Abstract

Augmented Reality (AR) gaming is leaving the lab and entering the general population with a combination of high-end systems from the likes of Microsoft and Facebook as well as magic window AR games for commodity smartphones like Pokemon Go. Unlike traditional video games, AR games must solve the registration problem to map objects in the real world to the screen via the camera. Sensors are typically employed to provide the real world pose of the physical camera. However, like all sensors, the location and orientation sensors are subject to noise processes. While the interaction between noise processes and player enjoyment has been studied in networked games, limited work has been done examining the impact of sensor noise on player enjoyment in AR games and that work has been largely confined to simple noise models. In this paper, we present an empirical analysis of the impact on location based AR games of GPS noise on player experience. Our analysis shows that different games are impacted differently by noise. Multimodal noise processes can have a lower impact on player experience than equivalent unimodal processes, when players can time their interactions.
Abstract

Nanometer-sized structures, surfaces and sub-surface phenomena have played an enormous role in science and technological applications and represent a driving-force of current interdisciplinary science. Recent developments include the atomic-scale characterization of nanoparticles, molecular reactions at surfaces, magnetism at the atomic scale, photoelectric characterization of nanostructures as well as two-dimensional solids. Research and development of smart nanostructured materials governed by their surface properties is a rapidly growing field. The main challenge is to develop an accurate and robust electronic structure description. The density of surface-related trap states is analyzed by transient UV photoconductivity and temperature-dependent admittance spectroscopy. An advanced application of thin films on shaped substrates is the deposition of catalytic layers on hollow glass microspheres for hydrogen storage controlled exothermal hydrolytic release. Surface properties of thin films including dissolution and corrosion, fouling resistance, and hydrophilicity/hydrophobicity are explored to improve materials response in biological environments and medicine. Trends in surface biofunctionalization routes based on vacuum techniques, together with advances in surface analysis of biomaterials, are discussed. Pioneering advances in the application of X-ray nanodiffraction of thin film cross-sections for characterizing nanostructure and local strain including in-situ experiments during nanoindentation are described. Precise measurements and control of plasma properties are important for fundamental investigations and the development of next generation plasma-based technologies. Critical control parameters are the flux and energy distribution of incident ions at reactive surfaces; it is also crucial to control the dynamics of electrons initiating non-equilibrium chemical reactions. The most promising approach involves the exploitation of complementary advantages in direct measurements combined with specifically designed numerical simulations. Exciting new developments in vacuum science and technology have focused on forward-looking and next generation standards and sensors that take advantage of photonics based measurements. These measurements are inherently fast, frequency based, easily transferrable to sensors based on photonics and hold promise of being disruptive and transformative. Realization of Pascal, the SI unit for pressure, a cold-atom trap based ultra-high and extreme high vacuum (UHV and XHV) standard, dynamic pressure measurements and a photonic based thermometer are three key examples that are presented.
Abstract

Pretreatment of lignocellulosic biomass to overcome its intrinsic recalcitrant nature prior to the production of valuable chemicals has been studied for nearly 200 years. Research has targeted eco-friendly, economical and time-effective solutions, together with a simplified large-scale operational approach. Commonly used pretreatment methods, such as chemical, physico-chemical and biological techniques are still insufficient to meet optimal industrial production requirements in a sustainable way. Recently, advances in applied chemistry approaches conducted under extreme and non-classical conditions has led to possible commercial solutions in the marketplace (e.g. High hydrostatic pressure, High pressure homogenizer, Microwave, Ultrasound technologies). These new industrial technologies are promising candidates as sustainable green pretreatment solutions for lignocellulosic biomass utilization in a large scale biorefinery. This article reviews the application of selected emerging technologies such as ionizing and non-ionizing radiation, pulsed electrical field, ultrasound and high pressure as promising technologies in the valorization of lignocellulosic biomass.

Database

ScienceDirect
Abstract

Highly efficient extracellular electron transfer (EET) of electroactive bacteria is essential for economically viability of a diverse array of bioelectrochemical systems (BES) in environmental and energy fields. However, the EET efficiency of exoelectrogens remained a primary bottleneck. Synthetic biology is a research field that combines the investigative nature of biology with the constructive nature of engineering, which offers great prospects in rationally engineering to facilitate highly efficient EET of electroactive cells. In this review, we firstly summarized the recent advances in synthetic biology strategies to enhance the EET efficiency of exoelectrogens, which included broadening feedstock spectrum, strengthening intracellular electron generation, optimizing conductive cytochromes systems, promoting biosynthesis and secretion of electron shuttles, and constructing conductive biofilms. Genetic technologies in engineering exoelectrogens, in particular the genomic editing tools, were then reviewed. Lastly, a number of fundamental questions to be addressed in this field were proposed as a perspective for further boosting the EET efficiency and practical applications of BES systems.
A visual simulation of ocean floating wind power system

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Computer Animation and Virtual Worlds

https://doi.org/10.1002/cav.1859

Abstract

The development of ocean floating wind power has been burgeoning in recent years because of its low cost and high efficiency. To facilitate effectiveness, 3D visualization using virtual reality and augmented reality technologies has been applied to many operating systems. However, most of the existing 3D motion visualizations are “pseudo” visualization, and there are a few realistic visualization systems that base the motion of ocean floating wind power on simulation and experiment results. Therefore, in this paper, we conducted research related to the design for a realistic motion visualization system based on numerical simulation data using a commercial game engine (Unity 3D). In our system, the six-degree-of-freedom motion (Surge, Sway, Heave, Roll, Pitch, and Yaw) is simulated and visualized based on numerical analysis results of two hydrodynamics simulation softwares, which can illuminate the nuance between simulation results and experiment results and give us a “real-time” visual experience about motion in each direction. Meanwhile, comprehensive sea environment conditions, such as wind, rain, water, sound, and cloudiness, are also visualized in Unity 3D.

Database

Wiley Online Library
Abstract

During the last few years there is an increasing demand to the natural biologically active compounds. According to the World Health Organization (WHO) about 11% of the conventional medicines are of plant origin. Nowadays, plant biotechnologies are modern and reliable tool for producing valuable bioactive compounds. Recently, the potential of plant cells as foods also was confirmed. The advantages of plant in vitro systems over the intact plants are well known: growing under controlled and optimized laboratory conditions; independence of climatic and soil differences; preservation of rare and endangered plant species; cultivation in diverse bioreactor systems for increasing production yields of target metabolites.

There have been developed many in vitro systems for production of various plant bioactive compounds with potential application in food industries. But potential for industrial implementation of this technology depends on solving problems with the scale-up of bioreactor cultivation, development of additional approaches for improving/modification of bioactivities of the target plant secondary metabolites, and to find way to exclude or replace in the culture media the carcinogenic plant growth regulator 2,4-dichlorophenoxyacetic acid (2,4-D) with its safety analogs, such as α-naphtaleneacetic acid (NAA) and/or indole-3-butyric acid (IBA).

The aim of the current mini review is to summarize information about different in vitro systems of edible plants from the Balkan Peninsula with potential for producing food additives and biologically active substances and to describe prospects for successful industrial implementation of this technology.
Abstract

The carbon net negative conversion of biochar, the byproduct of pyrolysis bio-oil production from biomass, to very high-purity (99.95%), highly crystalline flake graphite that is essentially indistinguishable from high-grade commercial Li-ion grade graphite, is reported. The flake size of the graphite is determined by the physical dimensions of the metal particles imbedded in the biochar, demonstrated in the range of micrometers to millimeters. “Potato”-shaped agglomerates of graphite flakes result when the flake diameter is in the 1–5 μm range. The process is shown to work with a variety of biomass, including raw lignocellulose (sawdust, wood flour, and corn cob) and biomass components (cellulose and lignin), as well as lignite. The synthesis is extremely rapid and energy efficient (0.25 kg/kWh); the graphite is produced with a very high yield (95.7%), and the energy content of its coproduct, bio-oil, exceeds that needed to power the process. The demonstrated process is a tremendous advance in the sustainability of graphite production, currently commercially mined or synthesized with very high environmental impacts, and results in a value-added product that could economically advantage carbon-neutral bio-oil production.
Title: Accumulation of Marcellus Formation Oil and Gas Wastewater Metals in Freshwater Mussel Shells

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Journal: Environmental Science & Technology

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Abstract

For several decades, high-salinity water brought to the surface during oil and gas (O&G) production has been treated and discharged to waterways under National Pollutant Discharge Elimination System (NPDES) permits. In Pennsylvania, USA, a portion of the treated O&G wastewater discharged to streams from 2008 to 2011 originated from unconventional (Marcellus) wells. We collected freshwater mussels, Elliptio dilatata and Elliptio complanata, both upstream and downstream of a NPDES-permitted facility, and for comparison, we also collected mussels from the Juniata and Delaware Rivers that have no reported O&G discharge. We observed changes in both the Sr/Cashell and 87Sr/86Srshell in shell samples collected downstream of the facility that corresponded to the time period of greatest Marcellus wastewater disposal (2009–2011). Importantly, the changes in Sr/Cashell and 87Sr/86Srshell shifted toward values characteristic of O&G wastewater produced from the Marcellus Formation. Conversely, shells collected upstream of the discharge and from waterways without treatment facilities showed lower variability and no trend in either Sr/Cashell or 87Sr/86Srshell with time (2008–2015). These findings suggest that (1) freshwater mussels may be used to monitor changes in water chemistry through time and help identify specific pollutant sources and (2) O&G contaminants likely bioaccumulated in areas of surface water disposal.

Database

American Chemical Society Journal (ACS)
Abstract

Background
Extracellular polymeric matrix (EPM) is a complex component of the organo-mineral assemblages created by biological soil crusts (BSCs). Mainly of polysaccharidic origin, it embeds soil and sediments and provides key benefits to the crust community. Services provided include: sediment cohesion and resistance to erosion, moisture provision, protection from external harmful factors, as well as support to plant establishment and growth. EPM is the product of BSC microbial community, and it is constituted by exopolysaccharides (EPS) associated to other substances, organized in a three-dimensional structure having different levels of gelation, and degrees of condensation.

Scope
This review aims at focusing scientific attention, for the first time, on the characteristics and the roles of three operationally defined EPM fractions, one water soluble, one more adherent to cells and sediments, and one firmly attached to microbial cells. The latest results obtained by analyzing EPM of natural and induced (i.e, the result of cyanobacteria inoculation) BSCs are outlined, and the optimized extraction methodology is described in details.

Conclusions
The review underlines the complexity of investigating the characteristics and the role of microbial EPS, and its supra-structure (EPM), in natural conditions (as opposed to cultures in laboratory conditions), where the matrix is subjected to continuous microbial rearrangement due to biosynthetic, self- and cross-feeding processes, and where microbial activity affected by environmental parameters.

Database
SpringerLink
Abstract

Different stationary phases were compared for their separation efficiency of Trandolapril (TRP) and Verapamil (VRP) in presence of acidic, basic, oxidative, and photolytic degradation products. The separation was applied on two different stationary phases. The first stationary phase was the conventional C18, whereas the second was the more polar cyano stationary phase. However, for the conventional C18 packing, two columns with two different lengths were used, 250 and 150 mm. Optimum performance for C18 columns was obtained using acetonitrile: potassium di-hydrogen ortho-phosphate buffer pH 6 adjusted by 0.1 M NaOH (50:50 v/v) as a mobile phase while for cyano column it was acetonitrile: potassium di-hydrogen ortho-phosphate buffer pH 4.5 (25:75 v/v). For both stationary phases, the flow rate was 1 mL min\(^{-1}\) and the detection wavelength was 215 nm. The validations of all the adopted methods were done as per ICH guidelines. The comparison was accomplished in terms of resolution, tailing factor, column efficiency, and total run time of analysis. Both C-18 columns showed superior results over cyano column. The C-18 column (150 mm) exhibited better results than C-18 (250 mm) column in terms of column efficiency and total run time. The results were compared with the reference method and no significant differences were found. In addition, one-way ANOVA testing was done to compare the three methods.