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

UNIVERSITÀ DEGLI STUDI DI PADOVA

DIPARTIMENTO DI INGEGNERIA INDUSTRIALE

COPERTINA

Trasmissione e riflessione della luce attraverso un componente in vetro sodico-calcico realizzato tramite stampa 3D

DIPARTIMENTO DI INGEGNERIA INDUSTRIALE

SPECIAL PAGE 2016

Il Dipartimento di Ingegneria Industriale e le competizioni studentesche: una storia di successo

Il 2016 è stato un anno speciale per il Dipartimento di Ingegneria Industriale. Ben tre gruppi si sono distinti per eccellenti risultati nelle competizioni studentesche

• Mètis Vela: dopo anni di impegno, di ore passate in cantiere e di altre in giro per le acque del nord Italia, il team velico dell'Università di Padova (coordinatore: Prof. Andrea Lazzaretto, DII) ha vinto, per la seconda volta nella sua storia, il trofeo del 1001Vela Cup, la competizione tra skiff di classe R3 progettati, costruiti e portati in acqua da studenti universitari, organizzata nelle acque del Lido di Venezia, al largo dello stabilimento Elioterapico della Marina militare.

• Race UP Team: nel corso del 2016 il Race UP Team (coordinatore: Prof. Giovanni Meneghetti, DII) ha avuto l'onore di partecipare a due eventi ottenendo importanti risultati con la monoposto MG 11.16, presentata a maggio. Il primo di questi è la XII edizione della Formula SAE Italy (Formula ATA), tenutosi a luglio presso il circuito Riccardo Paletti, in Varano De' Melegari (Parma), dove il frutto del lavoro del Team ha ottenuto il primo posto nel Design e nello Skid Pad e il terzo posto nell'Autocross, piazzandosi in definitiva al settimo posto su trentanove nella classifica generale. Nel secondo evento, Formula Student Germany (FSG), tenutosi ad agosto presso il circuito tedesco di Hockenheimring, il Team si è piazzato al quindicesimo posto su settantatré nella classifica generale.

• Team Quartodilitro: alla prima partecipazione alla competizione internazionale Motostudent il team dell'Università di Padova (coordinatore: Prof. Vittore Cossalter, DII) è salito sul podio, terzo assoluto. Grande emozione e soddisfazione per tutti gli studenti del team.

Bioingegneria, biotecnologia e tecnologie per la salute
Bioengineering

DII research group
Chemical Bioengineering &
Polymer Engineering Group (PEG)

Monica Dettin
monica.dettin@unipd.it
Phone: +39 049 8275553

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

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

Collaborations:
Dr. Annj Zamuner

Main research topics:

- Innovative biomaterials: synthesis of bioactive peptides and covalent functionalization of surfaces
- Synthesis of DNA mimetics for biosensors
- Matrixes of self-assembling peptides chemoselectively modified for regenerative medicine
- Treatment of animal pericardium for prosthetic heart valves
- Physical and chemical recycling of polymeric materials
- Thermal stability and fire behavior of polymeric materials
- Polymeric nanocomposites
- Polymer and biopolymer processing
- Nanostructured membranes based on nanofibers (electrospinning and electrospraying)

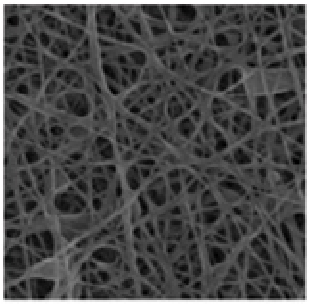
Elecrospun Scaffolds for Osteoblast Cells

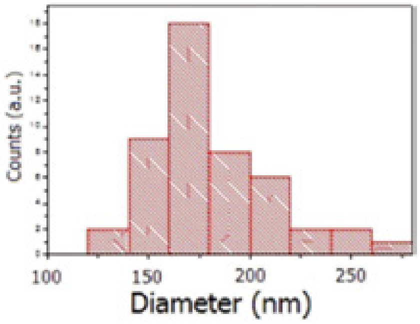
Most of the synthetic polymers used in tissue engineering or regenerative medicine are characterized by good mechanical and physical properties but are usually hydrophobic and often lack suitable biocompatible molecular sites for communicating with target cells. For example, poly- -caprolactone (PCL) has been widely used in several biomedical applications due to its biodegradability, biocompatibility, and good mechanical properties. PCL cast films however are not appropriate for cell scaffolding because they are non-porous and therefore prevent nutrients and oxygen from being transported to the cells.

In the last decade, electrospinning has emerged as a new technique able to weave fibers that are structurally similar to the fibrous components of most extracellular matrices (ECMs). Fiber composition, diameter, alignment and scaffold porosity can be tailored to the particular cell or tissue type. In addition, the high area-to-volume ratio offers the possibility to improve surface decoration with protein, peptides or other bioactive molecules. On the other side, hydrogels custom made using physiological fibril-self-assembling peptides (SAPs) are matrices capable of sustaining tissue regeneration on their own

The design of hybrid polycaprolactone (PCL) self-assembling peptides (SAPs) matrices represents a simple method for the modification of synthetic scaffolds, which is essential for cell compatibility. We have investigated the influence of increasing concentrations (2.5%, 5%, 10% and 15% w/w SAP compared to PCL) of three different SAPs (EAK, EAbuK and RGD-EAK) on the physicochemical/mechanical and biological properties of PCL fibers. Our aims were to: i) correct the high hydrophobicity of PCL and lack of biochemical signals; ii) rectify the excessive softness of peptide hydrogels.

We demonstrated that physical-chemical surface characteristics were slightly improved at increasing SAP concentrations: the fiber diameter increased; surface





wettability increased significantly with the first SAP addition (2.5%) and slightly lower for the following ones; SAP-surface density increased but no change in the conformation was registered. These results could allow engineering matrices with structural characteristics and desired wettability according to the needs and the cell system used. Surprisingly, the biological and mechanical characteristics of these scaffolds showed a disjointed trend at increasing SAP concentrations suggesting a correlation between cell behavior and mechanical features of the matrices. As compared with PCL, SAP enrichment increased h-osteoblast adhesion, encoding of specific mRNA levels of osteoblast-related genes and calcium deposition, revealing the potential application of PCL-SAP scaffolds in regenerative medicine.

New Materials for Electrochemical Energy Conversion and Storage Devices

The research activity of the CheMaMSE (Chemistry of Materials for the Metamorphosis and the Storage of Energy) group is focused on the preparation and characterization of materials for application in the field of energy storage and conversion.

The research work consists in a broad range of activities, including: a) the design of new materials, starting from basic chemistry and physics concepts; b) novel chemical synthesis and processing; c) advanced materials characterization; d) measurement of physical and chemical properties; e) fabrication and evaluation of prototype devices; and f) the development of a fundamental understanding of the structure-property-performance relationships of the materials.

In particular, most of the research efforts are devoted to the synthesis and the study of: a) primary and secondary lithium and magnesium batteries; b) low and high temperature polymer electrolyte fuel cells (PEMFCs) including anion exchange membrane fuel cells (AEMFCs) and direct methanol FCs (DMFCs); c) aqueous and non-aqueous redox-flow batteries; d) field-effect transistors; e) sensors and actuators; and g) photo-electrochemical devices such as dye-sensitized solar cells.

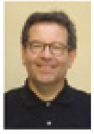
In the field of rechargeable batteries several classes of materials are currently investigated comprising: a) solid state single ion-conducting polymer and ceramics; b) ionic-liquid-based electrolytes; and c) high voltage and high specific capacity cathodes. The interplay between structure, conductivity and electrochemical performance of these systems is studied in order to propose advanced materials for not only high energy density batteries but also for technologies beyond conventional lithium-ion systems.

Concerning fuel cell applications, core/shell carbonitride-based electrocatalysts for the oxygen reduction reaction as well as innovative cations or anion conductors for PEMFCs are synthesised and carefully investigated by means of several in-situ and ex-situ techniques. The most promising materials are then tested in prototype devices.

Most of these materials have been promptly patented, in collaboration with several companies, and are among the most innovative and better performing in the field of energy storage and conversion systems.

Energia
Energy

CheMaMSE (Chemistry of Materials for the Metamorphosis and the Storage of Energy).



Vito Di Noto
vito.dinoto@unipd.it
Phone: +39 049 8275229

Members of the research group:
Dr. Giuseppe Pace, Dr. Enrico negro, Ing. Keti Vezzù, Dr. Federico Bertasi, Dr. Graeme Nawn, Dr. Gioele Pagot, Dr. Chuanyu Sun, Dr. Yannik Bang, Dr. Angeloclaudio Nale

www.chimica.unipd.it/lab_DiNoto/

The research activity is carried out in collaboration with the following institutions and companies:

The University of Tennessee Knoxville; The City University of New York; Chemical & Biological Engineering Colorado School of Mines; 3M; TAT Tokyo University of Agriculture and Technology; Jülich; The University of New Mexico; JAIST; Fraunhofer ISC; IIT Istituto Italiano di Tecnologia; Cinel Strumenti Scientifici; United States Naval Academy; Breton; CEA; Università Ca' Foscari Venezia; Northeastern University College of Science; Tokyo University of Science; TEXA; CRS4; ARL www.arl.army.mil

Main research topics:

- Electrolyte and electrode materials for fuel cells of the type PEMFCs (Polymer Electrolyte Membrane Fuel Cells), AEMFCs (Anion Exchange Membrane Fuel Cells), HT-PEMFCs (High-Temperature Proton Exchange Membrane Fuel Cells), DAFCs (Direct Alcohol Fuel Cells), and for PEM electrolyzers (since 1999)
- Electrolytes and innovative electrode materials for the reversible storage of electrical energy in secondary lithium and magnesium batteries
- Study of the electric response of ion-conducting, electric and dielectric materials by broadband electrical spectroscopy (BES)
- Redox Flow battery materials including ion-conducting membranes, innovative redox couples and electrode configurations

Ingegneria dei sistemi elettrici
Electric systems

DII research group
Power System Group

Roberto Benato
roberto.benato@unipd.it
Phone: +39 049 8277532

http://www.dii.unipd.it/en/power-system-group

This study was carried out in collaboration with: Prof. Mauro Andriollo and Dr. Sebastian Dambone Sessa, Phd student at the Department of Industrial Engineering, Padova; Dr. Massimo Rebolini, Dr. Francesco Palone, Dr. Andrea Necci, Dr. Gianluca Bruno and Dr. Rosario Polito with Terna Rete Italia, Rome.
Dr. Carlo Parmeggiani, Dr. Giorgio Crugnola, Dr. Stefano Zin, Dr. Giuseppe Lodi, Dr. Marco Todeschini with FIAMM, Vicenza.

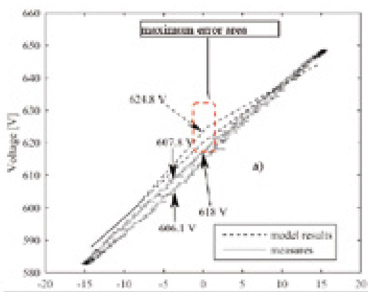
Main research topics:

- Smart grids: the operation and control of active network
- Voltage regulation in the distribution network with high penetration of distributed generation
- Large-scale energy storage in the network
- EHV/HV dc and ac innovative transmission lines e.g. insulated cables and gas insulated lines
- Synergy between railway and highway infrastructures and insulated cables
- Multiconductor cell analysis (MCA) of asymmetric systems by means of self-implemented matrix procedures (insulated cables with screens and armours, gas insulated lines with enclosures, overhead lines with one or more earth wires)

Large-scale electrochemical energy storage in high voltage grid: the Italian experience

The Italian transmission system operator has moved towards two different directions with regard to electrochemical energy storage systems (with acronym EESS) in the high-voltage network. In the first one, the electrochemical energy storage is conceived to release renewable generation from electric loads and to avoid overload conditions in the existing overhead lines. This use implies longer charge/discharge intervals (about 8 h) and a kind of "energy service" more than a "power service"; therefore, these installations have been called "energy intensive" installations. For Italian "energy intensive" installations , Terna has chosen, because of its extensive history of successful installations, the Sodium-Sulphur (Na-S) electrochemistry , supplied by the Japanese NGK. There have been three installation sites located in the South of Italy (around Benevento city): two installations of 12 MW and one of 10,8 MW (wholly 34,8 MW Na-S storage has been installed). It is worth remembering that Na-S batteries belong to the Na-beta battery family (as Na-NiCl2). The other direction has involved electrochemical technologies with short charge/discharge intervals (from 0,5 to 4 h). The tested technologies have been the Li-ion family and sodium-nickel chloride. The installation sites have been Sardinia (9,15 MW installed power in Codrongianos) and Sicily islands (6,8 MW installed power in Ciminna). Due to their high flexibility use allowed by the Power Conversion System (with acronym PCS) , power intensive installations have been applied in the field of grid ancillary services. The power system group of the Department of Industrial Engineering has actively participated in the planning and realization of these installations: for energy intensive applications the research group has theoretically and experimentally demonstrated the environmental compatibility and safety operation of large scale installations of such technologies ; for power intensive applications, the research group has developed two electrical models based on a given set of experimental tests which have demonstrated an extremely high agreement with real behaviours both in steady-state and in transient operations.

Some photos of Italian large scale stationary electrochemical storage installations



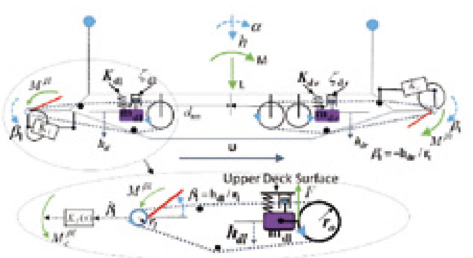
Comparison between experimental volt-amperometric and model curves

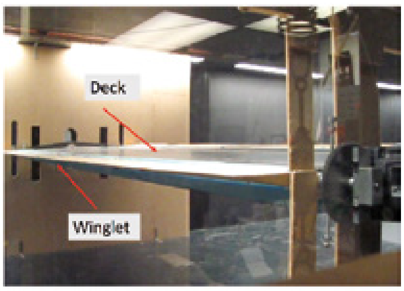
Fiamm Sonick 7,8 kW ST523 Na-NiCl2 module

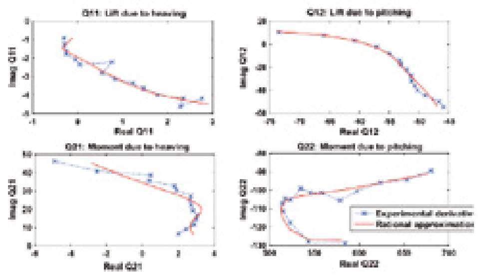
Aeroelastic control of long-span suspension bridges with controllable winglets

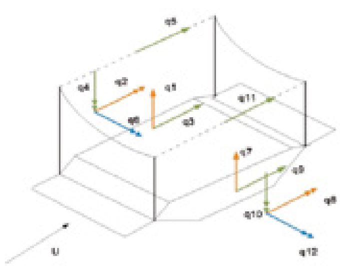
Aeroelastic instabilities like flutter and torsional divergence pose limits to the length increase of cable-supported bridges, with the now iconic Tacoma Narrows Bridge disaster serving as a reminder of the importance of aeroelastic design. Increasing span lengths pose a challenge to aeroelastic stability, and experience gained from record span projects showed that classic aerodynamic design either in the form of deep truss girders (e.g. Akashi Kaikyo Bridge, JP) or the more modern flat box girder solution (e.g. Great Belt East Bridge, DK) reaches its limit for spans approaching 2000m. To overcome these limitations, appropriate counter-measures should be adopted, which traditionally have focused on the deck's aerodynamic improvement or alternatively on the implementation of active and passive control methodologies.

Research activities have been carried out to devise a passively controlled deck-flap network, with special attention to robustness against uncertainties. First, a kinematic flap arrangement has been introduced, which is based on a general passive controller, including inerters, rather than the classical spring-damper configuration. An important advantage is that there is no need for preselecting the network layout, which is instead determined by an optimization process. Second, a suspended mass inside the box girder has been introduced to provide a driving force to the flaps through a simple linkage. The proposed mechanical layout avoids the use of external components, which interfere with the deck's aerodynamic characteristics, and of additional cables which complicate the system and increase dead load.









Ingegneria dei sistemi meccanici
Mechanical systems

DII research group
Applied Mechanics

Matteo Massaro
matteo.massaro@unipd.it
Phone: +39 049 8276792

www.dii.unipd.it
http://control.eng.ox.ac.uk/Actagreen

The research has been carried out in cooperation with Dr. K.N. Bakis and Prof. D.J.N. Limebeer (Oxford University, UK), Prof. J.M.R. Graham (Imperial College London, UK).

Main research topics:
- Modelling and simulation of mechanical systems
- Optimization of mechanical systems
- Analysis and reduction of mechanical vibration

Materiali avanzati
Advanced Materials

DII research group
Metallurgy

Prof. Manuele Dabalà
manuele.dabala@unipd.it
Phone: +39 049 8275749

Assisted by
Dr. Katya Brunelli, post-doc
Dr. Valentina Zin, CNR ICMATE

www.dii.unipd.it/metallurgia

The work was supported by a STREP grant to the SELECTNANO Consortium (Development of Multifunctional Nanometallic Particles using a New Process Sonoelectrochemistry), from the European Community

Main research topics

- Novel anti-wear and anti-corrosion coatings on light alloys
- Study of microstructural evolution of high-alloyed stainless steel
- Electrotytic plasma oxidation of light alloys
- Recovery of metals from steelmaking residues by means of hydrometallurgical methods
- Production of metal nanoparticles

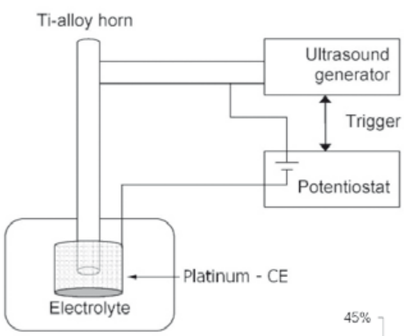
Effects of Synthesis Temperature on Behaviours of FeCo Nanoparticles Produced Sonoelectrochemically

The study describes synthesis of FeCo nanoparticles by using the sonoelectrochemical technique, a method which couples an electrochemical process with the employment of high power ultrasound, as shown in Fig.1. The effects of synthesis temperature on process efficiency was visible in Fig.2.

Generally the increase of T enhances metal salts solubility and as a consequence bath's conductibility and ions mobility rise too, and diffusion processes are hence accelerated; moreover the diffusion layer regenerates quickly after each electrochemical pulse and contracts because of thermal agitation, while solution viscosity decreases.

These aspects, combined to the possible thermal activation of nucleation sites, should increase the limiting current of the electrochemical process and the global process efficiency in terms of nuclei population density. In spite of all these benefits the global yield decreases at temperature over 40° C and reaches the maximum value at room values. On the other hand, high temperature furthers Fe(II) to Fe(III) oxidation and hinders iron reduction at the electrodic surface; moreover it is likely that the high temperature accelerates redissolution phenomena of the small nanoparticles in the electrolyte. At temperature below the room value, bath's viscosity and difficult ions migration obstruct reduction processes; so the best compromise among these opposite conditions was found to be a synthesis temperature of between 25° and 40° C. From XRD measurements the grain size increases with bath's temperature from about 10 nm to almost 30 nm. It can be explained in terms of growth rate of metal nuclei on the cathodic surface; at higher temperatures growth prevails on nucleation processes and the final consequences are a small number of nuclei formed on the cathode, a drop in yield and the achievement of bigger nanoparticles. The opposite is observed at lower temperature because of mass transfer phenomena, which control the growth rate of nuclei, are slowed down

Fig.1. Schematic of the apparatus for nanoparticles production.



Sample	T / °C	a / Å	Grain size / nm
FeCo1	10	2.86	8.6 ± 0.3
FeCo2	25	2.84	12.3 ± 0.5
FeCo3	40	2.85	25.1 ± 1.3
FeCo4	60	2.86	28.1 ± 1.4

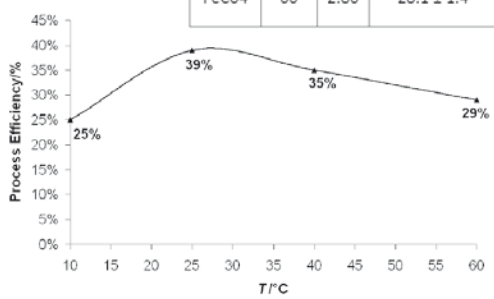


Fig.2. Effect of bath's temperature on final process efficiency

SCENT Italian Startup Monitor

The enactment of a law on innovative startups (Decree-Law 179/2012, converted into the Law 221/2012) and the creation of a special section in the Italian business register have helped to give impetus to the startup phenomenon. The School of Entrepreneurship of the DII-Unipd has been monitoring Italian innovative startups since 2014 in order to understand the dynamics of such firms. By the end of December 2015 the number of innovative startups was 5,145. Considering the geographical distribution, the regions with the highest number of startups are Lombardy (1,126), Emilia-Romagna (579) and Lazio (502). Veneto is in the fourth position (384). As regards the startup density (n. inhabitants / n. startups) Veneto is in the thirteenth position, while the first three regions are Trentino-Alto Adige, Marche and Emilia-Romagna.
In order to be included to the special section of the business register a startup must fulfill at least one of the following criteria: at least 15% or more of the turnover (or production value) should be allocated to Research and Development (R&D) and/or it should have high qualified human resources and/or it should be the owner of one or more patents. As shown in Table 1, most of the startups (65%) claims to invest in R&D; only 126 (2.6%) fulfil all the three criteria.
In order to have an accurate profile, every startup has been analyzed from a financial point of view. The analysis considers the following aspect: production values, operating income, net income, total assets, share capital, equity and liabilities. The considered time span is from 2009 to 2014. The sectors with the highest production values for 2014 are Software Production, ICT and Internet (37%), Manufacturing (27%) and Professional Activities (25%). The full report is available at the SCENT website.
Considering the complexity of the technological and economic environments, the success of a startup is not determined only by its own abilities, but is the result of a synergy between the company and the ecosystem in which it operates. Starting from this perspective, SCENT also studies the interactions between startups and any kind of firms involved in their growth (e.g. venture capital firms, incubators/accelerators, angel investors' groups, ventures programs). Totally, the considered supporting firms are 83. Of them, 49 were founded after 2012; 43 are based in Lombardy; 13 are classified as S.G.R. (i.e. Società di Gestione del Risparmio). Table 2 shows the different kinds of supporting firms. Considering the interaction between startups and this kind of firms, 1,360 agreement have been detected. The monitoring activity considers every agreement regardless of the year in which they occurred. Thanks to this approach, a global perspective can be assumed, allowing to detect the most active startups in the Italian ecosystem. 1,059 startup have been involved in at least one agreement with a supporting firm.

Tab.1 - Innovative startups fulfilled criteria

Criteria	Freq.	Percent
R&D only	2,689	52.2%
HR only	1,000	19.4%
Patent only	628	12.2%
R&D + HR	327	6.4%
R&D + Patent	183	3.6%
HR + Patent	65	1.3%
R&D + HR + Patent	136	2.6%
Not available	117	2.3%
Total	**5,145**	**100.0%**

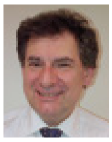
Tab.2 – Business supporting firms

Type	Freq.	Percent
Investment firms*	42	51%
Incubators / Accelerators	27	32%
Angel Investors Groups	9	11%
Other	5	6%
Total	**83**	**100%**

* of them 13 are classified as S.G.R.

Management e imprenditorialità
Management and entrepreneurship

DII research group
Management and
Entrapreneurship



Moreno Muffatto
moreno.muffatto@unipd.it
phone: +39 049 8276725

Assisted by:
Eng. Francesco Ferrati

www.dii.unipd.it/en/management-and-entrepreneurship

SCENT PADOVA SCHOOL OF ENTREPRENEURSHIP

http://scent.dii.unipd.it

This study was carried out in collaboration
with Infocamere and Camera di Commercio Padova

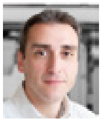
Financial support to this research was provided
by the University of Padua

Main research topics:

- Global Entrepreneurship Monitor (GEM)
- Italian Startup Monitor
- Startup Investors Monitor
- Entrepreneurial Ecosystems
- Entrepreneurship for Growth
- Performance Measurement and Management
- Technology Transfer

Processi, prodotti e servizi
Processes, products and sercice

DII research group
Precision manufacturing engineering group



Giovanni Lucchetta
giovanni.lucchetta@unipd.it
phone: +39 049 827 6710

Assisted by
Dr Marco Sorgato, post-doc

www.labtesi.dii.unipd.it

This research was conducted in collaboration with the company SIPA S.p.a.

Main research topics:
- Manufacturing systems and processes
- Micro-technologies and precision technologies
- Shaping of metallic materials
- Processing of polymeric materials

Geometric metrology

Effects of different mold coatings on polymer filling flow in thin-wall injection molding

Computer, communication, consumer electronics and packaging industries are increasingly demanding lighter and thinner parts due to economic and environmental reasons. In fact, a reduction of the main wall thickness generally leads to a smaller part volume and, therefore, to a lower material cost and impact. A thinner wall also results in a shorter cycle time, decreasing the process environmental and economical burdens. Injection molding of parts having high flow length/thickness ratio is a challenging task for both micro and packaging applications. Therefore, in this work, the effects of three cavity surface coatings, viz. aluminum oxide, diamond-like carbon and silicon oxide, on the filling flow of polyethylene terephthalate (PET) and polystyrene (PS) were experimentally investigated. The filling of a representative micro-part was studied as a function of mold coating, injected polymer and different process parameters, in order to identify the effects of heat conduction and wall slip related to the coatings. A numerical model of the process was calibrated by inverse analysis to identify the thermal boundary conditions that characterize each coating in relation to the filling pressure. The experimental results indicated that all the coatings could be effectively exploited to reduce the cavity pressure, up to 8% for PET and up to 3% for PS. The experiments also gave some insight into the influence of the process parameters. In particular, for PET the lower value of melt temperature attenuated the coatings effect. Experimental and numerical results clearly indicate that the investigated mold coatings can be effectively exploited to reduce the filling pressure of PET, aiding the complete replication of the mold geometry. In particular, SiOx is more effective in lowering the HTC at low shear rates while Al2O3 promotes the wall slip at the interface at high shear rates.

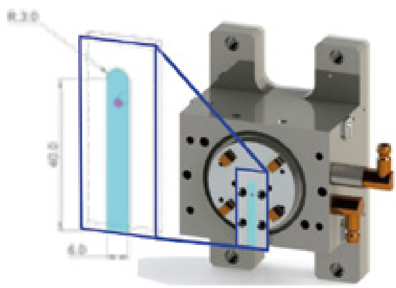


Figure 1. Design of the mold used for the experiments. The cavity is an open flow micro channel characterized by a length of 40 mm, a width of 6 mm and two alternative thickness value of 400 and 800 μm.

Figure 2. Different mold inserts with different coatings. From the left to the right: uncoated mold insert, ALD coating, DLC coating and SiOx coating.

CO_2 capture using CaO-based sorbents: microstructure evolution and reaction kinetics

A promising technology to capture CO_2 emissions from combustion and gasification power plants at high temperature involves the utilization of CaO based porous solid sorbents. The advantages of these materials include a high theoretical capture capacity (0.78 kg of CO_2 per kg of CaO) and a high CO_2 capture rate at high temperatures.

The CaO carbonation kinetics is related to the evolution of the sorbent microstructure, namely of the textural properties and of the CaO/$CaCO_3$ crystallite size. Using an innovative approach, based on a capillary flow-cell and on time-resolved in-situ synchrotron radiation XRPD, the $CaCO_3$ crystallite size and the CaO conversion were simultaneously computed even at short times (Figure 1).

Very high CaO conversion rates (0.28 s-1) were obtained, thanks to the capillary reactor by which external mass transfer was minimized. The transition between the first fast stage of the CaO carbonation and the product-layer diffusion controlled stage was interpreted through the concept of critical $CaCO_3$ crystallite size; such quantity was defined as the local maximum in the $CaCO_3$ crystallite size curves over time and marks the transition between the two reaction stages. An equation was developed to compute the active surface area from the critical $CaCO_3$ crystallite size measurements; the active specific surface area is related to the surface area effectively utilized to form carbonate islands over the CaO particle internal surface. Intrinsic reaction rate parameters were calculated combining the active surface area with the conversion rate data (Figure 2), obtaining a zero-activation energy. The estimates of the active specific surface area, the decrease of the active surface area and the increase of the $CaCO_3$ crystallite size with the reaction temperature provide quantitative support to a description of the CaO carbonation, in which the $CaCO_3$ is not uniformly distributed over the particle internal surface.

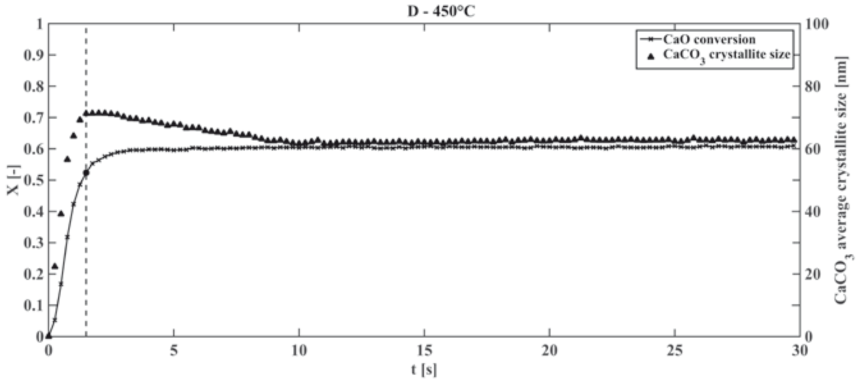
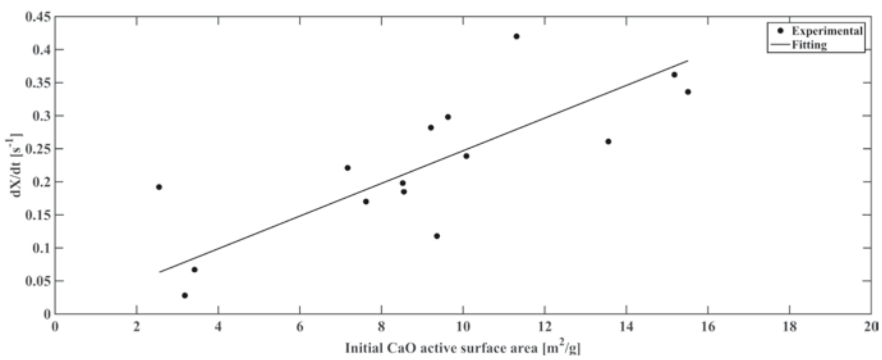


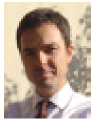
Fig 1: $CaCO_3$ crystallite size and CaO conversion versus time (carbonation at 450°C).

Fig 2: CaO conversion rate vs CaO specific surface area at the beginning of carbonation. Solid line represents the zero-activation energy behavior.



Ambiente
Environment

DII research group
CO_2 Capture and Multiphase CFD



Matteo Strumendo
matteo.strumendo@unipd.it
Phone: +39 049 8275464

Collaborator
Alberto Benedetti

www.dii.unipd.it

This investigation was conducted in collaboration with Prof. C. Segre (Illinois Institute of Technology), Prof. G. Salviulo (University of Padova), Dr. Zorzi (University of Padova), Dr. G.J. Halder (Argonne National Laboratory) and Dr. A. Yakovenko (Argonne National Laboratory). Experiments were performed at the Advanced Photon Source of the Argonne National Laboratory. Additional information on this work can be found in: A. Biasin, C.U. Segre, G. Salviulo, F. Zorzi, M. Strumendo, CES, 2015, 127, 13-24; A. Biasin, C.U. Segre, M. Strumendo, Crystal Growth and Design, 2015,15, 5188-5201.

Main research topics:

- CO_2 Capture and Utilization
- CO_2 solid sorbents synthesis and characterization
- Thermogravimetric analysis of gas-solid reaction kinetics
- In-situ microstructure analysis of non-catalytic gas-solid reactions
- Computational Fluid Dynamics of single phase and gas-solid systems
- Population balances




http://is.dii.unipd.it/

Corso di laurea magistrale in Ingegneria della sicurezza civile e industriale

Caratteristiche e finalità

Il corso forma un ingegnere della sicurezza che, accanto a solide conoscenze di base, acquisisce approfondite capacità nel settore dell'analisi del rischio degli edifici civili e delle infrastrutture e degli impianti dell'industria di processo, delle modalità tecniche gestionali della qualità, della sicurezza delle strutture civili e dei processi industriali e negli ambienti di lavoro.
L'integrazione di tali aspetti sarà raggiunta attraverso la complementarietà dei temi trattati nei singoli corsi e l'abitudine ad affrontare le problematiche con approccio multidisciplinare.
Il laureato sarà caratterizzato da capacità professionali di "problem solving".

Ambiti occupazionali

Le problematiche di sicurezza e analisi del rischio in sistemi complessi richiedono la formazione di laureati che posseggano una preparazione di tipo interdisciplinare, nonché una solida conoscenza delle tecniche per la valutazione dei rischi e l'analisi di affidabilità e disponibilità dei sistemi. Tali figure sono sempre più richieste dal mondo del lavoro pubblico e privato.
I principali sbocchi occupazionali sono quelli relativi all'inserimento nella progettazione in ambito di ingegneria civile, nella protezione industriale e nella sicurezza nell'industria di processo, nell'analisi dei rischi industriali, nella gestione e monitoraggio dei processi industriali, nel controllo della qualità dei prodotti, nella gestione, controllo e minimizzazione degli impatti ambientali, nelle attività di auditing, nell'ambito dei sistemi di gestione della qualità e della sicurezza e nella gestione delle emergenze di attività di primo intervento in caso di incidenti rilevanti e disastri ambientali.
Inoltre avrà tutti i requisiti per ricoprire gli incarichi di:
• Responsabile per la Sicurezza nei cantieri previsto dal Testo Unico 81/2008 sulla sicurezza sul lavoro
• Responsabile del Servizio di Prevenzione e Protezione previsto dal Testo Unico 81/2008 sulla sicurezza sul lavoro
• Tecnico per la prevenzione incendi

Dalla triennale alla magistrale

Hanno accesso diretto gli studenti in possesso di una laurea ex DM 270/04 nella classe L7 Ingegneria civile e ambientale o nella classe L9 Ingegneria industriale.
I requisiti d'accesso per gli studenti in possesso di lauree diverse sono :
- aver conseguito complessivamente almeno 30 crediti formativi nei settori MAT*, FIS*, CHIM,* ING-INF/05, INF/01;
- aver conseguito almeno 40 crediti formativi nei settori da ICAR*, ING-IND*
Per l'accesso è richiesta inoltre la conoscenza della lingua inglese (livello B1) e un voto di laurea non inferiore a 84/110.

Corso di Dottorato in Ingegneria Industriale

Il titolo di Dottore di Ricerca (corrispondente al titolo di Ph.D. internazionalmente riconosciuto) costituisce il 3° livello della formazione universitaria. Esso si consegue dopo la laurea magistrale, a conclusione di un ulteriore periodo di studio della durata di tre anni svolto presso un laboratorio o centro di ricerca universitario.
Scopo del Dottorato è addestrare alla ricerca scientifica e tecnologica e fornire, quindi, le competenze necessarie per esercitare attività di alta qualificazione presso Università, Aziende private o Enti pubblici, anche all'estero.
Il Dottorato è a numero chiuso e vi si accede per concorso pubblico.

Il Corso di Dottorato in Ingegneria Industriale, organizzato dal Dipartimento di Ingegneria Industriale (coordinatore: Prof. Paolo Colombo) ha lo scopo di promuovere, organizzare e gestire tutte le attività collegate a progetti formativi di livello dottorale multidisciplinari ed interdisciplinari nell'ambito dell'Ingegneria Industriale. Numerose borse di studio sono finanziate direttamente da Aziende, per lo studio e la soluzione di complessi problemi industriali.

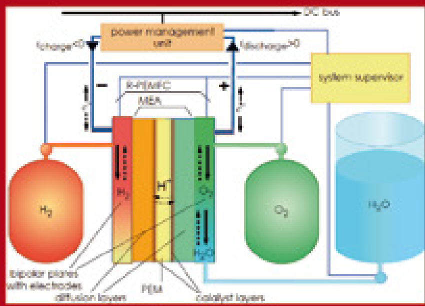
A partire dal XXX ciclo il Corso di Dottorato in Ingegneria Industriale offre i seguenti curricula:

- Ingegneria Chimica e Ambientale, referente prof. Matteo Strumendo
- Ingegneria dei Materiali, referente prof. Enrico Bernardo
- Ingegneria Meccanica, referente prof. Giovanni Meneghetti
- Ingegneria Energetica, referente prof.ssa Luisa Rossetto
- Ingegneria dell'Energia Elettrica, referente prof. Roberto Turri

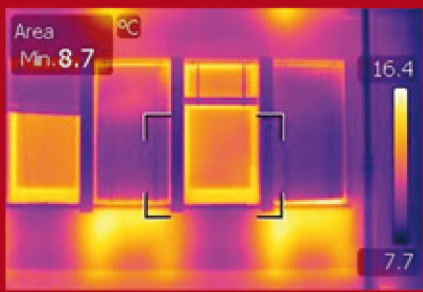
UNIVERSITÀ DEGLI STUDI DI PADOVA

Post-Graduate Course in Industrial Engineering


Simulatore di guida motocicli

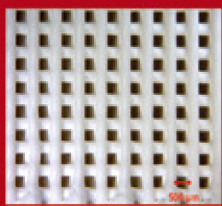


Studio di immagazzinamento energetico



Studio delle performance termiche di edifici


Progetto e analisi di compressori multistadio a flusso assiale


Stampa 3D di ceramici


Studio della fermentazione di batteri ricombinanti

http://www.cdii.dii.unipd.it

Achievements

La vettura FSAE MG 11.16 dell'Università degli Studi di Padova esposta a Bruxelles per la "Notte Europea dei ricercatori"

Per ulteriori informazioni rivolgersi al
Prof. Giovanni Meneghett
(049 8276751, giovanni.meneghetti@unipd.it)

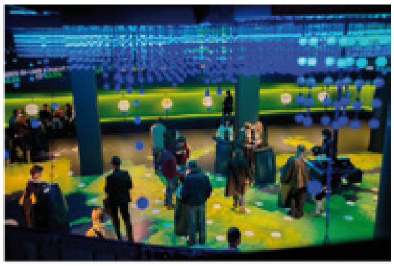
http://www.raceup.it/

La Notte Europea dei Ricercatori ha luogo ogni anno in tutta Europa l'ultimo Venerdì di Settembre.

Gli eventi, che si rivolgono principalmente alle famiglie, sono incentrati sulla scienza e l'apprendimento giocoso e danno la possibilità ai visitatori di poter incontrare i ricercatori.

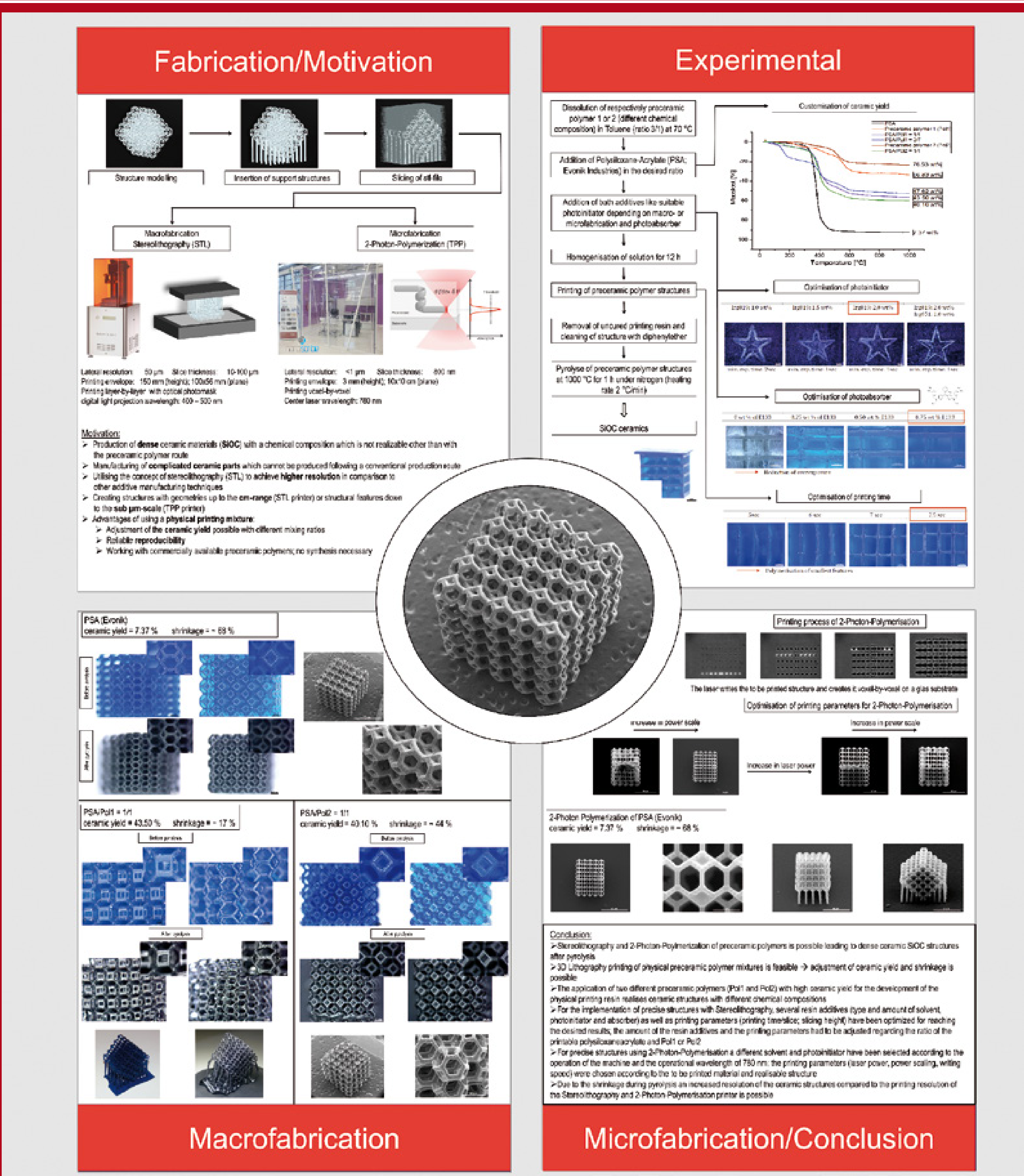
All'evento di quest'anno era presente anche il Race Up Team dell'Università di Padova, che ha realizzato due monoposto, una totalmente elettrica e una a combustione interna. Proprio quest'ultima è stata esposta al Parlamentarium di Bruxelles in occasione della "Notte Europea dei Ricercatori", mentre quella elettrica è stata esposta all'evento di Padova.

Oltre presentare la monoposto, a Bruxelles gli studenti del team patavino hanno sottoposto ai piccoli visitatori un quiz interattivo con il quale i bambini hanno potuto comprendere un po' più da vicino la natura dei materiali e vedere alcuni componenti utilizzati per la realizzazione dell'auto.



3D Stereolithography of polymer derived ceramics (PDCs)

J. Schmidt, G. Della Giustina, G. Brusatin and P. Colombo
Presentated by Johanna Schmidt - Dipartimento di Ingegneria Industriale, Università di Padova

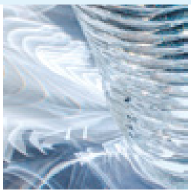


Best poster award (2nd place)
6th International Congress on Ceramics
August 21-25, 2016, Dresden

ICC6

Contacts: Prof. Paolo Colombo
paolo.colombo@unipd.it
phone: +39 49 8275825

Cover story



Trasmissione e riflessione della luce attraverso un componente in vetro sodico-calcico realizzato tramite stampa 3D

Effetti di trasmissione e riflessione della luce attraverso un componente in vetro sodico-calcico realizzato tramite stampa 3D a partire da materiale fuso. La stampante 3D che ha realizzato questo oggetto è unica nel suo genere ed è stata progettata e realizzata presso il Media Lab del Massachusetts Institute of Technology (MIT) nell'ambito di una collaborazione con la Prof.ssa Neri Oxman ed il gruppo Mediated Matter. Alcuni degli oggetti realizzati nella fase di validazione e ottimizzazione del processo di stampa sono entrati a far parte della collezione permanente del Cooper Hewitt, Smithsonian Design Museum di New York.

Ing. Giorgia Franchin

Nata a Padova, il 27/06/1989. Dottoranda in Ingegneria Industriale XXIX ciclo. Dopo aver conseguito la laurea magistrale in Ingegneria dei Materiali nell'ottobre 2013 presso l'Università di Padova, ha iniziato la sua attività di ricerca come dottoranda presso il gruppo Ceramici Avanzati e Vetri del DII. I suoi interessi di ricerca riguardano principalmente l'additive manufacturing di materiali ceramici e vetrosi, con particolare interesse per la realizzazione di reticoli e solidi cellulari con architetture complesse ed elevata porosità.

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Direttore: Massimo Guglielmi

Vicedirettore: Stefania Bruschi

Segreteria amministrativa:
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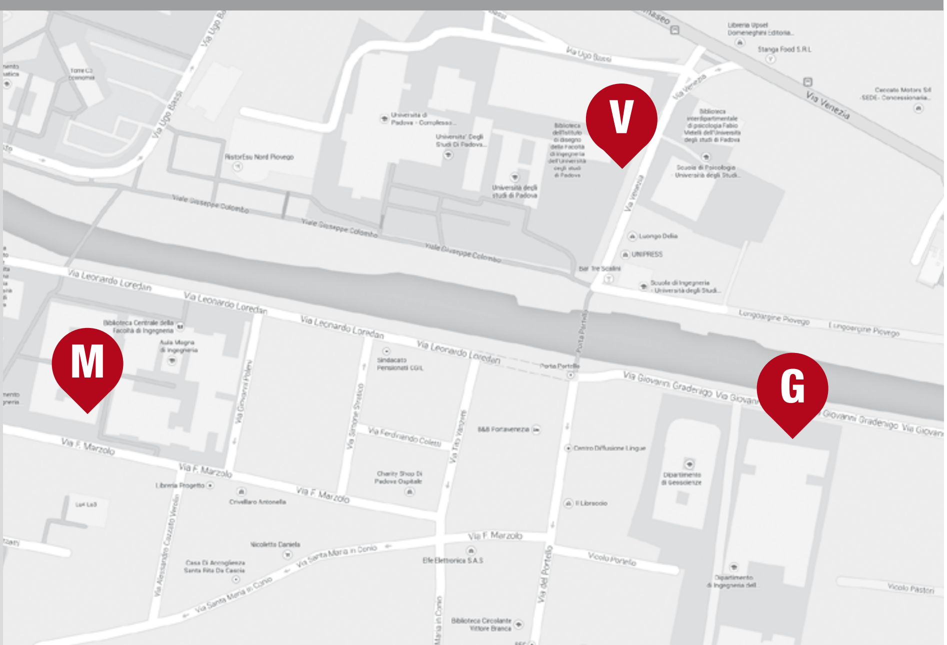

DII
Dipartimento di Ingegneria Industriale, Università degli Studi di Padova

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