Cycle: 37th

Student: Caravella Alice
Thesis Tentative Title: A circular economy framework: from biomass waste to bioplastic material.

Abstract

The aim of this work is to valorize lignocellulosic wastes by extracting the polymers they contain (holocellulose and lignin) to produce bioplastic materials. Polymers were extracted using an optimized organosolv treatment and different bleaching treatments on grape shoots powder. The extracted polymers were characterized using FTIR, DSC, and TGA analysis. Cellulose acetate (CA) was produced from cellulose and bioplastic films were produced by casting. The films were characterized for transparency, mechanical, and thermal points of view using FTIR, UV-Vis, DSC, TGA and tensile tests.

Student: Chebil Achref
Thesis Tentative Title: Smart-printed electrochemical sensors

Abstract

The monitoring of oxygen in food packaging is crucial in food quality surveillance. In this context, we report the development of a Bluetooth-assisted sensor for oxygen monitoring. The sensor encompassing three layers namely zinc sheet as an anode, silver ink screen-printed on polypropylene acting as a cathode, and a deep eutectic solvent deposited on a paper-based substrate sandwiched between both electrodes. Finally, the device was integrated into packages containing mushrooms, tomatoes, and broccoli, obtaining a good correlation with a reference method, namely commercial oxygen gas detector.

Student: Deidda Tarquini Greta
Thesis Tentative Title: Green nanoceria as active principle of an anti-oxidant/anti-inflammatory/UV-protective dermatological lotion

Abstract

In my first 2 years of PhD, I showed that nanoceria, combining UV-shielding and antioxidant properties, protect skin cells from UV-induced damage. In this 3rd year, I demonstrated that the antioxidant activity is pivotal over UV-shielding in this process, and does not require nanoceria internalization into cells. Additionally, I synthetized a "green" preparation of nanoceria, substituting TEMED with agarose as capping agent, and verified that it is safe and efficiently protect cells from UV. I am now developing and validating two nanoceria-based topical formulations (lipophilic and gel) on human skin explants.

Student: Draz Umer
Thesis Tentative Title: *Cell architecture optimization to maximize cell stability as CO_2-SOEC*

Abstract

The choice of electrolysis cell components is critical for optimizing CO_2-SOEC performance. This study explores LSFCu as a promising Ni-free, Co-free symmetrical electrode for SOECs with LSGM and YSZ electrolytes. LSGM faces instability at voltages above 1.6 V, while YSZ, when paired with Sr-containing electrode, forms an insulating phase at LSFCu//YSZ interface. Introducing a protective interlayer mitigates these issues. Interlayer, increased the YSZ performance by reducing polarization resistance and improving current density to 1.11 A/cm² and stabilize the LSGM performance up to 2 V.

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Student: Gullo Ludovica
Thesis Tentative Title: Paper-based electrochemical biosensors

Abstract

Phytic acid is a phosphorylated derivative of myo-inositol, serving as the primary phosphorus storage in plants. While beneficial for plants, it acts as an antinutrient in human diets by binding essential minerals like calcium, iron, and zinc, reducing their bioavailability. In this scenario a reagent-free paper-based electrochemical biosensor for quantifying phytic acid in spinach leaves using a 3D printed extraction device was developed. Phytase immobilized on paper electrodes hydrolyses phytic acid, generating phosphate ions detected via cyclic voltammetry.

Student: Laureti Andrea
Thesis Tentative Title: ACCURACY OF DYNAMIC NAVIGATION GUIDED IMPLANT SURGERY FOR IMMEDIATE LOADING COMPLETE ARCH RESTORATIONS: PROSPECTIVE CLINICAL TRIAL

Abstract

Within study limitations navigation was reliable for complete-arch implant placement with immediate loading digitally pre-fabricated FDP. AI driven surface anatomy identification and calibration protocol made fiducial free registration as accurate as fiducial based. Implant site characteristics was the only statistically significant variable with healed sites reporting higher accuracy compared to postextractive. Live-tracked navigation surgery enhanced operator performance and accuracy regardless of implant angulation and type of jaw.

Student: Nardi Roberto
Thesis Tentative Title: Evaluation by microCT of root canal cleansing of the XP-Endo Rise sequence as a function of shaping time: a preliminary study.

Abstract

Micro-computed tomographic technology (micro-CT) has been used to evaluate the shaping ability of endodontic instruments during root canal preparation procedures. The use of micro-CT revealed that 59.6% to 79.9% of the dentinal walls remained untouched after preparation of oval-shaped canals, which is a critical challenge for any available shaping protocol.
The study evaluates, using microCT analysis, the ex vivo root canal cleansing obtained with XP-Endo Rise sequence in relation to working time of the shaping instruments in laminar root canals from human extracted teeth.

Student: Nisa Khair Un
Thesis Tentative Title: Development of Carbon-based Electrodes for Electrochemical Energy Conversion and Storage

Abstract

Microbial fuel cells (MFCs) use organic waste as biofuel. Fe-N-C cathodes achieved high power density (1028 mWm^{-2}) [1], providing a sustainable alternative to costly platinum-group metals.
Moreover, different biochar samples from urban green waste were obtained via CO_2 activation and nitrogen doping. The best sample excelled in electrochemical tests showing good activity towards oxygen reduction reaction (ORR) and hydrogen evolution reaction (HER), making it ideal for MFCs and hydrogen-mediated CO_2 electroreduction in microbial electrosynthesis cells (MES), respectively.

Student: Rosa Alessio
Thesis Tentative Title: Influence of surgical drills wear on thermal process generated in bones: in vitro study of bone integration rations during drilling

Abstract

Repeated use of cutters during drilling and sterilization procedures cause cutters to wear out. Drills can wear out and become blunt. Using worn drills to prepare osteotomies for implants gnerates more friction and

heat. Bone overheating during drilling may cause early implant failure due to the accumulation of necrotic bone, fibrous tissue, bone sequestration, bacteria and inflammatory infiltrates around the implant. The objective of the present study is to verify the incidence and importance of surgical drill wear on the rate of early failure or implant success. Wear due to repeated use of the surgical drill and thermal variations will be evaluated, as the cutting efficiency and quality of rotary drills affect bone integration.

Student: Alessio Zotti

Thesis Tentative Title: Compare between 3 types of non-resorbable titanium membranes in GBR

Abstract

Guided bone regeneration (GBR) is an effective and simple method for bone augmentation, which is often used to reconstruct the alveolar ridge when the bone defect occurs in the implant area. Titanium mesh has expanded the indications of GBR technology due to its excellent mechanical properties and biocompatibility, so that the GBR technology can be used to repair alveolar ridges
with larger bone defects and can obtain excellent and stable bone augmentation results. Currently, GBR with titanium mesh has various clinical applications, including different clinical procedures. Bone graft materials, titanium mesh covering methods, and titanium mesh covering methods are also optional. Moreover, the research of GBR with titanium mesh has led to multifarious progresses in digitalization and material modification.