermal treatment. The PDCVs are generated by using HCDs-tagged responsive hydrogel to replicate the nanostructure of silica nanoparticles assembled spherical PhC particles. As the dispersion/aggregation of HCDs and hydrogel lattice of the PhC are depending on their surrounding solvent, the resultant PDCVs can perform dual color variations, including fluorescence and structure color, by changing their solvent. Based on this feature, we have demonstrated that the PDCVs can be employed as elements to construct various dynamic colorful patterns with wide viewing angle and allow for eminent information encryption. There results indicate that the proposed PDCVs are promising to have practical applications in the fields of information encryption, displaying, anti-counterfeiting, and so on.

Poster D2

(in chronological order)

Author: Dongyu Xu
Affiliation: Southeast University, China
Paper ID: 93
Title: Bio-inspired Janus structural color films as visually flexible electronics

Abstract: Multifunctional composite flexible sensors are essential components in flexible and stretchable electronics. In this paper, we present novel mussel-inspired Janus structural color films as visually flexible electronics. The Janus composite film with a three-layer structure, which is composed of a conductive carbon nanotube (CNT) layer, a supporting polydimethylsiloxane (PDMS) layer and a structural color layer formed by two-dimensional colloidal crystals (2D-CCs), is prepared by a hierarchical assembly strategy. The manufactured multi-layer CNT films and the 2D-CCs are integrated on both sides of the supporting PDMS layer respectively by the self-assembly process and the adhesion of polydopamine (PDA) to provide corresponding excellent conductivity, flexibility and visual optical sensing for the Janus composite film. It is demonstrated that the CNT films could not only increase the contrast of structural color of the 2D-CC array as their light absorption characteristics in the broadband frequency field, but also impart the composite film with photothermal response characteristics. In addition, because of the outstanding electrical properties, visualized structural color and photothermal response, the resulting Janus structural color films show stable electrical sensing and visualized color-sensing under deformations arose by human motions and near-infrared (NIR) illumination, which could play essential roles in flexible and stretchable electronics.

Author: Qijie Liang
Affiliation: Songshan Lake Materials Laboratory
Paper ID: 94

Title: Pentagonal Two-dimensional Materials and device applications

Abstract: Shadows are everywhere. Not much use has been found but this ubiquitous effect is strenuously avoided in optoelectronic applications. In this work, we present a shadow-effect generator (SEG) that scavenges the illumination contrast that arises on the device from shadow castings and generates a direct current, simply by shadowing part of the generator. The shadow-effect mechanism is experimentally validated by Kelvin Probe Force Microscopy (KPFM). The SEG is capable of harvesting energy from illumination contrasts arising under weak ambient light. Without any optimization, our generator has a power density of 0.14 μW cm-2 under indoor conditions (0.001 sun), where shadows are persistent. Our SEG performs 200% better than that of commercial silicon solar cells under the effects of shadows. The harvested energy from our generator in the presence of shadows arising from at a very low intensity (0.0025 sun) can drive an electronic watch (1.2 V). In addition, the SEG can serve as a self-powered sensor for monitoring moving objects by tracking the movement of shadows. With its cost-efficiency, simplicity and stability, our SEG offers a promising architecture to generate green energy from the ambient to power electronics and as a part of smart sensor system, especially in buildings.

Poster D2

(in chronological order)

Author: Qian Zhang
Affiliation: Shenzhen Campus of Sun Yat-sen University
Paper ID: 95

Title: Shadow-effect Energy Harvester

Abstract: Shadows are everywhere. Not much use has been found but this ubiquitous effect is strenuously avoided in optoelectronic applications. In this work, we present a shadow-effect generator (SEG) that scavenges the illumination contrast that arises on the device from shadow castings and generates a direct current, simply by shadowing part of the generator. The shadow-effect mechanism is experimentally validated by Kelvin Probe Force Microscopy (KPFM). The SEG is capable of harvesting energy from illumination contrasts arising under weak ambient light. Without any optimization, our generator has a power density of 0.14 μW cm-2 under indoor conditions (0.001 sun), where shadows are persistent. Our SEG performs 200% better than that of commercial silicon solar cells under the effects of shadows. The harvested energy from our generator in the presence of shadows arising from at a very low intensity (0.0025 sun) can drive an electronic watch (1.2 V). In addition, the SEG can serve as a self-powered sensor for monitoring moving objects by tracking the movement of shadows. With its cost-efficiency, simplicity and stability, our SEG offers a promising architecture to generate green energy from the ambient to power electronics and as a part of smart sensor system, especially in buildings.

Author: Jie Hu
Affiliation: Chungnam National University, Korea
Paper ID: 97

Title: Controlling the fracture location of the photocurable resin-based capsules using the bonding surface adhesion energy

Abstract: Titanium is promising candidates for bipolar plates in fuel cell, electrolysis, etc., due to the excellent corrosion resistance of titanium oxide (TiO¬2). However, TiO2 also possesses poor electrical conductivity and leads to high power losses, so that the conductivity of titanium needs to be further improved. In this work, the effect of thirty-nine metals on the conductivity of TiO2 was studied based on the first-principles merged with the Boltzmann transport equation and Deformation potential theory. The results show that the conductivity meets the target of 100 S·cm-1 proposed by the U.S. Department of Energy when TiO2 doped with Cr, Sb, Ga, etc. The Sb-doped not only enhances carrier concentration, reduces relaxation time, but also improve the chemical bond. The intermediate bands induced by Au, W, Rh, etc. is a special conductivity enhanced mechanism.

Poster D2

(in chronological order)

Author: Geun Yoo
Affiliation: Gyeongsang National University, South Korea
Paper ID: 98
Title: Research of electrolyte additive for aqueous zinc-ion battery with stable and high-capacity

Abstract: The ongoing environmental crises are necessitating the development of sustainable energy technologies. Lithium-ion batteries (LIBs) are presently seen as the optimal energy storage choice for a sustainable society due to their high energy density. [1,2] However, there are limitations to cover large-scale applications due to the lack of lithium resources and the risk of fire or explosion due to flammable organic liquid electrolytes. [3,4] To address these limitations, research and development of diverse next-generation batteries is underway. An aqueous zinc-ion battery (ZIB) made up of a Zn anode and a vanadium pentoxide (V_2O_5) cathode is considered a promising option for large-scale energy storage systems due to its stability, high capacity, eco-friendliness, and low cost. Nevertheless, the dissolution of metal ions at the cathode due to the use of an acidic electrolyte, the growth of dendrites and hydrogen evolution from the Zn anode limit the capacity and cycle life of ZIB. Therefore, in this study, the use of vanadium(IV) oxide sulfate ($VOSO_4$) electrolyte additive forms a protective layer on the surface of the Zn anode to attenuate corrosion and hydrogen evolution and mitigate byproduct formation. In addition, the cathode structure was maintained by suppressing V dissolution in the V_2O_5 cathode and promoting interfacial Zn diffusion. The self-assembled passive layer on the anode surface enabled improved ion diffusion kinetics. As a result, it showed improved capacity (590 mAh g^{-1} at 1 A g^{-1}) and rate performance (420 mAh g^{-1} at 5 A g^{-1}). Furthermore, it was verified that the cycling performance of the battery had been enhanced, exhibiting a capacity retention rate of 77% even after 400 cycles at 5 A g^{-1}.

Author: Kihyuk Yun
Affiliation: Gyeongsang National University, South Korea
Paper ID: 100
Title: An investigation into enhancing the electrochemical performance of zinc-ion capacitors through the application of a non-metal element doped carbon protection film

Abstract: The increasing concern about environmental pollution has emphasized the importance of renewable energy sources as a substitute for fossil fuels. However, renewable energy sources have the drawback of an unpredictable power supply due to climate change. Therefore, research into energy storage devices capable of storing energy for later use and maintaining a consistent power supply has gained attention. [1,2] Among the various energy storage devices, zinc-ion capacitors have garnered interest due to their ability to withstand moisture and oxygen, as well as their high theoretical capacity. However, issues such as the development of irregular dendrites on the anode surface, corrosion, and performance degradation resulting from hydrogen evolution still persist in zinc-ion capacitors. [3,4] To address these problems, in this study, a carbon-based material doped with a non-metal element was introduced as a surface protective layer for the zinc anode. The protective layer effectively inhibited dendrite growth, corrosion, and hydrogen evolution on the zinc surface and created uniform nucleation sites, confirming the excellent energy storage performance and cycling stability of the zinc-ion capacitor.

Poster D2

(in chronological order)

Author: Seoyeong Kim
Affiliation: Gyeongsang National University, South Korea
Paper ID: 99

Title: Research on the introduction of a carbon protective layer for the surface control of the zinc anode in aqueous zinc-ion batteries

Abstract: Batteries are essential components in devices ranging from small electronics to large-scale energy storage systems, and are crucial for the development of renewable energy sources to achieve carbon neutrality. While lithium-ion batteries (LiBs) are widely used in various applications due to their high energy density, the use of organic electrolytes, which pose risks of fire/explosion and environmental pollution, has been identified as a fundamental problem.[1,2,3] Therefore, batteries using aqueous electrolytes that can simultaneously satisfy price, safety, and durability characteristics compared to conventional organic electrolytes have been attracting attention worldwide. Zinc-ion batteries (ZiBs) based on aqueous electrolytes are an attractive candidate for the next-generation battery material due to their low cost compared to lithium and their advantages such as high safety and reasonable theoretical capacity. [3] However, the growth and corrosion of uneven dendrites on the zinc anode limit the electrochemical performance of zinc-ion batteries. Therefore, in this study, a carbon protective layer was introduced on the surface of the zinc anode to prevent direct contact between the acidic aqueous electrolyte and the zinc anode, reducing corrosion on the anode surface and inducing uniform dendrite formation through nucleation site control. This improved the energy storage performance and cycling stability of zinc-ion batteries. The crystal structure and chemical characteristics of the surface were analyzed by scanning electron microscopy (SEM), transmission electron microscopy (TEM), X-ray diffraction (XRD), X-ray photoelectron spectroscopy (XPS), and contact angle measurement systems for the carbon-protected zinc anode. The electrochemical performance of the fabricated zinc-ion battery was evaluated through galvanostatic charge/discharge tests and symmetric cell tests.

Poster D2

(in chronological order)

Author: Jaeyeon Lee
Affiliation: Gyeongsang National University, South Korea
Paper ID: 102
Title: A Novel Electrode Design for Zinc-Ion Batteries with High Volumetric Energy Density

Abstract: Multifunctional composite flexible sensors are essential components in flexible and stretchable electronics. In this paper, we present novel mussel-inspired Janus structural color films as visually flexible electronics. The Janus composite film with a three-layer structure, which is composed of a conductive carbon nanotube (CNT) layer, a supporting polydimethylsiloxane (PDMS) layer and a structural color layer formed by two-dimensional colloidal crystals (2D-CCs), is prepared by a hierarchical assembly strategy. The manufactured multi-layer CNT films and the 2D-CCs are integrated on both sides of the supporting PDMS layer respectively by the self-assembly process and the adhesion of polydopamine (PDA) to provide corresponding excellent conductivity, flexibility and visual optical sensing for the Janus composite film. It is demonstrated that the CNT films could not only increase the contrast of structural color of the 2D-CC array as their light absorption characteristics in the broadband frequency field, but also impart the composite film with photothermal response characteristics. In addition, because of the outstanding electrical properties, visualized structural color and photothermal response, the resulting Janus structural color films show stable electrical sensing and visualized color-sensing under deformations arose by human motions and near-infrared (NIR) illumination, which could play essential roles in flexible and stretchable electronics.

Author: Geon-hyoung An
Affiliation: Gyeongsang National University, South Korea
Paper ID: 103
Title: Flexible Supercapacitors Utilizing Fluorine and Nitrogen Co-doped Mesoporous Carbon FiberElectrodes

Abstract: Market growth in wearable electronic devices has been driven by the expansion of the Internet of Things (IoT) industry. These wearable devices necessitate compact and long-lasting independent energy storage solutions. However, meeting these requirements with existing energy storage devices, given their structure and material characteristics, has proven challenging. As an alternative, the concept of flexible fiber textile energy storage devices has been proposed for wearables. These fiber-based flexible supercapacitors exhibit resilience to bending, twisting, and tying without compromising their performance. Nevertheless, carbon fiber electrodes, which are commonly employed, suffer from low surface area and electrical conductivity, resulting in suboptimal electrochemical performance. To address these issues, the utilization of nitrogen and fluorine co-doped activated carbon fiber electrodes has been explored to enhance energy capacity and conductivity. The study presents promising results, including a high specific capacitance of 243.9 mF cm−2 at a current density of 10.0 μA cm−2, along with excellent cycling stability, retaining 91.3% of capacitance over 10,000 cycles at a current density of 250.0 μA cm−2. These results will be thoroughly discussed at the ICNFM2023 conference, with the research supported by a grant from the National Research Foundation of Korea (NRF) funded by the Korean government (MSIT) (NRF-2020R1C1C1010611).

Poster D2

(in chronological order)

Author: Soobeom Lee
Affiliation: Gyeongsang National University, South Korea
Paper ID: 101

Title: Enhancement of Energy Storage Performance in Fiber-Type Supercapacitors through the Integration of High-Capacity Electrode Materials

Abstract: As environmental crises drive the need for sustainable energy technologies, wearable devices have gained significant interest due to their diverse applications, including medical monitoring, smart electronics, and robots [1]. However, the challenge of developing lightweight, flexible, and portable energy storage devices limits their broader application [1]. To address this need, fibrous supercapacitors have emerged as a promising energy storage option for wearable electronics, providing high power output and fast charge/discharge rates, but their low energy density remains a constraint [2]. Carbon-based fibrous supercapacitors (CFS) offer potential due to their flexibility, practicality, and lightness; however, issues like low specific surface area and poor electrical properties of carbon fiber electrodes hinder their performance [3]. In this study, a multidimensional carbon composite for CFSs is fabricated using carbon fiber as a substrate, graphene and carbon nanotubes as interface materials, and activated carbon as the primary active material. This incorporation of graphene, activated carbon, and carbon nanotubes enhances the electrical properties and energy density of CFSs, resulting in improved electrochemical performance and mechanical stability [4,5]. The CF/G/CNT/AC composite exhibited remarkable electrochemical capability with a high specific capacitance (692 mF cm–2) at 70.0 μA cm–2 and a fast cycling stability for 2,000 cycles, maintaining 85% capacitance at 400.0 μA cm–2. This approach paves the way for developing high-performance power sources for wearable electronics.