Preface

4th Annual International Conference on Energy Development and Environmental Protection [EDEP2021] will be held on July 23-25, 2021 (Virtual Conference). The conference aims to provide a forum for researchers, experts and professionals in the industry and academia to share the latest research findings. Make it a platform for people to exchange experiences and share achievements in energy development, environmental protection and related fields.

EDEP2021 proceedings tend to collect the most up-to-date, comprehensive, and worldwide state-of-art knowledge on energy development and environmental protection. All the accepted papers have been submitted to strict peer-review by 2-4 expert referees, and selected based on originality, significance and clarity for the purpose of the conference. The conference program is extremely rich, profound and featuring high-impact presentations of selected papers and additional late-breaking contributions. We sincerely hope that the conference would not only show the participants a broad overview of the latest research results in related fields, but also provide them with a significant platform for academic connection and exchange.

The Technical Program Committee members have been working very hard to meet the deadline of review. The final conference program is divided into 3 sessions. The proceedings would be published in a volume by EDP Sciences-E3S Web of Conferences Series.

We would like to express our sincere gratitude to all the TPC members and organizers for their hard work, precious time and endeavor preparing for the conference. Our deepest thanks also go to the volunteers and staffs for their long-hours' work and generosity they've given to the conference. The last but not least, we would like to thank each and every of the authors, speakers and participants for their great contributions to the success of EDEP2021.

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EDEP 2021 Committee

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Keynote 1

Prof. Fa-Nian Shi, Shenyang University of Technology, China

Biography:

Fa-Nian Shi, Ph.D, professor, doctoral supervisor. In December 2014, he was introduced to the School of Environmental and Chemical Engineering of Shenyang University of Technology as the subject leader. The main research interests are the design, preparation, structure analysis and performance optimization of functional metal coordination polymer materials and the development and research of inorganic composites, new energy materials, including lithium ion battery materials, photocatalytic materials, etc. As project leader presided over a national natural science project (21571132, 2016-2019) and a key project of Liaoning Provincial Education Department (LZGD2017002, 2017-2020). During his study in Portugal (2001-2014), he also presided over a Portuguese national scientific research project (2010-2013). Currently in the guidance of the research works of 12 post graduate and 4 doctoral students. Published a total of more than 130 SCI scientific papers, including more than 100 papers of the first author or correspondence. He is the reviewer of many reputed SCI magazines such as Journal material chemistry A, Chemical engineering journal, Journal of power sources, Dalton transaction, etc.

Speech Title:

Design and Energy Storage Research of the New Negative Materials

Abstract:

Our team studied the electrochemical properties of new negative materials, especially the preparation of manganese-cobalt-nickel-based polymetal MOFs, explored the structures and lithium storage properties of lithium ionic batteries, the combination of metal complexes, cobalt oxide and cerium oxide, and the influence of rare earth elements on lithium storage properties of cerium and cobalt oxide composites. The following three conclusions are summarized: 1. Under the same conditions, different crystal structures have a great impact on electrochemical performance, relatively speaking, the higher capacity of complexes are with more stable structure; 2. Comparing with polymetallic coordination polymers of the same structure, the electrochemical properties of manganese-cobalt and nickel are different; 3. Cerium plays a stable role on the electrochemical properties of metal complexes, mainly inhibiting the decomposition of the complex structure and providing lithium ion transport channels to improve lithium storage performance.

Keynote 2

Prof. Samir Ladaci, National Polytechnic School of Constantine, Algeria

Biography:

Prof. Samir Ladaci obtained the State Engineer degree in Automatics in 1995 from the National Polytechnic School of Algiers and the Magister degree in Industrial Automation from Annaba University, Algeria in 1999. He obtained his Science Doctorate and Habilitation degrees from the department of Electronics, Mentouri University of Constantine, Algeria, in 2007 and 2009 respectively. His was a visiting researcher at IRCCyN, CNRS Nantes, France from 2006 to 2008, and has many collaboration projects with different research teams in France, Tunisia and Italy. From 2001 to 2013 he worked at the Department of Electrical Engineering at Skikda University, Algeria, as an Associate Professor. And since 2013 he joined the National Polytechnic School of Constantine, where he is a full Professor. He has published more than 140 papers in journals and International conferences, many book chapters and co-edited a book and supervises many PhD theses (9 already defended with success). His current research interests include Fractional order Systems and Control, Fractional Adaptive Control, Fractional nonlinear and chaotic systems, Robust Control.

Speech Title:

Fractional order control in Renewable Energy systems: towards more efficiency and applicability

Abstract:

There is more and more demand of energy in the world with its growing population and developing industry. This fact has considerably increased interest in renewable energy sources for power generation.

However, this new kind of energy, unlike fossil one, is generally instable or less regular, as the steady and continuous power output is not available. For example, in solar energy, we have to deal with a varying irradiation over the day. This is a real drawback of this option, because it disturbs the electrical output of the system. In Wind energy also, the wind is a varying phenomena making it difficult to maintain a stable frequency and output voltage for the electrical output. All these problems, express a real need for powerful control solutions, in order to improve the dynamics and performance of the generated energy.

Recently, many researchers have proposed fractional order controllers to deals with these fluctuations and uncertainties, as they proved to be more efficient than classical control tools. Fractional order systems, have the ability to modelize more accurately dynamic systems with memory or subject for disturbances and noses. Besides, the fractional order controllers are able to improve the performance of the controlled energy system, while rejecting disturbances and guaranteeing a robust behavior.

In this talk, I will focus on fractional adaptive control as an interesting and efficient solution for such problems. I will present two kinds of adaptive control: fractional extremal control, and fractional Model Reference adaptive control to deal with two renewable energy problems:

Maximum Power Point Tracking Technique for Efficient Photovoltaic based integration of fractional order, and

Fractional-order model reference adaptive control of a multi-source renewable energy system with coupled DC/DC converters power compensation.

These two techniques have been developed by our research team, and works are ongoing towards more proper energy with good quality.

Some future development and perspectives will be presented and discussed to demonstrate the importance and necessity of fractional order control solutions in this field.

Keynote 3

Dr. Liviu Popa-Simil, Los Alamos National Laboratory, USA

Biography:

Since 2002, he has worked for Los Alamos National Laboratory, developing Real Time Radiography methods, and then, developed advanced nuclear fuel cycle as part of AFCI program. He rapidly advanced through his field, serving as an engineer-physicist, project coordinator and senior researcher for IFIN-HH (Nuclear Physics and Engineering Institute - Horia Hulubei), Accelerator and Nuclear Physics Application Division where he developed nuclear methods and applications in industry and environment, and initiated novel nuclear fuel research and pulsed power applications. Dr. Liviu Popa-Simil has also contributed more than 300 peer-reviewed articles to professional journals, and wrote chapters for several books on novel nuclear materials, super-computers, etc.

Speech Title:

Nuclear Power is the Most Ecological Friendly Technology if it is Done Right

Abstract:

The actual nuclear Power relies on replacing the heat source in a thermo-electric plant with a nuclear reactor. In spite the technology is 80 years old, theoretically at maturation, but comparing with evolution of fire technology, it is in its early stages of development. Presently, nuclear power technology has significant drawbacks that render it unattractive, because it is very complex and expensive, as it has safety and security issues, has problems with environment radioactive contamination in situ and due to nuclear waste, and used fuel and has a very complex nuclear fuel cycle. Due to these problems, and after main accidents of INES7 (Chernobyl and Fukushima) the actual fleet of 440 operational nuclear reactors is in recession, estimating that by 2050 to be extinct, and the specialists started to talk about "nuclear renaissance", ignoring the need to solve main issues first. As it is known that electric light is not the result of continuous improvement in candle technology, and materials determine the ultimate performances of the objects build using them, so the nuclear power will require an influx of novelty coming from engineered micro-nano hetero-structured materials able to bring harmony inside nuclear reactors. It is known that life appeared on the blanket of a fission nuclear reactor, called Earth, placed au the goldilocks of a fusion nuclear reactor called Sun, with harmonious chemistry and time. Universe is nuclear. Nuclear energy is the most compact and powerful source of energy we know about, and if it is done right, it has minimum negative impact on environment. Each Kg of nuclear fuel, is delivering about 1 GWDay by fusion and up to 3 GWDay by fusion, leaving about 1 Kg of fission products that is not waste but may become a very special ore for the future, having many collateral applications. In order to achieve this stage 5 families of engineered micro-nano materials have been developed in the last 40 years, aimed at improving harmony between a nuclear process and the nuclear structure where it takes place, presently reaching TRL=3.5, making possible the development of new more advanced generations of nuclear power able to assure near perfect burnup, improved fuel cycle, while being modular, mobile, compact and solid state, removing all the actual drawbacks of the nuclear technology, making it environment friendly and reliable.

Keynote 4

Prof. Jingsong Li, Anhui University, China

Biography:

Dr. Jingsong Li has completed his PhD Hefei Institute of Physical Science (HIPS), Chinese Academy of Sciences (CAS), China and postdoctoral studies from Reims University (France), Max Planck Institute for Chemistry (Germany), and visiting scholar from Swiss Federal Laboratories for Materials Science and Technology (Switzerland). In 2013, He joined Department of Physics and Materials Science, Anhui University (AHU), working on development and implementation of mid-infrared quantum cascade lasers and sensitive spectroscopy techniques for atmospheric and marine science, soil ecosystems and biomedical applications. Currently, Dr. Li is the director of Laser Spectroscopy and Sensing Lab. He is a member of Chinese Society for Optical Engineering (CSOE), SPIE, IEEE, OSA and EGU. He has been an invited reviewer of more than ten international SCI journals for many years. He has authored over 70 peer-refereed SCI articles and more than 30 invited conference presentations, and now in charge of several projects including two National Natural Science Foundations of China, and one National Program on Key Research and Development Project.

Speech Title:

Laser absorption spectroscopy for atmospheric and marine applications

Abstract:

Laser absorption spectroscopy (LAS) is an excellent method for trace gas detection, since it presents advantages of high sensitivity, good selectivity, fast response and high temporal resolution. With the rapid development of laser fabrication technology, quantum cascade lasers (QCLs) have emerged as attractive laser sources for mid-infrared (MIR) spectroscopic applications. In this report, state-of-the-art quantum cascade laser based TDLAS gas sensor will be demonstrated as a promising new tool for High resolution molecular spectra and for noninvasive, real-time identification and quantification of trace gases in environmental atmosphere monitoring and isotope analysis, human breath gases diagnosis, gas exchange process between soil and atmosphere. Moreover, the development of deep-sea in situ multi-parameter chemical sensor based on manned submersible will also be demonstrated, and preliminary results of the multi-parameter chemical sensor in the South China Sea will be discussed.

Keynote 5

Prof. Alam Md. Mahbub, Harbin Institute of Technology (Shenzhen), China

Biography:

Alam Md. Mahbub is a professor at Harbin Institute of Technology (Shenzhen), China since 2012. More than 300 technical articles are authored and co-authored, including 138 journal papers, most of which have been published in the top-notched journals, including Journal of Fluid Mechanics, Journal of Fluids & Structures, Physics of Fluids, and Ocean Engineering. His papers are well cited, 2885+ (h-index 31) in ISI database and 4587+ (h-index 38) in Google database. He is the author of two books and 15 chapters in books. He has edited four special issues in 'Wind and Structures, an International Journal' and delivered 16 Keynote speeches at international conferences. Prof Alam has received a number of awards: Japan Government Scholarship (monbusho) for Masters and PhD studies; JSPS (Japan Society for Promotion of Science) Postdoctoral fellowship; South Africa National Research Foundation (NRF) rating 'Promising Young Researcher, Y1'; China 1000-young-talent scholar; Shenzhen High-Level Overseas Talent; 2015 Shenzhen Outstanding Teacher; and 2017 Nanshan-District High-Level Talent. He is an editorial board member of 'Wind and Structures, an International Journal'.

Speech Title:

Swimming of fish undergoing asymmetric oscillation

Abstract:

The drag-thrust transition and wake structures of a pitching foil undergoing asymmetric sinusoidal oscillation are numerically investigated for foil thickness-based Strouhal number StD = 0.1 – 0.3 and amplitude ratio AD = 0.5 – 2.0. The asymmetry in the oscillation is introduced by making one stroke (e.g. from the lower extreme to the upper extreme) faster than the other (e.g. from the upper extreme to the lower extreme). The results reveal that the drag-thrust transition advances with increasing the pitching asymmetry because of enhanced thrust in the faster stroke. Similar to the reverse Kármán wake generated from the symmetrical oscillation, the P+S (paired and single vortices) wake identified in the case of the asymmetric oscillation can produce both drag and thrust, hence appearing around the drag-thrust transition boundary. The formation and evolution of wake structures produced by the asymmetrically oscillating foil are discussed, showing how the asymmetric oscillation affects fluid dynamics, drag-thrust transition, vortex strength, and wake jet. This work provides some new perspectives to understand the swimming and flying performance and some useful findings to design bio-inspired robots.

Keynote 6

Dr. Alina Steblyanskya, Harbin Engineering University, China

Biography:

Alina Steblyanskya is Associate Professor, School of Economics and Management, Harbin Engineering University, Harbin, China. Her research interests concern complex economics, energy efficiency, environmental economics, sustainable financial growth and green environmental finance. BA (honors) in Economics from Moscow State University (Russia), MBA (honors) from Kingston University (UK). She received his PhD (honors) from China University of Petroleum (Beijing). 2008-2014 was the Leader of the "Transnefteproduct" (the biggest Russian oil and gas transportation company) HR and social affairs department. Further, academic research cooperation has been carried out with Ukhta State Technical University, Central Economics and Mathematica Institute of Russian Academy of Science, Kostroma State University and other research institutions. She has published more than 20 academic papers (Russian, English, Chinese). She is a member of the editorial board of the Moscow State University "BRICS Economic Journal".

Speech Title:

New Energy-Resource Efficiency, Technological Efficiency, and Ecosystems Impact Ratings for the Sustainability of China's Provinces

Abstract:

This paper concerns the necessity of ecosystem protection and energy efficiency rating development. The article analyzes the experience of the non-commercial Environmental and Energy Rating Agency (Interfax-ERA) ratings concerning the environmental assessment of Russian regions and the transfer of successful knowledge for evaluating 31 Chinese provinces. The theoretical base, quantitative and qualitative characteristics of the energy-resource efficiency (ERE) rating, technological efficiency (TE), and ecosystem impact (EI) ratings are proposed based on the system methodology, developed within the framework of the UN Sustainable Development Goals (SDGs). The primary study objective is to determine whether the Interfax-ERA rating methodology and considered criteria could be applied in China to assess the provinces' environmental, technological, and energy efficiency. The research highlights the importance of multifunctional tools for developing experiences and sharing methodological experiences across countries. The study efficiently emphasizes provinces with a high level of energy efficiency and technological innovations as well as the provinces with the deficient level of eco-oriented economy policy. The results show two types of systematic deviations—significantly high-level impact on the ecosystem in the Chinese provinces and considerably highlevels of energy and resource efficiency in capitals and business centers.