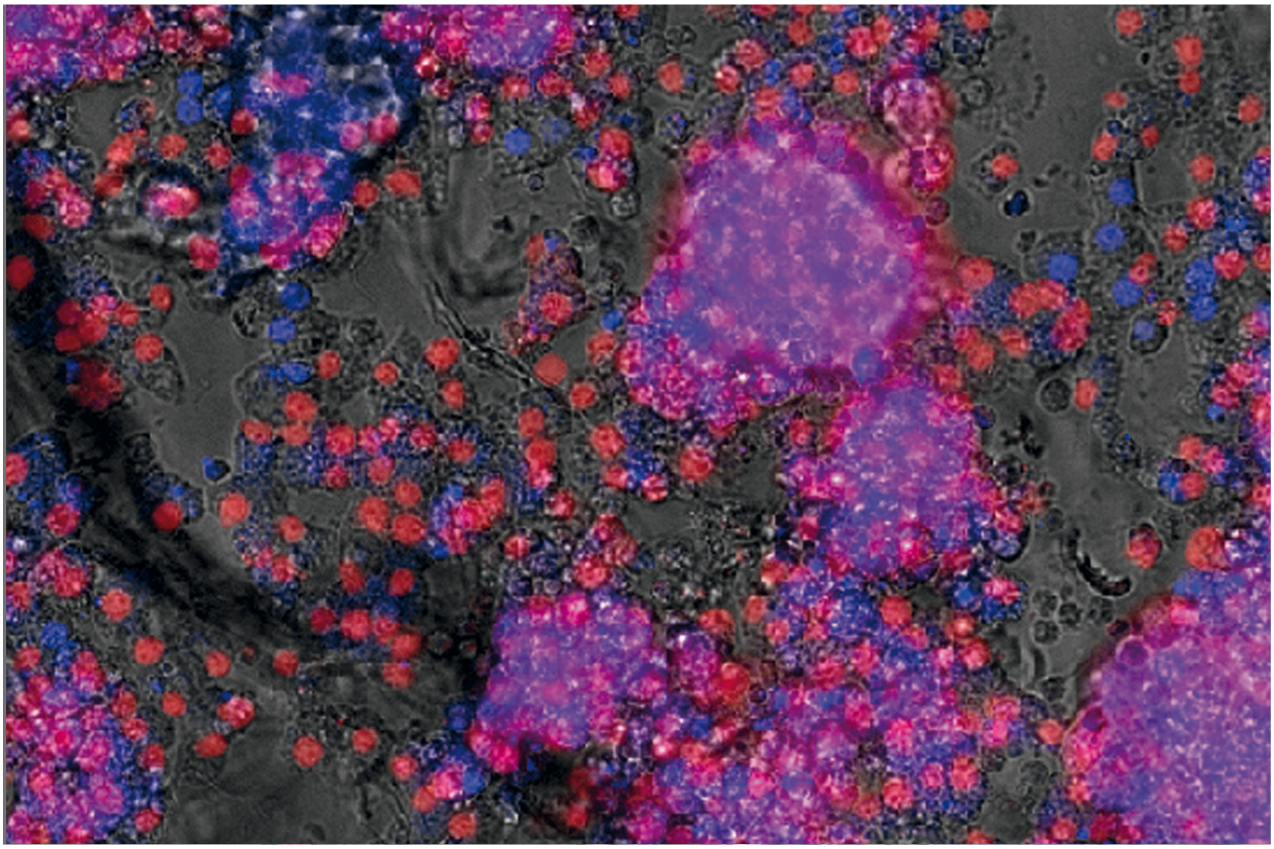
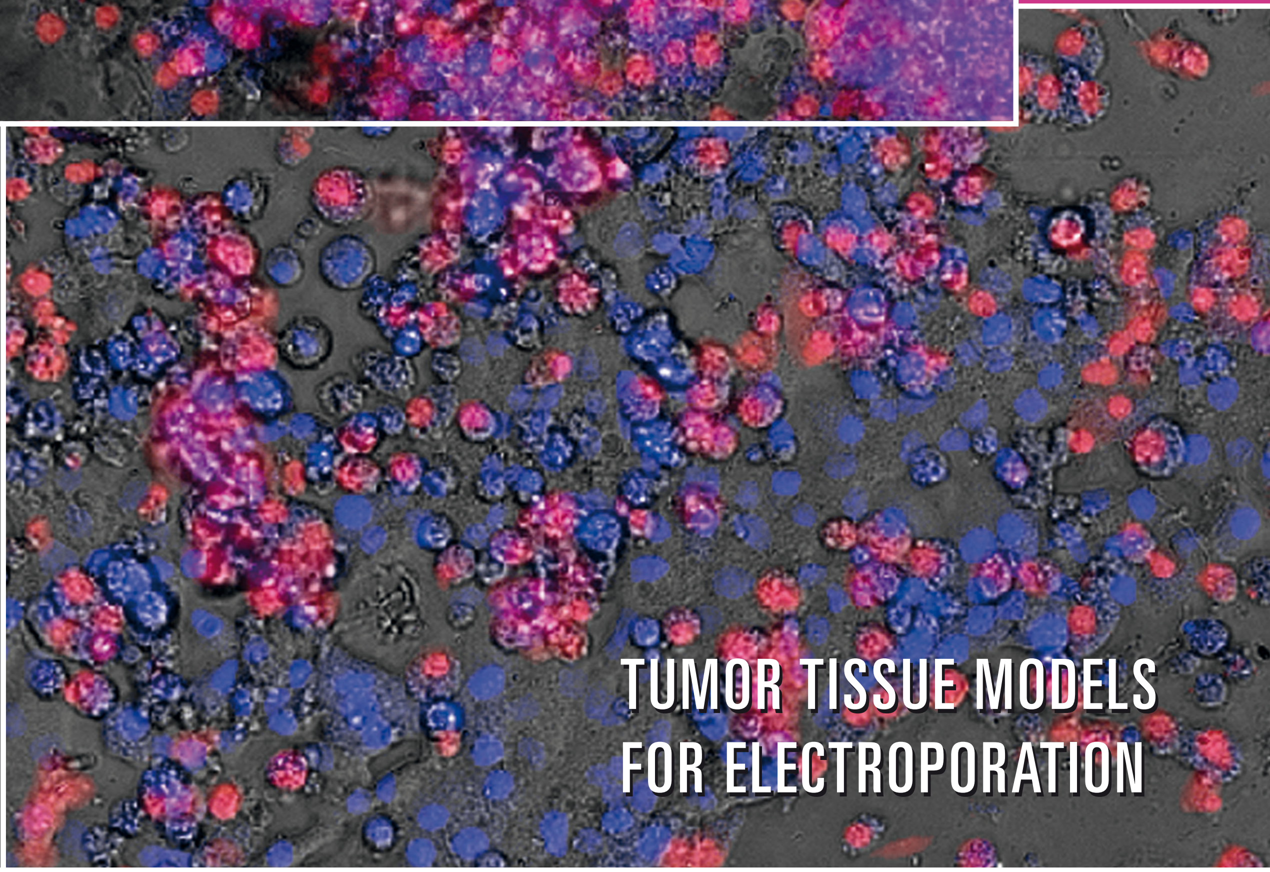
DIINFORMA

1.08
APRILE 2022

NEWSLETTER DEL DIPARTIMENTO DI INGEGNERIA INDUSTRIALE DELL'UNIVERSITÀ DEGLI STUDI DI PADOVA



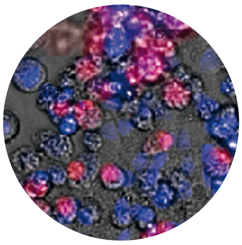


TUMOR TISSUE MODELS FOR ELECTROPORATION

DIPARTIMENTO DI INGEGNERIA INDUSTRIALE

1222·2022 800 ANNI

UNIVERSITÀ DEGLI STUDI DI PADOVA



C O P E R T I N A

Modelli di tessuto tumorale per elettroporazione
Tumor Tissue Models for Electroporation

P A G I N A

DIPARTIMENTO
DI INGEGNERIA
INDUSTRIALE

Fossil CO_2 emissions reduction: energetic, economic and environmental assessments by process simulation

During the last decades there has been an accelerated growth in human energy consumption, which, together with stricter requirements to meet the goals of greenhouse gas emissions reduction, has put an increasing pressure on the energy sector. Decisions on the strategies to pursue in this regard should be based on indicators able to summarize different aspects of this sector. Several indicators are available in the literature and normally used by decision makers.

One of them is the Energy Return on Energy Invested (EROEI), which relates the amount of net energy produced to the total input energy. It has recently been proposed as a benchmark tool by the international energy agency (IEA) in the guideline methodology for the net energy analysis of photovoltaic systems.

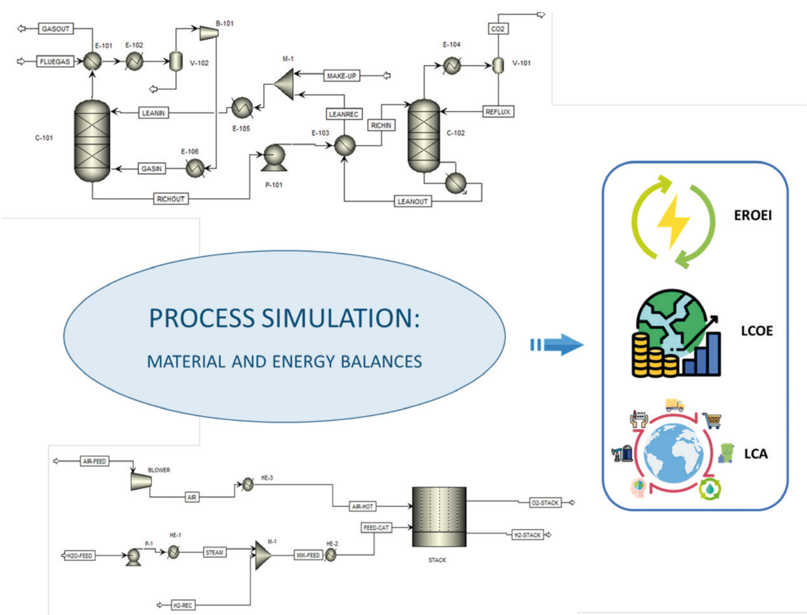
Another key performance indicator is the Levelized Cost of Energy (LCOE), which considers the cost of energy production process, and is calculated as the ratio between all the discounted costs over the lifetime of an energy generating plant divided by a discounted sum of the actual energy amounts delivered.

These two indicators are not sufficient for deciding on the global impact on the environment of the processes under study. To this aim, a full Life Cycle Assessment (LCA) study should be added to EROEI and LCOE evaluations.

The inputs required to evaluate the aforementioned indicators need to be based on detailed and consistent material and energy balances of a specific energy production process, which can be obtained by means of process simulations.

This approach has been applied, in collaboration with a group of the University of Trieste, to a Natural Gas Combined Cycle (NGCC) power plant coupled with Carbon Capture and Storage (CCS), to compare the performances with those of renewable sources (photovoltaics and wind). The analysis revealed that CCS strongly reduces the EROEI of the process by about 50%, and that renewables are more convenient in terms of both environmental and economic standpoints.

Since, however, energy production from renewables is problematic due to their fluctuating nature, great attention is being paid to energy storage/carriers, with hydrogen being one of the most promising alternatives. The same analysis approach can thus be applied to compare different hydrogen production technologies (such as water electrolysis and steam methane reforming with CCS) to assess their energetic efficiency, economic aspects, and environmental impacts.



Energia

Energy

DII research group

PARLAB

Elena Barbera
elena.barbera@unipd.it

Alberto Bertucco
alberto.bertucco@unipd.it
Phone: +39 048 827 5457

Prof. Maurizio Fermeglia,
Prof. Alessandro Massi Pavan,
Università degli Studi di Trieste

Main research topics:

- Energie rinnovabili

Sistemi aerospaziali

Aerospace systems

Aerospace propulsion

Daniele Pavarin
daniele.pavarin@unipd.it
Phone: +39 049 8079523

Francesco Barato
francesco.barato@unipd.it
Phone: +39 049 8079523

https://research.dii.unipd.it/propas/wp-login.php

Partners
Agenzia Spaziale Italiana (ASI)
Agenzia Spaziale Europea (ESA)
Avio
Thales Alenia Space Italia
Technology for Propulsion and Innovation

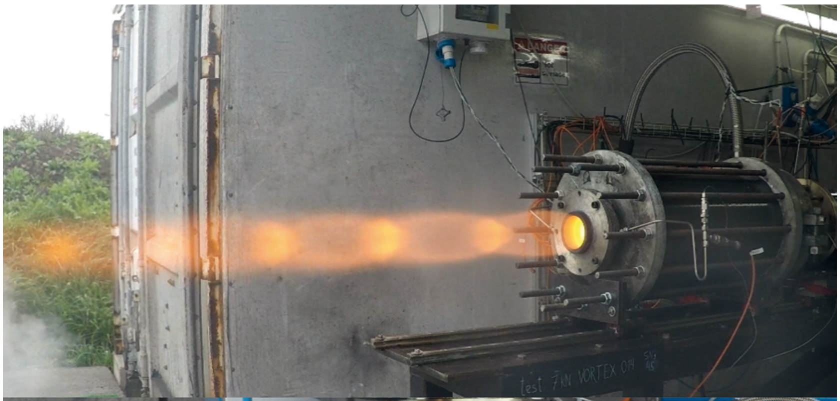
Projects
Electric Propulsion
HPH.com
SAPERE-Strong
Chemical Propulsion
SPARTAN
HYPROGEO
Plasma Antennas for telecommunication
PATH
EPT.com

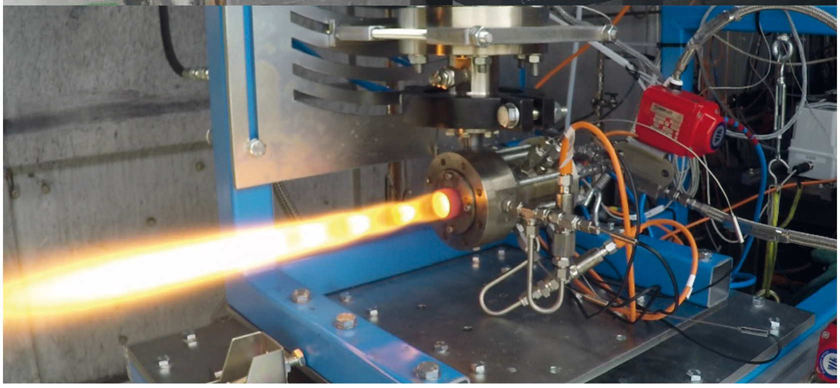
Main research topics:

- Chemical Propulsion
- Electric Propulsion
- Plasma Antennas

Innovative Affordable Green Propulsion for the NewSpace Economy

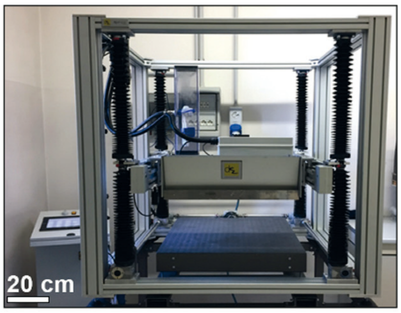
For decades, space has been a confined environment, characterized by few large companies and exorbitant costs. This is related to the harshness of the space environment and the impossibility of repairing a fault once it occurs. However, a revolution in the space sector has recently begun. A new space race has started, driven by the miniaturization of components that allows a new paradigm: to introduce alongside the classic large satellites a multitude of smaller satellites capable of performing countless new functions. It is expected that in the next few years a huge number of satellites distributed in various constellations will be launched and will be the basis of the so-called NewSpace Economy, with a significant impact on our life on Earth. This large number of satellites produced and launched requires a radical change in the propulsion systems used up to now. In fact, the traditional propellants are particularly toxic and polluting, burned in complex and expensive engines, prone to failures that are not too rare. The status quo is absolutely incompatible with an exponential growth of space activities. In order for this to be sustainable, new affordable, ecological and reliable propulsion systems are needed. The DII aerospace propulsion group is at the forefront in the world in the development of this type of propulsion systems. In particular, the research focuses on the use of hydrogen peroxide, a chemical substance widely used in the green industry, specially concentrated in situ for propulsive use. The group operates at the Voltabarozzo site in Padova, one of the largest university facilities in Europe for rocket engine testing, with the ability to reach thrusts of several tons. Another crucial aspect linked to the growth of space activities in the coming years is the generation of space debris. For this reason, the group is studying the use of satellites in lower orbits than the conventional ones, with the need to use the propulsion to compensate for the increased atmospheric drag. In this way these orbits 'clean themselves' at the end of the satellite's life when the propulsion system is shut-off and the satellite quickly and passively re-enters.



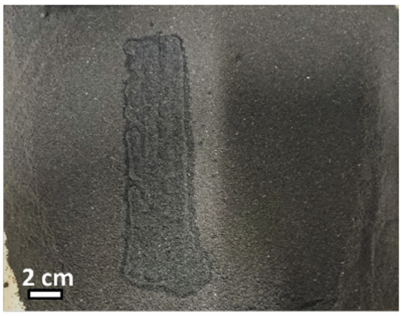


Upcycling of Industrial Residues through Large Scale Additive Manufacturing

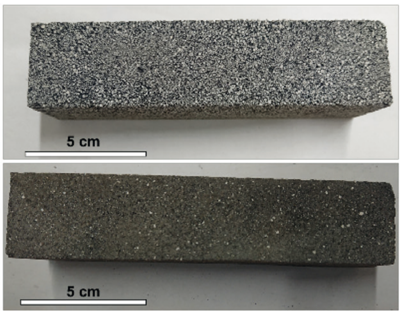
Additive manufacturing (AM) is one of the most attractive technologies for manufacturing components with complicated and customized shapes, completing the transformation of rapid prototyping into the rapid and demand fabrication with the design freedom of the final objects. Additive manufacturing of large parts is an innovative and challenging field of research, that allows producing complex parts with specific functional and structural properties.
In a first case study, binder jetting, as a powder bed additive manufacturing technique, was employed using a large scale printer to fabricate geopolymer-based high temperature boards (or customized parts with a specific shape). To achieve the target properties, the dry powder mix was comprised of lightweight aggregates, reactive vitreous byproduct (Copper Slag) and metakaolin. The printing was activated by the selective deposition of an alkaline solution (silicate solution). The reaction parameters were controlled to achieve an adequate setting time enabling rapid printing with a suitable resolution, and the building up of a structure at the macro-scale (meter-size). Various formulations with different aggregates were designed and tested to achieve the desired values for selected properties, such as density, strength, temperature behavior.
In a second case study, non structural 3D parts were made of a vitreous byproduct of the MSW plasma processing ('Plasmastone'). The printing bed, which comprised Plasmastone coarse powders, as inert aggregates, and reactive magnesium oxide and potassium phosphate powders, was activated by selective water deposition, at ambient temperature. The exothermic reaction between reactive powders and water generated in situ a hydraulic inorganic binder, that bound the aggregates Plasmastone, achieving a fast setting that enabled a rapid printing at the macro-scale. The fabricated parts possess suitable flexural and compression strength of 2.4 and 4 MPa, respectively, with a porosity of 35 %. Therefore, the produced parts are competitive with non-structural concrete and porous stones.
Large Scale Additive Manufacturing provides a feasible use for industrial waste by-products, which are often disposed in landfill, offering a sustainable and eco-friendly product, and taking into account all the advantages deriving from the AM technology in terms of design flexibility and process constancy water.



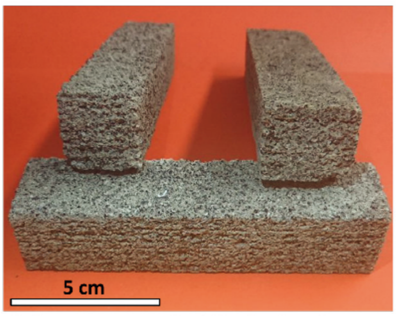
The printer



The powder bed



Slag-based printed parts



"Plasmastone-embedding" printed parts

Materiali

Materials

DII research group
Advanced Ceramics and Glasses
CERAMGLASS

Hamada Elsayed
hamada.elsayed@unipd.it
Phone: +39 049 8275828

Filippo Gobbin
filippo.gobbin@unipd.it
Phone: +39 049 8275634

Enrico Bernardo
enrico.bernardo@unipd.it
Phone: +39 049 8275510

Paolo Colombo
paolo.colombo@unipd.it
Phone: (+39) 049 8275825

https://www.dii.unipd.it/
https://research.dii.unipd.it/ceramglass

The research activity has been carried out in collaboration with:
Dr. Boudchicha Mohamed Reda
Dr. Patricia Rabelo Monich
Mr. Nicolò Frezza

The work was carried out in the framework of the IDEAL project (Industrial ResiDues for Smart FirE-resistAnt PhotocataLytic Components; KAVA Reference Number: 19040).

Research output from the project PON - D.M. 1062/2021 "Research and Innovation", "Research contracts on Green topics"

Main research topics:

- Nano-structured ceramic composites from preceramic polymers and fillers
- Advanced porous ceramic components
- Bioceramics from innovative formulations and processes
- Monolithic and cellular glass and glass-ceramics.
- Innovative building materials from inorganic waste
- Additive manufacturing of porous and dense ceramic components

Energia

Energy

DII research group
Tecnologie elettrotermiche - LEP
Microalghe Lab

Nicola Trivellin
Nicola.trivellin@unipd.it
Phone: +39 049 827 7514

Eleonora Sforza
eleonora.sforza@unipd.it
Phone: +39 049 8275467

Elena Barbera
elena.barbera@unipd.it

Other members:
Lisa Borella, lisa.borella@phd.unipd.it

https://www.dii.unipd.it/lep

Progetto BIRD2021: maximaLED: fine tuned LED technology to boost biological light exploitation in Arthrospira maxima

Main research topics:

- Microalgae cultivation for industrial and environmental applications
- Advanced lighting sources for industrial applications

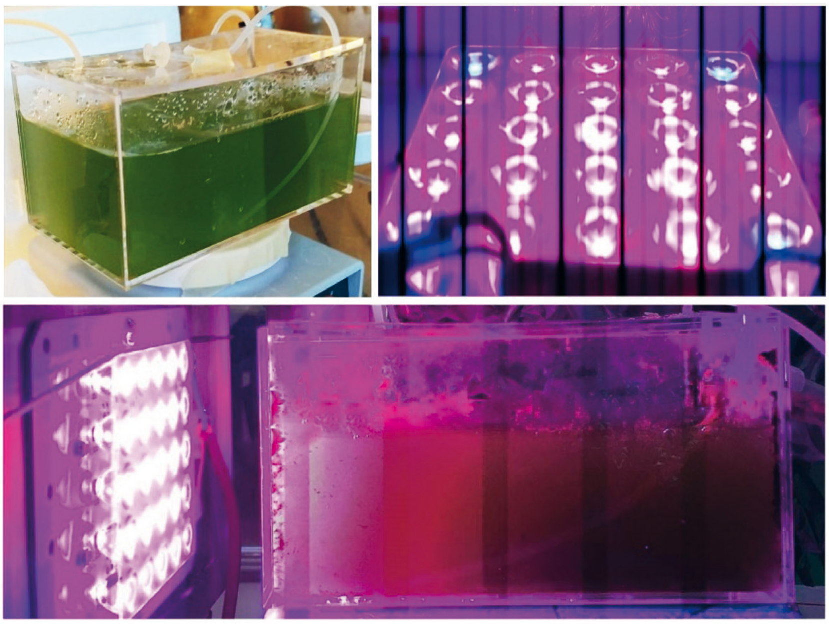
A multidisciplinary approach to improve microalgal productivity and energetic conversion

Interest in the production of algae-based products and microalgal biomass has exponentially increased in the last decade. Microalgae production is crucial since they constitute potential sources for: i) human nutrition, ii) biofuel, iii) aquaculture products for other organisms, iv) raw substances for pharmaceuticals and cosmetics, and v) biofertilizers.

Autotrophic microalgal growth requires a light source, which can be provided either by sunlight, or artificially with lamps. Although sunlight is the cheapest choice, it is characterized by a variable biomass production, in terms of both quantity and composition. Delivering light by artificial illumination has been proposed as an effective way to overcome these problems. However, the energetic cost is relevant, and the efficiency of artificial light needs to be substantially improved to allow market penetration. At this moment, the overall energy efficiency of a continuous microalgae cultivation system, integrated with artificial light, has not been assessed yet.

A multi-disciplinary approach, represented by different research groups of the Department, is needed to carry out a deeper energy efficiency assessment and modeling of a next generation LED-based continuous photobioreactor.

In order to study the effects of light quality on microalgal performances, the cyanobacterium Arthrospira maxima was cultivated under a custom designed R/B (red/blue) LED lamp at increasing light intensities. A mathematical model was then implemented to examine the effects of process variables on microalgal growth, and to predict maximum biomass productivity in the multi-wavelength spectrum employed, which was also included in the simulation tool. Both the photosynthetic and LEDs efficiencies were examined for energy evaluation. It was found that integrating tailored LEDs in microalgal cultivation increases process efficiency by reducing light energy waste. Moreover, integrating tailored LEDs was also found to be more efficient than using white LED source, due to their higher energy efficiency: considering efficiency of the R/B LED lamp, there was a clear-cut gain in the energy efficiency of the process. This may be interesting in view of expanding the use of artificial illumination in microalgae cultivation, allowing the design of highly efficient production processes.



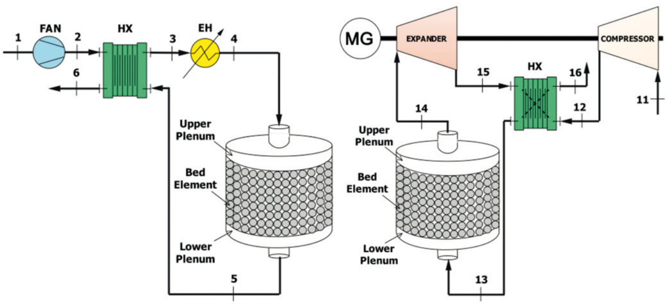
Thermal Energy Storage System integrating into a PV facility

The large penetration in the energy mix of renewable-based plants like wind and solar is considered a key aspect to boost the transition toward a decarbonized and sustainable energy system and, subsequently, to tackle the settled climate targets. However, the variability and unpredictability of solar and wind plants production require the implementation of actions able to assist the matching of supply and demand to avoid unbalances able to generate issues at various grid levels. Among them, the installation of utility-scale energy storage systems is of crucial importance to split the energy production from its consumption, compensate the power fluctuations and provide a more regular and predictable power profile.

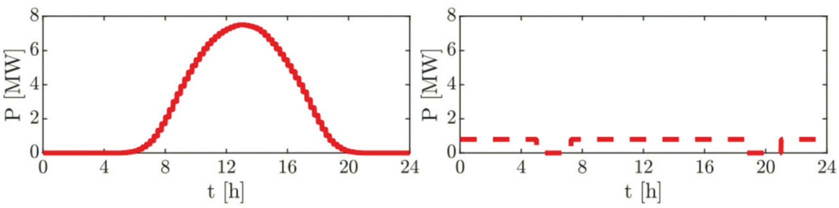
In this context, Thermal Energy Storage (TES) System for electricity applications is receiving considerable interest among researchers due to its expected reliability. In fact, also at DII, the TES group have developed and patented the so-called Integrated Energy Storage System (I-ESS); a TES-based storage unit which does not suffer from geographical constraints (like PHS and CAES), does not require a stable water flow rate (like PHS) or a natural gas stream (as CAES) and, it is characterized by a higher cycle life than batteries.

Despite the previously conducted investigations demonstrated the I-ESS plant feasibility, there is a need to evaluate the plant's ability to work in synergy with a variable RES plant. In this case, the RES unit is a 10 MWp PV facility. The I-ESS storage unit and the PV facility act as a Virtual Power Plant (VPP), being perceived by the electric grid as a unique generation unit able to provide a certain constant power to the grid and, therefore, avoid power fluctuations typical of PV systems.

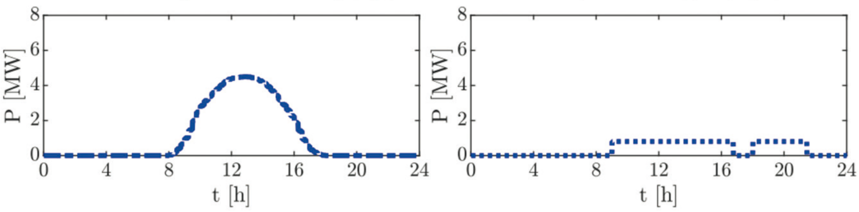
The simulations performed with the VPP plant mathematical model show that the regularity of power supply, defined by a dedicated index named IRE, is very high concerning the PV production and ranges from 50% (winter time) to 87% (summer period).



Schematic view of the I-ESS plant in charging and delivering mode



PV production in July (left) and VPP delivered power to the grid (right)



PV production in December (left) and VPP delivered power to the grid (right)

Energia

Energy

Turbomachinery and Energy System Group (TES)


Alberto Benato
alberto.benato@unipd.it
Phone: +39 049 8276752


Anna Stoppato
anna.stoppato@unipd.it
Phone: +39 049 8276780


Francesco De Vanna
Francesco.devanna@unipd.it

https://research.dii.unipd.it/tes/

Main research topics:

- Design and Optimization of Large-Scale Thermal Energy Storage System
- Fossil Fuels based Power Generation Unit Flexibilization
- Power Generation Units Dynamic Analysis
- Waste Heat Recovery Units Design and Optimization
- Hybrid Power Generation System Optimization
- Life Cycle Assessment
- Biogas Engine Emissions Characterization
- Application of sono-cavitation for the concentration of CO_2 in a liquid flow

Sistemi meccanici

Mechanical systems

DII research group

MMSA (Mechanism and Machine Science and Applications)

Basilio Lenzo
basilio.lenzo@unipd.it
Phone: +39 049 827 6813

Matteo Massaro
matteo.massaro@unipd.it
Phone: +39 049 827 6792

Roberto Lot
roberto.lot@unipd.it
Phone: +39 049 827 6806

Alberto Doria
alberto.doria@unipd.it
Phone: +39 049 827 6803

https://www.dii.unipd.it/mmsa

Several international collaborations are ongoing. Among the most important partners, it is worth mentioning Stanford University, (USA), Beijing Institute of Technology (China), University of Leuven (Belgium).

Main research topics:

- Industrial and service robotics
- Mechanical drives and control
- Mechanical vibrations
- Mechanisms and automated machines
- Road vehicles
- Robotic systems for human interaction

Autonomous driving at the limit of handling to explore new safety potential

Road traffic accidents are the 8th leading cause of death in the world, sadly the 1st for people between 5 and 29 years old. With that in mind, the advent of autonomous driving technologies is creating massive expectations for the enhancement of passenger safety.

Accordingly, the effectiveness of safety systems would significantly increase, as they could be designed around the idea that an autonomous vehicle can be way more skilled than an average driver - ideally like (or even better than) professional drivers. A clear example of this is drifting, i.e., a combination of acceleration and oversteering causing the back of the car to "drift" sideways - due to the rear tyres being saturated. The reader might be aware that drifting is achieved on purpose by rally drivers to perform sharper turns than otherwise possible.

In everyday driving, the ability to control drifting can be a life-saving skill in safety-critical conditions, e.g. to make a high speed sharp turn to avoid an accident. However, drifting is an unstable condition, that is very difficult to control. In fact, current safety systems (e.g. Electronic Stability Control, ESC) would never allow that by design: what they do is to keep the vehicle motion within an operating regime in which an average (not skilled) driver can maintain control.

Vehicle automation eliminates the influence of the driver. While it is unreasonable to expect all drivers to be able to control a drifting vehicle, it is possible to “teach” how to drift to an automated vehicle. This allows to study unexplored control possibilities that could make cars safer by intentionally saturating the rear tyres rather than avoiding it, when deemed appropriate.

With a prestigious Fulbright scholarship, Basilio Lenzo, RTD-b of the «Mechanics of Machines Science and Applications» group (ING-IND/13), has recently spent 4 months at Stanford University (USA). The visit concerned the development of advanced vehicle control techniques for autonomous drifting (based on torque-vectoring, see previous issue of DIInforma) and their experimental assessment on Stanford’s autonomous drifting DeLorean MARTY (figure below), featuring two independent electric motors at the rear axle. The key results of such successful test campaign will be soon published, further enhancing the already strong position of DII in the field of vehicle dynamics.

Lower leg biomechanics and ski boot: computational approach

Nowadays, computer methods provide reliable support for the investigation of the mechanical functionality of biological structures. Computational models can also be exploited to analyze interaction phenomena between biological tissues and devices, providing data that allow the assessment of reliability and the realisation of optimal designs. With specific regard to ski boots, the methods of computational biomechanics permit to analyze the stress and the strain fields that occur within lower leg and foot tissues, depending on ski boot conformation, buckling level and skiing actions. Specific focus was dedicated to the analysis of the interaction phenomena between lower leg and ski boot because of buckling. The mechanical stimuli determine relevant troublesome phenomena, as vasoconstriction effects. The development of the leg model entails the morphometric investigation of the building tissues and structures. The geometrical reconstruction is performed starting from CT and MR images, together with anthropometric data, and leads to virtual solid and finite element models of the system. Further efforts pertain to the characterization of tissues mechanics, as the constitutive analysis. Coupled experimental and computational activities are performed, aimed to the identification and the validation of the hyperelastic constitutive models. Contemporarily, a computational model of a ski boot is developed and accounts for the different building components and materials. Specific computational algorithms are exploited to simulate ski boot buckling (Fig. 1).
The developed model allows evaluating stress and strain fields within biological tissues because of ski boot buckling. The intensity of such mechanical stimuli may induce vasoconstriction phenomena, jeopardizing the ergonomics of the device (Fig. 2).
The principal challenges of computational modeling consist in the identification and validation of the models, and the solving time due to model complexity. In-silico analysis leads to an interpretation of the global and local response of lower leg tissues considering ski boot performance and buckling. Computational methods provide quantitative data and an effective framework for a more reliable and ergonomic design of ski boots.

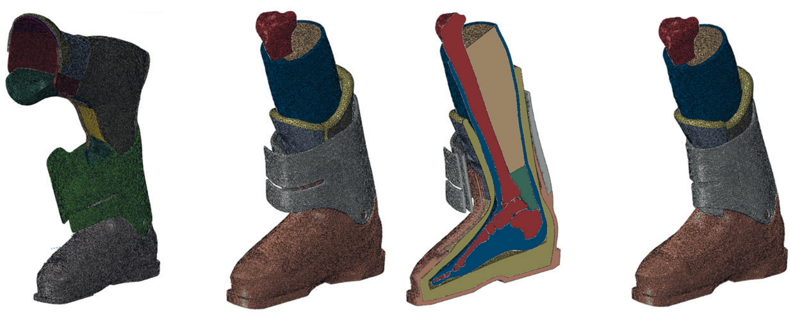


Figure 1: Numerical model of leg during the insertion in ski boot and closing.

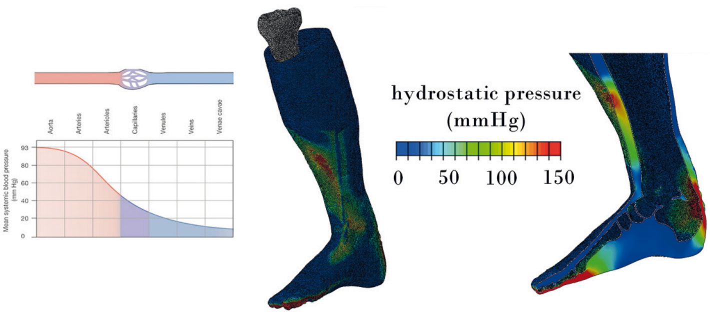


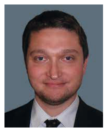
Figure 2: Computational results: hydrostatic pressure (mmHg) within leg tissues compared to the mean systematic blood pressure.

Bioingegneria, biotecnologie e tecnologie per la salute

Bioengineering

DII research group

Biomechanics
Mechanics of Biological Materials



Emanuele Luigi Carniel
emanueleluigi.carniel@unipd.it
Phone: +39 049 8276876

Chiara Giulia Fontanella
chiaragiulia.fontanella@unipd.it
Phone: +39 049 8276754

Ilaria Toniolo
ilaria.toniolo@unipd.it
Phone: +39 049 8276812

www.dii.unipd.it
www.cmbm.unipd.it

The research activity has been carried out in collaboration with the Department of Neurosciences, Biomedicine and Movement Sciences (University of Verona, Verona, Italy).
Funded by POR-Regione Veneto 2014-2020 “SMAC: SMArt and Creative technologies for the sportsystem”, and “SAFE: Smart creAtivity for saFety and rEstart”.

Fontanella, C.G., Arduino, A., Toniolo, I., Zampieri, C., Bortolan, L., Carniel, E.L., Computational methods for the investigation of ski boots ergonomics (2021) Sports Engineering, 24, Article number 15.
Best Paper of the year 2021

Main research topics:

- Mechanical behaviour of biological tissues
- Constitutive modeling of biological tissues
- Computational biomechanics
- Sport Biomechanics
- Investigation of interaction phenomena between human body and sport devices
- «In silico» techniques for the 3R approach to product design

Materiali

Materials

DII research group

Polymer Engineering Group-PEG

Michlele Modesti
Michele.modesti@unipd.it
Phone: +39 049 8275541

Martina Roso
Martina.roso@unipd.itl
Phone: +39 049 8275735

Alessandra Lorenzetti
Alessandra.lorenzetti@unipd.itl
Phone: +39 049 8275556

Polymer Engineering Group

https://research.dii.unipd.it/peg/

Main research topics:

- Chemical recycling of plastics
- Polymer and biopolymers processing, thermoplastic, thermoseeting and elastomeric materials
- Fire behaviour of plastics
- Nanostructured membranes for environmental applications (water and air treatment); electrospinning and electrospraying
- Nanocomposites

GripAlp – High performance soles for alpine sports (Suole ad elevate prestazioni per l'ambiente alpino)
Interreg V-A Italia-Austria 2014-2020 ITAT1074

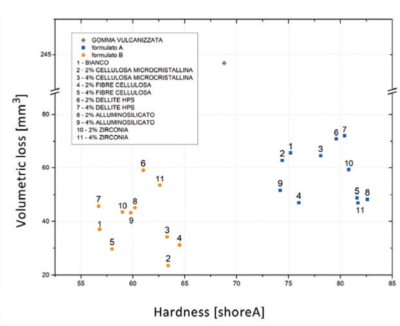
The Polymer Engineering Lab, thanks to the consolidated experience in the field of polymers processing and R&D of innovative nanocomposite materials, is parter in the GripAlp project, founded by the Interreg Italia-Austria cross border program, The lead parten is Dolomiticert which is supported by University of Innsbruck along with University of Padova. A tight-knit team, competent, skilled and able to share ideas in an energizing and gratifying environment.

The main goal of the project is developing a new class of performing soles for footwear used in alpine sports. Since slipping on ice and/or rock is the main cause of accidents in the mountains, the project aims at developing innovative soles, which can meet the needs of the market under several points of view:

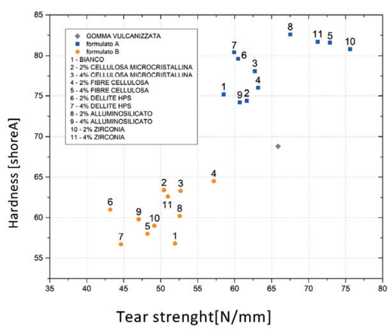
- Safety of the user: thanks to the materials chosen to ensure greater stability and less slipping for the end user;
- Environmental impact: choice of materials with better performance as regards wear and tear to increase the durability of the soles and suitable recyclability, besides reduction of micro-plastics introduced into the environment;
- Processing: simplification of manufacturing (moving from rubber vulcanization to reaction injection moulding with consequent reduction of manufacturing times); improvement in the bonding between materials used during assembly of the footwear; improvement of the disassembling of the product (ability to be dismantled) and recycling of the materials.

The ongoing work at PEG has already yielded positive results.

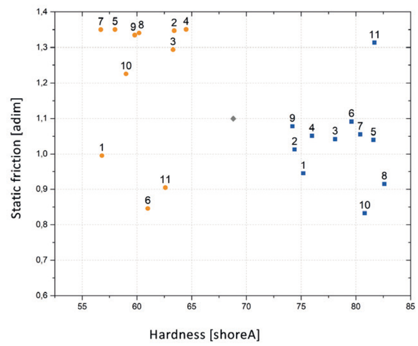
Volumetric loss vs Hardness



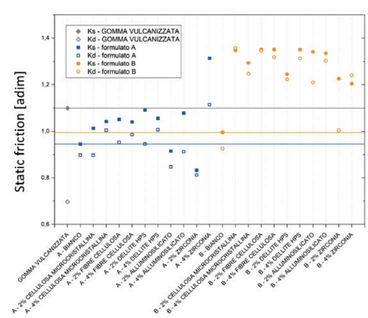
Hardness vs Tear strenght



Static friction vs Hardness



Slip resistance



Archievements

Il DII al top nella ricerca scientifica: 23 docenti nel 2% Top Scientist Ranking di Stanford

23 docenti del DII compaiono nel 2% Top Scientist Ranking della Stanford University del 2021 (liste per citazioni in carriera o nell'ultimo anno), confermando l'eccellenza della ricerca del Dipartimento in svariati settori dell'Ingegneria Industriale:

- **Aerospace & Aeronautics**
  (Ernesto Benini, Ugo Galvanetto, Enrico Lorenzini)
- Automobile Design & Engineering
  (Roberto Lot, Matteo Massaro)
- **Electrical & Electronic Engineering**
  (Luigi Alberti, Nicola Bianchi, Massimo Guarnieri)
- **Energy**
  (Roberto Benato, Michele De Carli, Vito Di Noto, Andrea Lazzaretto, Anna Stoppato, Alberto Benato)
- **Industrial Engineering & Automation**
  (Giulio Rosati)
- **Materials**
  (Enrico Bernardo, Stefania Bruschi, Paolo Colombo, Andrea Ghiotti, Massimo Guglielmi, Alessandro Martucci)
- **Mechanical Engineering & Transports**
  (Davide Del Col, Giovanni Meneghetti)

Il database creato dalla Stanford University elenca, tramite una complessa elaborazione delle informazioni reperibili in Scopus (presentata in J. Baas, K. Boyack, J.P.A., Ioannidis (2021), "August 2021 data-update for "Updated science-wide author databases of standardized citation indicators"", Mendeley Data, V3, doi: 10.17632/btchxktzyw.3), il top 2% dei ricercatori mondiali, analizzando 22 categorie scientifiche e le loro 176 sottocategorie.

Maggiori informazioni su:

https://ecebm.com/2021/10/26/stanford-university-names-worlds-top-2-scientists-2021/

https://elsevier.digitalcommonsdata.com/datasets/btchxktzyw/3

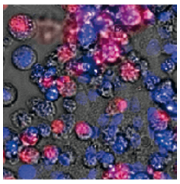
I 2% Top Scientist del DII, ad eccezione del Prof. Roberto Benato (nel tondo in alto a sinistra) e del Prof. Davide Del Col (nel tondo in alto a destra).

800 ANNI 1222·2022

UNIVERSITÀ DEGLI STUDI DI PADOVA

DIPARTIMENTO DI INGEGNERIA INDUSTRIALE

Cover story



La ricerca riguarda la messa punto dei parametri di elettroporazione in vitro utilizzando un modello di tumore epatico coltivato su un supporto sintetico. L'elettroporazione permeabilizza reversibilmente le membrane cellulari per favorire l'entrata di farmaci antitumorali. In figura sono riportati i risultati dell'elettroporazione di cellule cresciute su uno scaffold gelatinoso di nostra formulazione contenente peptidi auto-aggreganti (sopra) o su uno scaffold privo di peptidi (sotto). Si può notare come l'arricchimento con i peptidi induca la formazione di sferoidi e permetta una migliore elettroporazione delle cellule che risultano maggiormente colorate in rosso.

Leonardo Cassari

Ha ottenuto la laurea magistrale con lode in Bioingegneria, presso l'Università degli Studi di Padova, nel 2020. È attualmente dottorando del gruppo Bioingegneria Chimica, coordinato dalla Prof. Monica Dettin. Il suo progetto riguarda lo studio di accoppiamento del polimero PEEK con sequenze bioattive per progettare un impianto osseo che si interfaccia con le cellule. Attualmente sta svolgendo un periodo di sei mesi presso il King's College of London per apprendere la tecnica della stampa 3D da applicare al progetto di dottorato.

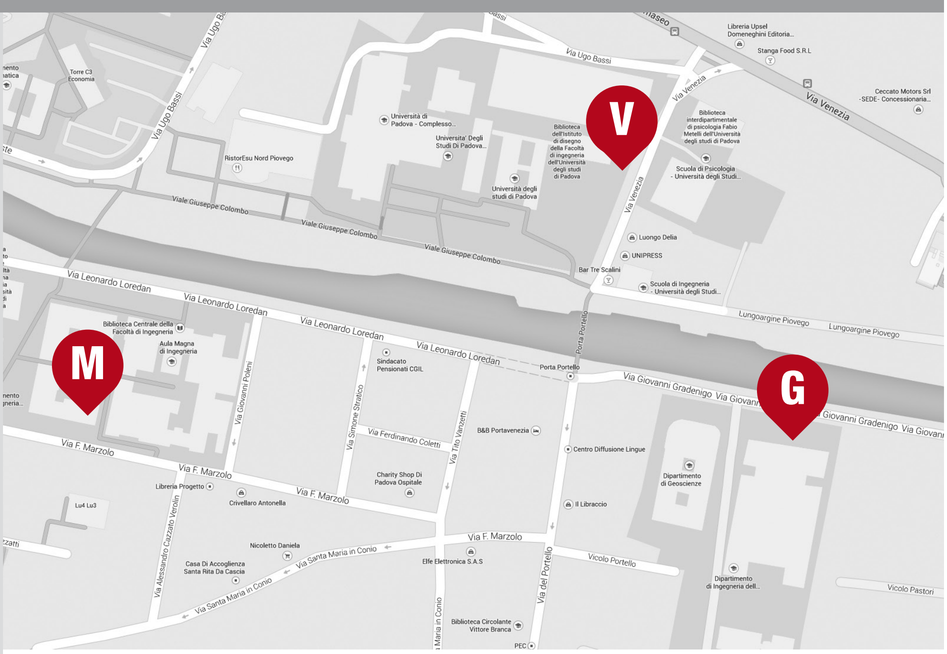
www.dii.unipd.it

Direttore: Stefania Bruschi

Vicedirettore: Piergiorgio Alotto

Segreteria amministrativa:
Paolo Rando

SEDI



DII
Dipartimento di Ingegneria Industriale,
Università degli Studi di Padova

Sede legale e amministrativa
Via Gradenigo, 6/a - 35131 Padova
tel. +39 049 8277500
fax +39 049 8277599
segreteria@dii.unipd.it
www.dii.unipd.it

Via Marzolo, 9 - 35131 Padova

Via Venezia, 1 - 35131 Padova