THE INTERNATIONAL CONFERENCE ON ADVANCED PLASMONICS, MAGNETICS, AND OPTICAL TECHNOLOGIES

SEED NANOTECH
International Inc.

ICAPMOT 2021 CONFERENCE

The International Conference on Advanced Plasmonics: Magnetics and optical Technologies (ICAPMOT-2021); May 25-28, 2021, Brampton, Ontario, Canada

INTERNATIONAL CONFERENCE ON ADVANCED PLASMONICS, MAGNETICS, AND MAGNETO-OPTICAL TECHNOLOGIES (ICAPMOT - 2021)

SEED NANOTECH

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ICAPMOT 2021 CONFERENCE SERIES

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MONDAY – FRIDAY – 09:00 TO 17:00 CANADIAN EASTERN TIME
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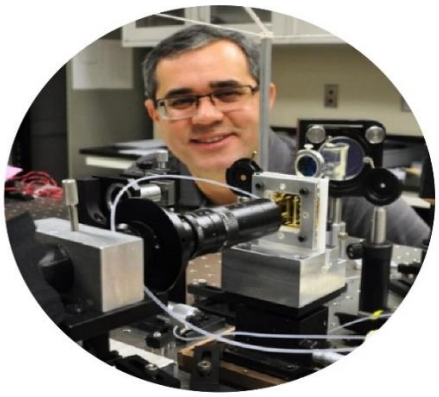
Speakers



PLANERY SPEAKER

DR. ALEXANDRE G. BORLO
PROFESSOR AND ACTING CHAIR,
DEPARTMENT OF CHEMISTRY,
THE UNIVERSITY OF VICTORIA,
VICTORIA, BC, CANADA.

Speakers

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DEPARTMENT OF PHYSICS AND MATERIALS SCIENCE FACULTY OF SCIENCE, TECHNOLOGY AND MEDICINE, UNIVERSITÉ DU LUXEMBOURG, LUXEMBOURG

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SENIOR RESEARCH SCIENTIST - INSTITUTO DE MICRO Y NANOTECNOLOGÍA, SPANISH NATIONAL RESEARCH COUNCIL, SPAIN

DR. DARA IGNATYEVA
RESEARCHER (ACADEMIC), FACULTY OF PHYSICS, LOMONOSOV MOSCOW STATE UNIVERSITY, MOSCOW, RUSSIAN FEDERATION

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DR. FRANCESCO PINEIDER
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Speakers

DR. HIROMASA SHIMIZU
ASSOCIATE PROFESSOR, DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING, TOKYO UNIVERSITY OF AGRICULTURE & TECHNOLOGY

DR. DOLENDRA KARKI
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SOCIAL WORKER AT INTERNATIONAL YOUTH SOCIETY ALGERIA (IYSA), PRESIDENT, INTERNATIONAL YOUTH SOCIETY NEPAL.

DR. MIM LAL NAKARMI
ASSOCIATE PROFESSOR, BROOKLYN COLLEGE, THE CITY UNIVERSITY OF NEW YORK, USA

Speakers

DR. NARAYAN UNNI KN
SENIOR PRINCIPAL SCIENTIST,
CSIR-NIST PROFESSOR,
PHYSICAL SCIENCES, ACADEMY
OF SCIENTIFIC & INNOVATIVE
RESEARCH, INDIA

MR. ANUJ KUMAR RONIYAR
BANGLADESH UNIVERSITY
OF ENGINEERING AND
TECHNOLOGY, INDEPENDENT
RESEARCHER, KATHMANDU,
NEPAL

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MISS SARAH KYALE
ELECTRICAL AND COMPUTER
ENGINEERING,
UNIVERSIDAD DEL ALGARVE,
FARO, PORTUGAL

TABLE OF CONTENTS

GENERAL CONFERENCE INFORMATION

SCOPE OF THE CONFERENCE

Seed nanotech International Inc. conference series would like to invite you to one of the most awaited and informative international conferences on Advanced Plasmonic, Magnetics, and Magneto-Optical Technologies(ICAPMOT). The conference is further themed on magneto-optics and technology. This international conference will disseminate crucial information on magnetics and plasmonics and include a practical demonstration of the uses and applicability of the technology in various fields like diagnostics, health, science, etc. Biophotonics, electromagnetism, and nanotech engineering are something that would also be discussed. Further, this technology conference will provide a stepping stone for various researchers and scientists to understand various practicalities and challenges involved in the operation of such technologies and understand the practical and rational approach to operating automation. This international conference will also highlight youth entrepreneurship and youth entrepreneurship programs by providing a clear and concise direction and guidance on the subject matters and boosting morale and confidence in using the technique. It will also analyze the various regulatory barriers for the youth and steps to overcome them through radical changes.

BRAMPTON, ONTARIO

Brampton is a city in the Canadian province of Ontario. Brampton is a suburban city in the Greater Toronto Area (GTA) and is a lower-tier municipality within Peel Region. The city has a population of 593,638 as of the Canada 2016 Census, making it the ninth most populous municipality in Canada and the third most populous city in the Greater Golden Horseshoe urban area, behind Toronto and Mississauga.

Indigenous peoples have inhabited the Brampton area for thousands of years, and the city is situated on the traditional territory of the Huron-Wendat, Haudenosaunee, and Anishinaabeg. Named after the town of Brampton in Cumberland, England, Brampton was incorporated as a village in 1853 and as a town in 1873. It became a city in 1974. Immigration has significantly increased Brampton's population, from 10,000 in the 1950s to over 600,000 today. The city was once known as "The Flower Town of Canada", referring to its large greenhouse industry. Nowadays, Brampton's major economic sectors include advanced manufacturing, retail administration, logistics, information and communication technologies, food and beverage, life sciences, and business services

Conference Chair

Conrad C. Rizal, PhD

President and Chief Executive Officer

Seed NanoTech International Incorporated

Brampton, ON

Canada

Web: www.seed-nanotech.com

Scientific Program Chair

Erden Ertorer, PhD

Managing Partner

Omegon North Technologies

Niagara Falls, Ontario,

Canada

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- Abstracts/digest submitted are reviewed by the experts selected by the conference committee.
- Authors will be notified of the review results by email.

Abstract/Manuscript Requirements:

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- The conference requires that the authors of each accepted manuscript must be present in the meeting.
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- The presenter must register before the deadline. And failure to do so will result in the automatic withdrawal of the manuscript.
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- The abstract / digest title must appear in boldface letters.
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CONFERENCE SESSIONS

Plasmonics and Optical Technologies - Session Chair- Paolo Vavassori & Dr. Erden Ertorer

Magneto-optics & Magneto-plasmonics - Part One (I) - Paolo Vavassori & Dr. Erden Ertorer

Magneto-optics & Magneto-plasmonics - Part Two (II)- Paolo Vavassori & Dr. Erden Ertorer

Bio-magnetics and Meta-materials - Dr. Asahi Tomitaka

Thin-films and Nanomaterials - Dr. Erden Ertorer & Dr. Ram Adhikari

Sensor and New Technologies - Dr. Erden Ertorer & Dr. Ram Adhikari

Education/Innovation/Entrepreneurship - Dr. Henri Migala & Dr. Asahi Tomitaka

CATEGORIES

MAGNETO PLASMONICS

- Theory and principle of magnetoplasmonics
- Theory and principle of magneto-optic Surface Plasmon Resonance (MOSPR)
- Synthesis of core-shell nanostructured materials
- Characterization of magnetoplasmonic materials
- Oxide and inverse spinel material-based materials
- Nanocomposites/nanocrystalline materials
- Nanofluidic and nanofabrication
- Nanobiomaterials and nanomedicine
- MOSPR biosensors and potential applications
- Magneto-optics materials for monitoring, surveying, and imaging
- Photonic crystal based magnetoplasmonic materials
- Graphene-based magnetoplasmonic materials
- Optomagnetic Biodetection and Thermoplasmonics
- Remote magneto-mechanical nano-actuation (MEMS)

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- Si-based and Photonic materials and magnetoplasmonics
- Green photonics, energy, and related technologies
- Ultrafast optics and applications
- Sensing, communications, and information processing
- Nonlinear optics, nanophotonics, and plasmonics
- Optical telecommunications

- Photonics technology entrepreneurship and innovation
- Photonic theory design and simulations
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- Metamaterials and Biomedical implants

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- Thin film, Nanomaterials, and Magneto-optics
- Magnetism in biology and medicine
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- Magnetic recording, Magnetic thin films & multilayers
- Magnetization dynamics
- Modeling and computational magnetism
- Microscopy, Imaging & Characterization
- Shape-memory alloys and Magnetocaloric effect
- Diluted Magnetic Semiconductors and Oxides

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- Competence in expanding new skills by searching for alternatives
- Financial literacy and capabilities for expansion and diversification
- Building emotional quotient with peers, Organizations, and Associations
- Reduction of tax and regulatory barriers for new entrepreneurs
- Expansion and Promotion of mentorship programs
- Providing room for internships, volunteering
- Expanding technical viability and resources

EDUCATION AND INNOVATIONS

- Channelizing young minds through
- Research and Development
- Addressing skill gaps through specialized global technologies
- Effective upskilling through awareness and cognitive mapping
- Encompassing technical, leadership, and domain-based learning
- Focus on “Human Engineering” through connections.
- Training in digital and incremental skills

PLENARY SPEECH:

Tuesday, May 25, 2021: 10 AM

Session Chair: Conrad Rizal & Elizabeth Rizal, Seed NanoTech International Inc.

"*Nanotechnology with Precious Metals: From Covid-19 diagnostic to single-molecule spectroscopy*", Prof. Dr. Alexandre Brolo, Assistant Dean, Department of Chemistry, University of Victoria, Victoria, BC, Canada.

REGISTRATION

Registration is available for the upcoming International Conference on Advance Plasmonics, Magnetics, and Magneto-optical Technologies – focused on education, innovation, and entrepreneurship. Discounts are available for participants through Membership and Early Bird registration. Ten scholarships (the registration fee is waived) for selected students/postdocs are also available. Please register early to receive discounts and secure spots.

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All participants are required to treat each other with dignity, respect. No discrimination and actions or statements are allowed based on individual characteristics such as age, disability, national origin, race, religion, gender, sexual or affectional orientation, gender identity, gender expression, appearance, political affiliation, and marital status. Anyone violating these rules will be asked to leave the session.

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The cancellation and refund will not be allowed after the payment. For exceptional circumstances, $50 administrative fee will be deducted subject to refund approval by the committee.

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Dr. Dolendra Karki,	Senior Research Associate, University of Pittsburgh Swanson School of Engineering, Pittsburgh, USA

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Nanotechnology with Precious Metals: From Covid-19 diagnostic to single-molecule spectroscopy

Plenary Speaker: Dr. Alexandre G.Brolo

Department of Chemistry

University of Victoria, Canada

[*Abstract not submitted but presented*]

Dr. Alexandre G. Brolo is a Professor and a current Acting Chair of the Department of Chemistry at the University of Victoria, Canada. His research interests include biophotonics, plasmonics, SERS, electrochemistry, SPR, and nanotechnology. He is particularly interested in the application of insitu spectroscopic probes to the characterization of electrochemical interfaces. His group is also investigating the optical and spectroscopic properties of both periodic and random metallic nanostructure. His work has taken him all over the world.

Nanophotonic architectures for biotechnology applications

Dr. Nicolò Maccaferri

Department of Physics & Material Science

Faculty of Science, Technology, and Medicine

University of Luxembourg, Luxembourg

[*Abstract not submitted*]

High-Efficiency performance of the drug discovery process and quality analysis of pharmaceutical Compounds Using MO-SPR Sensors

Anuj K Roniyar
Department of Electrical and Computer Engineering, Bangladesh University of Engineering and Technology, Dhaka-1000, Bangladesh

Conrad Rizal
Seed NanoTech International Inc.
Brampton. ON,
Canada

***Abstract*—** The Magneto-optic surface plasmon resonance (MO-SPR) technology evolved into a critical technology for the characterization of biomolecular interactions and is integrated into many stages of the drug discovery process. This work aimed to evaluate and develop different methods for the accurate and reliable determination of thermodynamic and kinetic information of such interactive systems. A combined analysis of all protein studies performed in this work reveals the benefits and limitations of SPR technology for the analysis of small molecules and low-affinity interactions. The sensitivities of MO-SPR sensors is found to be superior to SPR sensors in all cases. This enhancement in sensitivity means the detection limit of this class of transducers can be substantially improved.

Keywords: surface plasmon resonance; magneto-optic surface plasmon resonance; biosensors

Bias-magnet-free on-chip magneto-optical isolators for photonic integrated circuits

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Houghton, MI USA

***Abstract*—**
Heterogeneous integration of materials is inevitable in photonic integrated circuits to incorporate different device components such as lasers, optical isolators, circulators, optical amplifiers, receivers, etc., in a single chip. This enables the best quality materials for a particular device component; however, the material incompatibility brings challenges integrating them on silicon-based photonic platforms. Besides, the miniaturization of device components is crucial for on-chip photonic circuits. Integration of magnetic garnet-material-based optical isolators also faces miniaturization challenges because of the need for an external biasing magnet, either via a permanent magnet or an electromagnet. Here we present the first bias magnet-free on-chip optical isolators. Two integrated thin-film polarizers can be configured to make these isolators work for any polarization states, including TE polarization output states of on-chip lasers.

Keywords—optical, isolator, bias-magnet-free, thin-film waveguide, latching magnetic garnets

High-performance infrared magneto-plasmonics with transparent conductive oxide nanocrystals

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***Abstract*—**The modulation of plasmon resonance through magnetic fields can be a highly efficient way of boosting the performance of plasmonic refractometric sensors. We present a novel class of non-magnetic transparent conductive oxide nanostructures with localized plasmon resonance near-infrared. High resonance quality and low carrier effective mass result in exceptional magneto-plasmonic performance.

Keywords—magneto-plasmonics; magneto-optics; refractometric sensing; transparent conductive oxide nanoparticles

Comparison of performance of Early diseases detection (Alzheimer's: dementia) using SPR and MO-SPR Sensors

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***Abstract*—** A magneto-optic surface plasmon resonance (MO-SPR) sensor and surface plasmon resonance (SPR) sensor system has been utilized to sense the very low concentration of amyloid-beta (A-β)(1-42) by measurement of the reflectance variation respectively. Beta-amyloid (β-A) peptides are potential biomarkers to monitor Alzheimer's diseases (AD) for diagnostic purposes. Increased β-A level is neurotoxic and induces oxidative stress in brain resulting in neurodegeneration and causes dementia. Kinetics of binding was measured, and quantitative analysis was developed to detect melatonin partitioning into and amyloid binding to the membrane. This multifunctional mitochondrial enzyme is involved in the pathogenesis of Alzheimer's disease (AD) and represents a potential target for AD diagnostics. The results proved that the MO-SPR and SPR sensors system could successfully detect various concentrations of A-β (1-42), including critical concentration, to help diagnose Alzheimer's disease. A comparative analysis of all studies performed in this work reveals the benefits and limitations of MO-SPR technology for the analysis of small molecules. The sensitivities (and detection limits) of MO-SPR sensors are higher than SPR sensors in all cases.

Keywords—SPR, MOSPR, Alzheimer's diseases

Metamaterial-based High-Efficiency Wireless Power Transfer System to Compact Biomedical Implant

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Abstract—A new type of metamaterial, which is stacked and has near-zero permeability, is proposed. Then, this metamaterial is used as the transmitter of a wireless power transfer system with high efficiency to a compact receiver embedded in biological tissue.

Keywords—biomedical implant; field focusing; magnetic coupling; metamaterial; wireless power transfer.

Development of Focused Transcranial Magnetic Stimulation and Anatomically Accurate Brain Phantoms

Ravi L. Hadimani
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***Abstract*—**Diagnosable neurological disorders afflict one in five Americans above the age of 18 [1], and 50,000 new cases of Parkinson's disease (PD) are diagnosed every year in the United States [2]. Therefore, there is a critical need to develop new, safe, non-invasive methods for treating brain disorders. Specifically, disorders originating from deep brain structures, such as PD, are challenging to treat non-invasively. Transcranial Magnetic Stimulation (TMS) has the potential to tune a specific neuronal circuitry, such as motor circuitry, by stimulating a focused area of the brain cortex non-invasively and safely, thus treating the symptoms of several neurological disorders originating from the cortex and deep brain structures.

Studying the effect of transient magnetic fields on the neuronal firing patterns in specific neuronal pathways is essential to understanding and developing new treatment procedures for debilitating neurological disorders such as PD. Non-invasive techniques, including repetitive transcranial magnetic stimulation (rTMS), have had some success in other disorders, such as depression, but progress has been limited due to a poor understanding of the interaction of magnetic fields with neurons and neuronal networks, lack of focused TMS coils, and physical phantoms that can measure the stimulation strengths. Biomagnetics Laboratory at VCU aims to develop focal TMS coils brain phantoms for humans and focal coils and stimulators for animals to investigate the effect of TMS on individual nuclei of the motor circuit (shown in Fig. 1.).

We have designed and fabricated a new form of TMS coil, called the Quadruple Butterfly Coil (QBC), which is an improvement on the commercial Figure-of-8 coil design (Fig. 1) [3]–[5]. The QBC can stimulate smaller brain regions with similar field strength to the Figure-of-eight coil design and is, therefore, more focal. This is achieved by diverting the coil structure from the surrounding areas of the center point. A small Figure-of-8 coil is added inside the large to compensate for the field contribution at the center as shown in (b). We compared magnetic and electric fields in different brain regions when stimulated with the QBC versus the Figure-of-eight coil. From the FEM simulations of induced electric fields in the brain, we found that the volume of the induced electric field in M1, supplementary motor area (SMA), Broca's area, and the primary auditory cortex are reduced by 35% due to the QBC [3]–[5]. This result has been further improved by modifying the design to include passive shield materials with high permeability along with the QBC configuration, as shown in Fig.8 (a) and (b) and Table 1. We have also developed anatomically accurate brain phantoms that can be used to experimentally validate the stimulation strengths. We have also determined the critical areas of the brain that are stimulated above the threshold field [6]–[8].

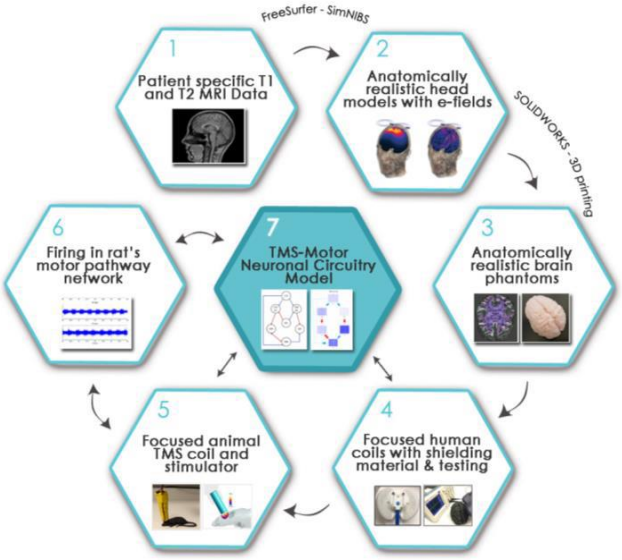

Fig. 1. Schematic TMS research activities to investigate the underlying mechanisms using focused TMS coils and anatomically accurate brain phantoms.

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Design of a Stacked-patch Antenna Implantable in Brain Tissue

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***Abstract*—**Typically, stacked patch antennas are parasitically coupled and provide larger bandwidth than a single patch antenna. Implantable antennas are mandatory to transfer data from implants to the external world wirelessly. The dispersion of the dielectric constant of the tissues and variability of organ structures of the human body absorbs most antenna radiation. Consequently, implanting an antenna inside the human body is a very challenging task. The antenna design is required to fulfill several conditions, such as miniaturization of the antenna dimension, biocompatibility, the satisfaction of the Specific Absorption Rate (SAR), and efficient radiation characteristics.

Furthermore, fabrication and implantation methods of the antenna inside the human body are summarized elaborately. This extensive summary of the medical implantable antenna technology will help understand the prospects and challenges of this technology. The prototype model is fabricated and in vitro demonstrated with skin-mimicking phantoms, which experimentally achieves impedance bandwidths. Radiation characteristic has been evaluated using HFSS Software (HFSS is a 3D electromagnetic (EM) simulation software for designing and simulating high-frequency electronic products)

Keywords—Antenna; Implantable, Brain tissue

Sensing with all-dielectric magnetophotonic crystals

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***Abstract*—**Surface wave resonances in the magnetophotonic crystals have extremely high Q-factors due to the small material losses. This makes it possible to enhance the structure's sensitivity to the real and imaginary parts of the refractive index of the analyzed sample. Moreover, it is possible to combine sensing of the bulk and surface refractive index changes in the frame of a single device by utilizing the difference of the penetration depths of TM and TE-type surface waves.

Keywords— magnetophotonic crystals, surface waves, all-dielectric structures

Nanostructured Organic Field-Effect Transistors as Efficient Ammonia Sensors

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***Abstract*—** Structure-property relationship plays an important role in defining the performance of organic semiconductor devices. Accordingly, the various performance parameters of organic opt-electronic devices can be modified by tuning the fabrication process parameters. Herein, we present the results of such studies on ammonia sensors based on organic field-effect transistors. It is shown that the process parameters can significantly alter the performance of a small molecule and polymer organic field-effect transistor-based ammonia sensors.

Keywords: ***organic field-effect transistor; ammonia sensor; doping; nanostructure***

Sodium acetate phase change materials (PCM) and nanomaterial based hand warmer

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Abstract— Nepal mostly comprises hilly and mountainous terrain, susceptible to elongated periods of acute cold- a fact backed by the locals and reiterated by the more than 2 Lakh trekkers and mountaineers the country receives as tourists annually. To address this issue in the most sustainable, affordable, and effective way possible, we have pioneered the Solar Hand Warmer. The product is designed like a pouch, comprising of a small button and sodium acetate trihydrate (SAT) PCM composite of nanomaterials, which remains solid in room temperature (we will name it "Nano Pad" hereafter). Nano Pad is designed to be charged by solar radiation, which melts the SAT based composition. Once fully charged (or melted) the button can be pressed to release the accumulated heat through the pouch. After activated, it maintains the heat for an hour, perfect for daily use with periods of recharge. The nanomaterials are used to augment the absorption of solar radiation by SAT. For testing its efficiency, we measured the charging time of 110 gm of SAT in a composite in plastic packaging, exposing it to radiation produced from a sun simulator of about 1000 Watts/m^2. Through this performance test, we found that Nano Pad gets fully charged comparatively about five times faster than heat packets without our composition of nanomaterials.

Since this packet's primary hurdle has so far been identified as the charging process, which we were able to address, we believe that once mass-produced, we will be able to provide significant relief to busy mountain dwellers or visitors on the move.

Keywords—Nanomaterials, Sodium acetate trihydrate, phase change materials, solar energy storage system

Recent Progress in Thin Film Perovskite Solar Cells

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Abstract: Perovskites are being extensively explored for both solar cells and lighting applications. To say that perovskites are wonder materials for the optoelectronic industry is an understatement. Generally, perovskites have a three-dimensional ABX_3 structure (A: organic or inorganic cation, B: metal cation, X: halogen), in which self-organized two-dimensional (2D) planes of organic layers (AX) are sandwiched between 2D planes of inorganic halides (BX_2). Organic-metal halide perovskites have shown remarkable improvement in recent years, with efficiencies increasing from 3.8% in 2009 to 25% in 2020, close to long-commercialized silicon solar cells. This presentation will cover a general overview of various solar cell technologies and discuss the recent progress in perovskite thin-film solar cells. In addition, our group's work on the effect of buffer layers on both reliability and performance of the perovskite solar cells will be presented. Finally, a brief discussion on how solar cells can boost Nepal's electricity capacity from hydropower during the off-season will be presented.

Applications of nanocolumnar systems with plasmonic properties

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***Abstract*—**The nanocolumnar systems have been fabricated by glancing angle deposition with magnetron sputtering (GLAD-MS). After introducing the fundamentals of GLAD-MS, several applications that take advantage of plasmonic effects in such nanocolumnar systems are presented.

Keywords—nanocolumns; sputtering; plasmonics; black-metals; SERS; solar cells; self-cleaning

Hexagonal boron nitride for UV quantum emitter

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Abstract— Hexagonal boron nitride (h-BN) is an ultrawide (~ 6.0 eV) bandgap semiconductor that has potential applications for developing electronic, optoelectronic and nanophotonic devices including the source of ultraviolet (UV) emitters. We present luminescence properties of h-BN crystal powders with evidence of sharp atomic-like emission lines that could have application in UV quantum emitters. Deep ultraviolet photoluminescence (PL) spectroscopy was employed to study the luminescence properties of hexagonal boron nitride (h-BN) crystal powders after annealing the samples at different temperatures range of 100 – 900 ^{o}C for one hour in ambient air. The fourth harmonic laser (~195 nm) generated from a Ti: sapphire laser was used for photoexcitation in the experiments. The PL spectrum from the h-BN samples annealed around 700 ^{o}C showed strong luminescence intensity at 5.49 eV along with enhanced phonon-assisted band-edge emission at 5.90 eV. Additionally, it revealed sharp atomic-like emission lines in UV region at 4.10, 4.12, 4.14 and 4.16 eV along with their longitudinal phonon replicas which were not present from the unannealed samples. These sharp emission lines in UV region with very small line widths of less than 1 nm from h-BN indicate as quantum emitters which could have application in quantum information technologies. Power- and temperature-dependent PL measurements of the sharp atomic–like emission lines exhibited robust nature of the energy peak positions. Possible candidates for the origin of the atomic-like emissions in UV region will also be discussed.

Keywords—Hexagonal boron nitride, Deep UV photoluminescence, UV luminescence, atomic-like emission, quantum emitter

A Wedge-Shape Au Thin Film for Integrating Multiple Surface Plasmon Resonance Sensors in a Single Chip

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A Youth Leader and Woman Entrepreneur in Nepal – A personal experience

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Abstract-In this talk, I will give a brief overview of youth and woman entrepreneurs of Nepal and discuss various challenges faced being women entrepreneur. It is a story of perseverance and persistence. Based on my personal experience, I will elaborate on various challenges and how to overcome these challenges. I would conclude with prospects of youth and woman entrepreneurs in Nepal.

Keywords: youth leader, woman entrepreneurs

Idea Studio – A platform to encourage and empower entrepreneurs to solve social and economic issues faced in Nepal

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Innovative Approach to Hospitality Education in Nepal

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Abstract - As a hospitality educator, my presentation will focus on our innovative approach to hospitality education in Nepal. The institution that we have created in Nepal is one of its kind. It is a highly admired academy that caters to those who seek world-class skills or embark on exciting global hospitality careers. I will discuss how one academy could attract students from over 21 nations in Nepal and manage to forge international collaboration bringing the best to our students. Not to mention, we have co-created one of the most ambitious hospitality apprenticeship programs where students can earn a bachelor's degree from Kathmandu University while maintaining a full-time job– it is the first and one of its kind in Nepal. I will discuss how we are able to create outreach centers, provide 100s of scholarships and transform the hospitality standards in Nepal.

I hope our audience will benefit from our success stories that nothing is impossible to do if one is determined to serve and achieve. Two decades back, there was not a single hospitality academy offering an undergraduate program. However, presently we are EHL Lausanne certified academy and provide Australian national qualifications through *TAFE NSW*. This is an indicator that the quality of education can be and should be made available to everyone no matter where one is residing. Global collaboration for quality education is a critical issue if we address the ongoing challenges around the world.

Opportunities and Challenges in Innovation and Entrepreneurship in Nepal

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Abstract— Nepal is a country with diversity in various respects – biological, cultural, geographical, and traditional and indigenous heritages. Social harmony is a prevalent nature of Nepalese culture. We would have giant neighbors in the North and in the South - a significant market opportunity if we could develop value-added products utilizing our resources. The people are hardworking, patient, and enduring. The nation has a glorious history in terms of technology development, arts and crafts. Many things of the Earth are found only in Nepal. There is every reason for the country to prosper. However, the hope and endurance of Nepalese people for prosperity still stand as a distant dream. "Why the country has not developed" has become a topic of plenty of academic discussions. In this paper, we will first put forward some keywords highlighting the significance of science, technology, and innovation (STI) as vehicles for the nation's prosperity, particularly the importance of investment in science. The latter has several facets: a) science as culture, b) science education and research, c) utilization of science for the benefit of humanity, d) grasping the opportunities created by emerging technologies, and e) private-public partnership. There is a gap between policy, resource mobilization as well as management, and entrepreneurship. We will highlight those issues with particular attention to creating a collaborative interface between education, innovation, and entrepreneurship. There is a huge opportunity to develop small and middle-sized enterprises utilizing the country's natural and intellectual resources. Nanotechnology (NT) is one of the areas with which Nepal has a chance to revive its glorious past in materials science, art, and crafts. We will briefly introduce some NT-related initiatives and areas we could utilize NT to develop new entrepreneurial courses.

Keywords—innovation, private-public partnership, science policy, nanotechnology

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