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Numerical Investigation of The Effects of BIOPCM-Enhanced Walls on The Annual Thermal Performance of a Typical Residential Building

Energy consumption in the building sector is responsible for more than one-third of the global primary energy usage. Thus, energy efficiency improvement in this sector has become a worldwide challenge in the last decades. As an evidenced solution, incorporating phase change material (PCM) as productive thermal mass in the construction of external walls and roofs could enhance the dynamic thermal behavior of buildings envelope and increase the thermal comfort of occupants.

In this study, a BIOPCM layer has been employed in the composition of the external walls and roof of a typical residential building located in the warm and dry climate of Shiraz, Iran. Thus, as a main purpose, the effects of relocating the PCM layer inside the wall composition on the total annual cooling and heating loads of the building have been investigated. Then, the optimum position of the PCM layer for achieving maximum reduction in the annual cooling and heating loads has been detected through numerical simulation by Energyplus toolkits. As a next scenario, various BIOPCMs with different melting point temperatures have been utilized in the detected optimum position of the wall composition and the effects of different melting point temperatures of BIOPCM on the total cooling and heating loads has been Analyzed. Finally, as a last scenario, a BIOPCM layer and an insulation layer simultaneously have been integrated to the wall composition and the thermal performance of the building has been simulated.

The results indicated that, the maximum energy saving for cooling of the building (by reduction of about 36% in the annual cooling load) achieves by placement of the BIOPCM in the outermost layer of the wall composition. Also, outfitting a PCM-enhanced wallboard via an extra insulation layer could decrease the amount of annual heating load by 95.1%. Therefore, the PCM layer, to a certain extent, have a promising energy-saving role in the building envelope.

Biography

Majid Ghassemi is a Professor of Mechanical Engineering Department at the K. N. Toosi University of Technology in Tehran, Iran. He has over 20 years of academic and industrial experience, served as the President his university from 2010 through 2013, supervised several undergraduate, masters and PhD students, published several books and many journal and conference papers. He is currently an Editor-in-Chief of several different International Journals. He also serves as organizing member of several international conferences. Professor Ghassemi received his Ph.D. in Mechanical Engineering from Iowa State University in 1993.

Pierluigi Siano

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A Scalable Privacy Preserving Distributed Parallel Optimization for Prosumers

Modern power systems are evolving from a centralized paradigm, according to which electrical energy was mainly generated by large power plants at the transmission level, to a new model where Distributed Generation (DG), often based on Renewable Energy Sources (RES) represents a relevant produced electrical energy.

In this new model, the provision of ancillary services to the Transmission System Operator (TSO) should take into account the possible flexibility furnished by new distributed resources, such as dispersed and small generators, also based on RES, and frequently endowed with small batteries.

In particular, distributed Battery Energy Storage Systems (BESSs), also of small scale, that were mainly used to decrease the uncertainty due to RES and to increase the energy self-consumption for the end-user, can be also managed to provide energy flexibility to the TSO.

The possibility of using residential PV-battery systems for the provision of up and down regulation has been verified and it has been proved that, in addition to mitigating the concerns due to the non-programmability of RES based generation,

storage systems can also be used to provide balancing resources and available energy reserve and for the Transmission System Operator (TSO).

Biography

Pierluigi Siano (M'09–SM'14) received the M.Sc. degree in electronic engineering and the Ph.D. degree in information and electrical engineering from the University of Salerno, Salerno, Italy, in 2001 and 2006, respectively. He is a Professor and Scientific Director of the Smart Grids and Smart Cities Laboratory with the Department of Management & Innovation Systems, University of Salerno. His research activities are centered on demand response, on energy management, on the integration of distributed energy resources in smart grids, on electricity markets and on planning and management of power systems. In these research fields he has co-authored more than 500 articles including more than 300 international journal papers that received in Scopus more than 9700 citations with an H-index equal to 49. He received the award as 2019 Highly cited Researcher by ISI Web of Science Group. He has been the Chair of the IES TC on Smart Grids. He is Editor for the Power & Energy Society Section of IEEE Access, IEEE TRANSACTIONS ON INDUSTRIAL INFORMATICS, IEEE TRANSACTIONS ON INDUSTRIAL ELECTRONICS, Open Journal of the IEEE IES, IET Smart Grid and IET Renewable Power Generation..

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Metabolic Modeling of Ischemic Livers Using Nash Equilibrium

End-stage liver disease claims up to 60,000 lives annually in the US. Many patients become too ill to tolerate liver transplantation, and even if transplantation were indicated, there is a severe shortage of viable donor organs and only 28% of the wait-listed patients receive transplants. These numbers could be reduced dramatically should the donor organ pool be expanded by rendering marginal cases, such as ischemic livers from Donors obtained after Cardiac Death (DCD), transplantable. It is estimated that about 6,000 livers/yr. are only marginally damaged by ischemia and could be resuscitated for transplantation. There is evidence from our lab and others that Normothermic Extracorporeal Liver Perfusion (NELP) is a very promising approach for recovering marginal organs that would be otherwise rejected from the donor pool.

In this talk, a mathematical model for liver metabolism is presented in order to study the behavior of cold and warm ischemic livers. The model attributes include (1) charge balancing, (2) explicit enzyme-substrate reactions and up/down regulation of enzymes when needed, (3) compartmentalization and transport between cell compartments. The resulting metabolic network is treated as a Nash Equilibrium, in which enzymes are treated as players in a multi-player game and all feedback and transport variables are converged using direct substitution. Fluxes, concentrations, amounts generated/consumed, pH, energy charge, and other metrics are computed for all metabolites/co-factors, and enzymes in the model. In particular, ATP content is used to measure the viability of the ischemic liver model and experimental data is used to validate the model.

Biography

Angelo Lucia has completed his PhD from the University of Connecticut, USA. He is the Chester H. Kirk Professor, a position he has held since 1995. He has published more than 100 papers in reputed journals and has been serving as an editorial board member for the Journal of Global Optimization and Spring Nature Operations Research Form.

Soshu Kirihara

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Dimensional Modulations of Ceramic Components to Expand Reaction Surfaces by Stereolithographic Additive Manufacturing

Ultraviolet laser lithography was newly developed as a direct forming process of fine ceramic components with micro geometric patterns. As additive manufacturing techniques, two dimensional cross sections were created through dewaxing and sintering by UV laser drawing on spread resin paste including ceramic particles, and three dimensional composite models were sterically printed by layer laminations and interlayer joining. Nanoparticles of alumina and titania of 300 nm in average diameter were dispersed in to photo sensitive liquid resins at 50 % in volume fraction. The resin paste was spread on a glass substrate at 50 μm in layer thickness by a mechanically moved knife edge. An ultraviolet laser beam of 355 nm in wavelength was adjusted at 10 μm in diameter and scanned on the surface. Irradiation power was increased to 1.0 W for enough solidification depth. The half wavelength of the incident ultraviolet ray should be comparable with the nanoparticles gaps in the resin paste, and electromagnetic field can be resonated and concentrated through Anderson localization. In this investigation, through computer aided smart manufacturing, design and evaluation (Smart MADE), solid electrolyte dendrites of yttria stabilized zirconia (YSZ) with spatially ordered pores were processed for fuel cell miniaturization, and ceramic sheets of lithium lanthanum titanate (LLT) with micro emboss patterns were developed for all-solid batteries.

Biography

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” for environmental improvements of “Geotechnology”, 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.

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Ultrasound Assisted Eco-friendly Leather Processing Techniques

Leather industry is one of the largest foreign currency earning sources in Bangladesh. Leather processing involves many physical operations and chemical processes such as unhairing, liming, tanning, dyeing, fatliquoring etc. Different types of chemicals are used in leather processing. Most of the tanneries use conventional methods which are inefficient and a lot of chemicals remain unused and disposed off with wastewater and pollute the environment. At present it is a prime concern of the scientists to look for alternative leather processing techniques to save the environment. This study describes leather processing by conventional methods and in presence of ultrasound (18 KHz – 10 MHz). The effects of different parameters such as processing time, temperature, frequency of ultrasound, ratio of reactants to leather were studied in detail. Ultrasound assisted Cr Tanning, dyeing and fatliquoring of leather showed better results compared to conventional methods. Tanning time was shortened from 6 hours to 2 hours and the amount of leachable chromium in the leather was also reduced by using ultrasound. This remarkable enhancing effect has been attributed mainly due to increased penetration of tanning agents into pickled leather. Different physical and mechanical properties of leather processed by conventional method and in presence of ultrasound were evaluated and compared. Ultrasound enhanced leather dyeing without compromising the quality of leather. Photomicrographic analysis of the cross-section of the tanned leather showed a higher penetration of tanning agents in presence of ultrasound. It is assumed that ultrasound created cavitational effects and it accelerated the leather processing resulting in a decrease in environmental pollution.

Biography

Dr. Md. Zahangir Alam completed his B.Sc. (Hons') and M.Sc. in Applied Chemistry and Chemical Technology from University of Dhaka, Bangladesh. He achieved his PhD from Kumamoto University, Japan under the supervision of Professor Dr. Seiji Kurihara. He also did JSPS Postdoctoral Research at the same university. He is now working as Professor of Applied Chemistry and Chemical Engineering at University of Dhaka, Bangladesh. He has published more than 50 research articles in reputed scientific journals and has been serving as an editorial board member of the Bangladesh Chemical Society Journal.

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IF7-SN38: brain and non-brain tumor vasculature-targeting therapeutic by carbohydrate-mimetic peptide

Previously we identified a linear carbohydrate mimetic 7-mer peptide, that we designate IF7, which bound to the N-terminal domain of annexin A1 (Anxa1) (Hatakeyama *et al., Proc. Natl. Acad. Sci. USA*, 2011). Although Anxa1 is normally expressed intracellularly in numerous cell types, it is found on the endothelial cell surface in malignant tumors. When we injected an anti-cancer drug conjugated to IF7 intravenously at low dosage into mouse models of melanoma or lung, prostate, breast, or colon cancers, it suppressed tumor growth without side effects. When we injected fluorescently-labeled IF7 intravenously into brain tumor model mice, IF7 reached the tumor vasculature and targeted tumor cells in stroma, overcoming the blood-brain barrier (BBB) (Nonaka *et al., Brit. J. Cancer,* 2020). In a dual tumor mouse model harboring both subcutaneous and brain tumors, IF7-conjugated to the anti-cancer drug SN-38 (IF7-SN38) suppressed growth of both tumors. Moreover, in a brain metastatic model of syngeneic melanoma, tumors continued shrinking after IF7-SN38 administration had been stopped. Finally, when melanoma cells were injected subcutaneously into mice made tumor-free by IF7-SN38 treatment, CD8+ cytotoxic T cells infiltrated the injection site, suggesting a heightened immune response against tumor cells. These results suggest that IF7-SN38 can overcome BBB to suppress brain tumor growth with high efficacy and promote an immunotherapeutic response by the host. A first-in-human clinical trial of IF7-SN38 in glioblastoma patients is now underway.

Biography

Michiko N. Fukuda obtained her PhD in 1980 from the University of Tokyo. After postdoctoral studies at the Fred Hutchinson Cancer Center, she became an independent investigator at the Sanford-Burnham-Prebys Medical Discovery Institute (SBP, then La Jolla Cancer Research Foundation) in 1983 and remained as a professor there from 1986 to 2014. She was then invited to become Center Director of the National Institute of Advanced Industrial Science and Technology (AIST) in Japan and remained there until 2019. Currently, she is an emeritus professor at SBP and president of IF7Cure Inc. She has published more than 150 papers

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Dairy lactic acid bacteria as microbial platforms to sustain human health and bioeconomy

Healthy diet contributes to prevent chronic diseases such as metabolic, cardiocascular, neurodegenerative, and cancer disorders. Fermented dairy foods (FDFs) obtained from fermentation of milk by the metabolic action of lactic acid bacteria (LAB), represent pivotal elements in a healthy diet due to the presence of live fermentative microbes and of prohealth molecules (PHMs) mostly derived from the microbial conversion of food compounds. In FDFs, the main PHMs are bioactive peptides (BPs) released from milk proteins by the microbial proteolysis. These bio-molecules display a pattern of functions such as anti-hypertensive, antioxidant, immuno-modulatory, and anti-microbial activities, which significantly contribute to prevent chronic diseases. Therefore, FDFs are promising bio-reservoirs of novel BPs-producing novel BPs-producing LAB. In Parmigiano Reggiano cheese we found food-grade LAB cultures suitable to release antihypertensive peptides Valine-Proline-Proline and Isoleucine-Proline-Proline from milk casein. They were successfully used as adjunct cultures to enhance BP content in yogurt and can be further exploited to develop novel dairy food and beverages also using cheese-making byproducts such as whey. The multidisciplinary approach proposed in this study integrates metabolomics, microbiology and genetics of BPs-producing LAB cultures in order to develop novel functional dairy food, in compliance with sustainability criteria of circular economy.

Biography

Lisa Solieri has completed his PhD and postdoctoral studies in Food Science and Biotechnology from the University from the University of Modena and Reggio Emilia, Italy. She is Associate Professor in Food Microbiology at the University of Modena and Reggio Emilia, Italy. She has published more than 50 papers in reputed journals and has been serving as an editorial board member of reputed journals, such as Frontiers in Food Microbiology, International Journal of Biotechnology & Biochemistry and Beverages. She is Editor in cheap of fungal genomics & Biology

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The decision-making process 4.0: equity analysis conditio sine qua non in any planning process

The planning fallacy, which characterized many public decisions, was mainly related to the trend of overestimating the benefits of design solutions, regardless of past experience with similar decision-making processes that proved to be a failure. Moreover, it fostered the funding of "unnecessary" or "not-shared" decisions.

The decision making processes has experienced 3 main steps of evolution during the years. In the first step, a unique decision-maker, Deciding Announcing and Defending his/her decision, was considered; in the second step, the decision-maker started interacting with the analyst, who evaluated the quantitative impacts of interventions; in the third step, the decision-maker together with the analyst started engaging the public as well.

Stakeholders Engagement (SE), is the process of identifying and incorporating stakeholder concerns, needs and values in the transport decision-making process. The overall goal of engagement is to achieve a transparent decision-making process with inputs from stakeholders and their support of the decisions to be taken.

The decision-making process 4.0, which is the original contribution of this paper, should promote an equity, inclusion and diversity analysis in the final stage of the process itself, before a choice is taken. For example, in the field of engineering, when planning the introduction of a public work, such as an infrastructure, policy makers should focus on integrative solutions, taking into account that the gap between primary and peripheral areas should not increase. An example of how an equity analysis should be carried out is discussed for High Speed Rail systems.

Biography

Francesca Pagliara is Assistant Professor in Transportation Engineering, Polytechnic School and of the Basic Sciences, University of Naples Federico II, Italy. She is author of academic books both in Italian and in English and of more than 100 papers. She co-edited two books published by Springer. She participated at several research projects. Her main fields of research are the wider socioeconomic impacts of High Speed Rail systems, Public Engagement in the transportation decision-making process, Transit Oriented Development Policies and Integrated Land-use/Transport models.

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Manipulating materials at the molecular- and nano-scale with scanning probe microscopy

As devices and materials scale down to the nanoscale, we require the ability to understand and to precisely manipulate and control those materials in a useful way. For nano-engineering we need to be able to repeatedly pattern and fabricate materials at the nanoscale to take advantage of their special properties, but also explore and characterize device behavior at the atomic scale. One solution to both manipulating and measuring materials at the nanoscale is scanning probe microscopy. This talk will explore three example applications which relate to existing and emerging materials: How STM can characterize hot electron-induced breakdown of oxides in silicon devices at the molecular scale; How STM can induce local nanoscale ripples in graphene and characterize the resulting mechanical and electronic response; and How contact probe measurements inside an electron microscope can perform electrical characterization of single nanowires and nanotubes. The results of these studies will be brought together to address this contemporary challenge in nanoscale engineering and look towards using scanning probe microscopy to realize the required solutions.

Biography

Dr Richard Cobley, is a former EPSRC / Royal Academy of Engineering Research Fellow, now a Senior Lecturer at Swansea University (UK). His research uses scanning probe microscopy to characterize carrier transport in operating semiconductor device structures and to characterize contact formation to individual nanomaterials. He uses STM to induce local ripples in graphene to manipulate and selectively address layers, and uses STM and STEM to study neuromorphic nanostructured metals. His work has been funded by EPSRC, EU/ERDF, the Royal Academy of Engineering and the Leverhulme Trust.

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Corona Virus Disease (COVID-19) is one of the most deadly diseases in developing countries, so the detection of COVID-19 is an essential challenging task in the world these days. According to a very high spread rate of Coronavirus and the other viruses which causes lung pneumonia in the cold seasons it is so crucial to find a way to detect the kind of pneumonia then visualizing infected regions among a huge number of patient's computerized tomography CT images. So, scientists are seeking a way to get help from computerized detecting systems because these kinds of medical imaging present the obscured little regions with high resolution. The main target of this paper is to consider a machine learning method to detect disease and visualize regions in the input lung CT image. The utilized method for detecting is a convolutional neural network (CNN) with Res-Net algorithm. For visualization of the regions, confusion matrix was used and compared with watershed algorithm. Different metrics values were calculated to evaluate the particularity of recent work. Although the number of input CT images is lower than the other studies, the results present that the recent method is more accurate. Results show that the convolutional neural network is more efficient than watershed algorithm in visualization and the accuracy of detecting procedure is 99.8%.

Biography

Seyed Milad Mousavi is a Master student of Mechanical Engineering at the K. N. Toosi University of Technology in Tehran, Iran. He is one of the best students of Professor Ghasemi who is a professional professor at at the K. N. Toosi University of Technology. He has done so many different projects in machine learning, and now he is working on the artificial intelligence applications in biomechanic and energy.

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Altered tooth-sum spur gearing

Altered tooth-sum spur gearing is an important aspect in design of spur gears used in automotive as well as defense industries. This gearing is made to work by varying the number of teeth operating between a specified center distance. In this technical talk the effect of contact stresses, bending stresses, sliding velocity, power loss and mesh stiffness and its effects on altered tooth-sum gearing will be discussed in comparison with standard tooth-sum gearing. The future challenges of this altered tooth-sum gearing in case of helical gears will also be discussed along with spur gearing.

Biography

Dr. Sachidananda is currently an Associate professor and Assistant Registrar-Evaluation at Manipal academy of higher education at school of Engineering and IT, Dubai. He is working in the education industry from past 20 years. He has completed his doctoral degree from Manipal institute of technology, Manipal India. He has published more than 45 papers in international journals and conferences. He has been invited and honored as session chair in international conferences at UAE. Have been awarded the best paper presentation award at ICMTSET conference held at Dubai and best poster presentation award at Manipal University, India. His research interest is in the area of machine design, altered tooth-sum gearing, optimization using Taguchi and grey relation analysis, ANN and manufacturing processes.