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2023 6th International Conference on
Agricultural Science and Biotechnology

2023 6th International Conference on
Chemical and Biological Engineering

May 27, 2023

Virtual Conference

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Introduction

2023 6th International Conference on Agricultural Science and Biotechnology (ICASB2023) and 2023 6th International Conference on Chemical and Biological Engineering (ICCBE2023) are organized by Shanghai Laixi Conference Services Co., Ltd. According to the similarity among the topics of ICASB2023 and ICCBE2023, ICASB2023 is held in conjunction with ICCBE2023 virtually on May 27, 2023.

ICASB2023 and ICCBE2023 serve as an optimal platform for specialists, scholars and researchers in the field related to agricultural science, biotechnology, chemical engineering and biological engineering to facilitate academic communications and exchange ideas. The conferences offer an academic space known for its interdisciplinary approach as well as a space for academics and practitioners.

Major themes of the Conferences included:

Agricultural Science: Agricultural Biotechnology, Agricultural Chemistry, Agricultural Diversification, Agricultural Education, Agricultural Economics, Agroecology, Agrophysics, Animal Breeding, Animal Husbandry, Animal Nutrition, Farm Management, etc.

Biotechnology: Industrial Biotechnology, Nanobiotechnology, Medical Biotechnology, Agro- and Food Biotechnology, Vector Technology, Imaging Technology, Single Cell Technology, Nanobiotechnology and Biomaterials, Omics Technology, Plant Biotechnology, Sequencing Technology, etc.

Chemical Engineering: Supramolecular Chemistry, Thermochemistry, Supramolecular and Nanoscale Chemistry, Computational and Modeling Chemistry, Crystallography and Physical Methods, Molecular Chemistry, Inorganic Materials and Polymers, Catalysis and Organometallic Chemistry, Medicinal and Bioinorganic Chemistry, Fundamental Chemistry, Applied Chemistry, etc.

Biological Engineering: Cell Engineering, Molecular Bioengineering, Nucleic Acid Engineering, Food Process Engineering, Physiological Engineering, Energy Systems Engineering, Soil and Water Engineering, Environmental Bioengineering, Bioresources and Biorefinery Engineering, Biomaterials and Tissue Engineering, Cell Culture Engineering, etc.

The abstracts that were selected had a complete peer review process. Selected papers are also published at the cooperating journals of each conference. They show the richness in interdisciplinary approaches, theories, models and applied research presented in the conference.

We would like to thank you for your scientific contribution to ICASB2023 and ICCBE2023 and look forward to having the opportunity to showcase and disseminate your research.

Special thanks also to the organizing committee, and all the people that worked hard, to bring in light this considerable event.

Sincerely,

ICASB2023 and ICCBE2023 Organizing Committees

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Effects of Light Intensity and Artificial Aeration on Growth and Photosynthetic Physiology of Marine Invasive Green Alga *Codium fragile* from Bohai Sea, China

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Abstract: *Codium fragile* has attracted much attention due to its high economic and nutritional values. The light intensity and artificial aeration affect its growth process and photosynthetic activity of the full-grown algae the light intensities (30μmol·m^{-2} s^{-1}, 60μmol·m^{-2} s^{-1}, 90 μmol·m^{-2} s^{-1}) and aeration injection are investigated to the effect on the growth and photosynthetic physiology of *C. fragile* collected from the Bohai Sea, China. The results show that different light intensities have a highly significant effect on the maximal photochemical efficiency of PSII (Fv/Fm), photochemical quenching coefficient (qP), and non-photochemical quenching coefficient (NPQ). They all decreased the least under 60μmol·m^{-2} s^{-1}. The increase in the relative growth rate (RGR) of *C. fragile* during aeration was greater than that of the non-aeration group. In the aeration group, the Fv/Fm and qP decreased less than those of the non-aeration group. It shows that the aeration injection had a highly significant effect on the wet weight, Fv/Fm and qP of *C. fragile*. Even at high light intensity, the stress-induced damage was alleviated in the aeration group. Among the six groups, only aeration and light intensities of 60 and 90μmol·m^{-2} s^{-1} were suitable for the growth of *C. fragile*, because the Fv/Fm decreased less and the qP increased. The result shows that the interaction of the two environmental factors had a significant effect on the Fv/Fm and qP of *C. fragile*, while there was no significant effect on the wet weight and NPQ. Considering the difference of experimental results, we speculate that this difference reflects the different environmental adaptation of *C. fragile* in the south and the north to some extent, but the deeper reasons need to be further explored.

Keywords: Environmental Factors, Light Intensities, Artificial Aeration, *Codium fragile*, Photosynthetic Physiology

Transcription Factor *GsWRKY40* from Wild Soybean Plays Positive Roles in Plant Salt Tolerance

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Abstract: Salt stress can cause serious damages on plant growth and development. The WRKY transcription factors are widely involved in plant development, defense regulation and stress response. In this study, we found that *GsWRKY40* gene was mainly expressed in the root tissue of wild soybean (*Glycine soja*) and was significantly induced by NaCl. The confocal fluorescence microscopic data showed that *GsWRKY40* was localized in the nuclei of plant cells. In yeast, *GsWRKY40* did not demonstrate transcriptional activation ability but showed its ability to specifically bind to W-box in DNA sequence by using yeast one-hybrid approach. The heterologous overexpression of *GsWRKY40* gene in *Arabidopsis* enhanced salt stress tolerance, and the root length and survival rate of transgenic plants were higher than those of the wild-type plants under salt stress. The qRT-PCR analysis showed that overexpression of *GsWRKY40* genes significantly altered the expression patterns of several downstream genes. In order to study the regulatory mechanism of *GsWRKY40* in plants, we isolated a *GsWRKY40* interacting protein (*GsbHLH92*) from wild soybean cDNA library by yeast two-hybrid approach. This protein is homologous with bHLH transcription factor family in phylogeny, and its function is unknown. *GsWRKY40* and *GsbHLH92* interacted in the plant nucleus determined by BiFC, pull-down and co-immunoprecipitation assays. In order to explore their physiological functions in soybean, we co-expressed *GsWRKY40* and *GsbHLH92* genes in soybean hairy roots. The results showed soybean that co-expressing *GsWRKY40* and *GsbHLH92* genes showed better salt tolerance. qRT-PCR analysis showed that several important regulatory genes under salt stress were up-regulated by overexpression of *GsWRKY40* and *GsbHLH92* genes. By yeast one-hybrid experiment, we proved that *GsWRKY40* can bind to the W-box element of *GmSPOD1* promoter. Dual-luciferase reporter assay confirmed that the expression of *GmSPOD1* gene was co-regulated by *GsWRKY40* and *GsbHLH92*. Our data provide a new perspective for the regulatory mechanism of plant tolerance to abiotic stress.

Keywords: Wild Soybean, Salt Stress, *GsWRKY40*, Soybean, Transcription Factor

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Research Progress on Ecological Impact and Expansion Mechanism of Weeds in Degraded Grassland

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Abstract: To clarify the impact of weeds on the grassland ecosystem and the mechanism of spreading in degraded grasslands, and to provide references for restoration of degraded grasslands, existing works on weeds were reviewed in this paper. The main ecological influences of weeds include: affecting species diversity, hindering the economic development of animal husbandry, and altering soil properties, affecting the stability of grassland communities. And explained the invasion and spread of noxious weeds in degraded grasslands and came to the following conclusions: In lightly degraded grassland, weeds are neglected by livestock due to their terrible taste, which renders grazing futile in suppressing their growth and spread, and acquiring more living space and nutrients through allelopathy. In severely degraded grassland, weeds adapt better to the harsh environment of degraded grasslands due to their morphological advantages and unique reproductive biology. Most of the weeds in desert grassland are shrubs with strong roots and drought resistance. In addition, some suggestions on weeds control and utilization were put forward in this article. Compositive control measurement of noxious weeds based on prevention should be applied, and using non-toxic weeds wisely. Get a comprehensive understanding of weeds and coexist with weed science.

Keywords: Grassland Degradation, Grassland, Weeds, Toxic Weed, Allelopathy

Calcification of the Egg Capsule of the Invasive Apple Snail *Pomacea canaliculata*: The Organic Matrix and the Calcium-Rich Granules

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Abstract: The apple snail *Pomacea canaliculata* is native to South America and has invaded many countries around the world. Understanding the basis knowledge of their reproduction will lay a foundation to control their rapid expansion. *P. canaliculata* is an amphibian mollusk that lays aerial eggs above the water level. The hatching larvae is protected from sunlight, desiccation and other damages by a calcified capsule which is composed of vaterite. Vaterite is a metastable calcium carbonate seldom found in inorganic sediment, and the only found stable forms in nature are biominerals in molluscs and corals. Moreover, the egg capsule represents another evolved biomineral after the spiral shell in gastropod. Therefore, the calcified egg capsule provides an interesting biomineralization model to study the crystal polymorph and evolution of calcium carbonate biomineral. We first explored the calcification process of the eggs. It was found that numerous calcium-rich granules were present inside the newly deposited eggs and transported to the outer surface for capsule mineralization, indicating a unique mineralization pathway compared with the exoskeleton shell formation. We then analyzed the organic matrix extracted from the egg capsules and found that the organic matrix could stabilize vaterite and modify the crystal morphology. FTIR revealed that the matrix was composed of proteins and polysaccharides, similar to most molluscan shell matrices. Proteomics analysis showed that the shell proteins contain chitin-binding and calcium binding proteins, and several sulfatases. The sulfatase is unique and may be involved in vaterite deposition via generating sulfate ions from sulfonic polysaccharide. Our work suggests that the calcification of the *P. canaliculata* egg capsule may be accomplished via a unique pathway which calls for further studies.

Keywords: *Pomacea canaliculata*, Egg Capsule, Organic Matrix, Proteomics, Calcium-Rich Granule

C15orf48 Promote Prostate Cancer Progression and Activate AKT/mTOR Signaling Pathway

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Abstract: *Background:* In recent years, the incidence and mortality of prostate cancer have been increasing. However, the specific molecular mechanism of its onset and development remains unclear. *Purpose:* To address this issue, PCa requires new effective therapeutic targets. *Methods:* Through bioinformatics analysis, we identified a novel differential gene, C15orf48, which has not been studied in the context of prostate cancer. In this study, we analyzed the GEO database and found that C15orf48 was highly expressed in PCa tissues. Analysis of the UALCAN database further confirmed this phenomenon. Then the expression level of C15orf48 in tissues and cells was detected by qRT-PCR. To assess the impact of C15orf48 on cell proliferation, we evaluated, migration, invasion, CCK-8, EdU, Western blot, and wound healing assays. We performed the flow cytometry and Western blot assays to detect cell apoptosis. To detect the impact of C15orf48 on the cell cycle, we performed the Western blot assay. In the study, we also detected the impact of C15orf48 on the AKT/mTOR signaling pathway. *Results:* Our results shown that the overexpression of C15orf48 can promote cell proliferation and cell cycle progression, and inhibit cell apoptosis. Activating AKT/mTOR signaling pathway. While C15orf48 knockout has the opposite effect. *Conclusions:* Our study reveals a novel molecular target that can be targeted for prostate cancer therapy by modulating C15orf48 expression.

Keywords: Prostate Cancer, C15orf48, AKT, MTOR, Progression

Chitinous Nerve Cannula Loaded Bone Marrow Mesenchymal Cells Repair Peripheral Nerve Injury

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Abstract: *Objective:* Post-traumatic peripheral nerve injury (PNI) is a medical dilemma with limited and unresolved treatment outcomes. Epineural sutures are clinically important in the treatment of PNI, but are inevitably accompanied by complications such as nerve fiber misconnections and neuroma formation. The tubular small gap cannula is an effective suture alternative to epineural suturing. However, the repair effect of this method also depends to some extent on more effective loading factors or cells, of which bone marrow mesenchymal stem cells are proven effective cells, but how to maximize the effector state of such cells has become a hot issue in the field of peripheral nerve injury repair recently. The existing peripheral nerve conduit materials cannot meet the required mechanical strength and at the same time fully utilize the maximum repair effect of stem cells. Therefore, we want to develop a composite stem cell peripheral nerve repair catheter to maximize the rapid repair of peripheral nerve injury and obtain the optimal repair effect. *Methods:* In this study, we demonstrated a method to construct peripheral nerve conduits based on the principle of chitin acetylation. In addition, the microscopic morphology, mechanical properties and biocompatibility of the chitinous nerve conduit formed by chitin acetylation were further tested. And the bone marrow mesenchymal stem cells, which were cultured in three dimensions, were loaded onto this nerve conduit to enhance the effect of promoting peripheral nerve regeneration. *Results:* Chitin is a high-quality biomaterial for constructing nerve conduits. Previous reports have shown that culturing MSCs into spheroids can improve the therapeutic potential. In the present study, we prepared bone marrow MSCs that could express higher stemness-related genes. In a PNI rat model, BMSCs microspheres had a stronger ability to promote sciatic nerve regeneration than BMSCs suspensions. *Conclusion*: Chitinous nerve conduits containing BMSCs offer a promising therapeutic option for post-traumatic peripheral nerve regeneration.

Keywords: Peripheral Nerve Injury, Chitin, Peripheral Nerve Conduit, Bone Marrow Mesenchymal Stem Cells, Spheroid

Clinical Application of Rapid Detection of Pathogenic Microorganisms Based on SERS

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Abstract: Culture technology is often used in clinical microbial detection, but this method has the disadvantages of long time, high cost, and low positive rate. Some fastidiosa and fungal growth is slow, which brought lots of difficulties to identification. Therefore, the application of rapid detection method may suggest targeted treatment plans to improve clinical treatment efficiency. Surface-enhanced Raman spectroscopy (SERS) is a fast and sensitive detection method, which has little interference in aqueous solution and has enrichment effect to a certain extent. Therefore, SERS has extremely high application value for the detection of microorganisms in body fluids and blood with low abundance. Based on the amplification effect of metal nanoparticles SPR, the SERS signal of microorganisms in liquid environment was detected. Combined with the SERS signal database constructed, the types of microorganisms were quickly and sensitively determined according to PCA analysis. In this study, according to the special structure of *Acinetobacter baumannii*, aptamers were constructed and combined with metal nanomaterials by sulfhydryl group to improve the adsorption efficiency of nanomaterials on microorganisms and further improve the detection efficiency. Compared with the amplifying effect of gold nanomaterials on SERS signal, the signal amplifying efficiency of silver nanoparticles was higher. The minimum detection limit of gold and silver nanometers was 10^5 and 10^4 respectively, and the primary detection of strains could be completed within 30 minutes according to PCA analysis. Combined with aptamer, the detection sensitivity of silver nanomaterials was further improved, and the lowest content of *A. baumannii* was 10^2 orders of magnitude. The detection based on SERS can quickly and efficiently complete the preliminary identification of microorganisms, which has a more efficient advantage compared with the conventional clinical mass spectrometry identification technology. In addition, since the aqueous solution itself had no significant interference on SERS signal, this method could quickly and accurately complete the enrichment and identification work in the detection of clinical urine, ascites and cerebrospinal fluid, which has a high application value. The detection technology based on SERS can improve the detection method according to specific aptamer modification for different pathogenic microorganisms and improve the identification efficiency.

Keywords: Microbial Identification, Surface Raman Spectroscopy, Aptamer

Alkylation of Aromatic Hydrocarbons with Long Chain Alkenes Catalyzed by a Liquid Acid

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Abstract: Friedel-Crafts reaction is widely used in the petrochemical production process, mainly for the production of fine chemicals containing aromatics. Long-chain alkyl naphthalene is often used as the base oil of lubricating oil. It has the characteristics of high lightning and excellent thermal stability. At the same time, it can also be compounded with other lubricating oils to prepare high-quality lubricating oil. At present, $AlCl_3$ is still the main catalyst in the aromatics alkylation industry, but there are environmental problems such as equipment corrosion and wastewater and solid waste difficult to treat; Solid catalysts have the advantages of green and environmental protection, but it is difficult to realize large-scale application due to weak acidity, poor mass transfer, difficult regeneration and high cost. A liquid acid catalytic alkylation process has obvious effect and is cheap and easy to obtain. At the same time, its successful experience in C4 alkylation process will be conducive to our research on aromatics alkylation process. After screening of catalyst system and optimization of process conditions α-Methylnaphthalene and 1-decene were used as raw materials. The experimental results showed that when the liquid acid was added at 30 ℃, 30 min, the amount of catalyst was 6w%, and the molar ratio of arylene was 1:2, the olefin conversion could reach 100%, and the selectivity of disubstituted products exceeded 80%. Compared with the traditional process, this reaction process has low energy consumption, low catalyst cost, and the product is suitable for the production of a variety of alkyl naphthalene products, which has a certain application prospect.

Keywords: Aromatics Alkylation, Liquid Acid, Catalytic Mechanism

Dynamic Studies of Fly Ash Particles Impact on a Flat Surface Under Humid Condition

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Abstract: Lots of pollutants will be generated in the coal combustion processes. Particulates in the flue gas is evaporated by electrostatic precipitator. However, there is an obvious penetration window for the micro-nano fly ash particles from coal combustion. The dust removing efficiency is different in coal and relative humidity. Therefore, the wet electrostatic precipitators and low-low temperature precipitators are proposed to improving the relative humidity by reducing the flue gas temperature. Thus, the experimental facility and dynamic model for different fly ash particles against a flat surface under humid conditions were built to explore the variation of restitution coefficient. Results shows that the capillary force plays a dominant role in humid condition. The liquid bridge between the contact surfaces increases the energy loss to reduce the restitution coefficient. Compared with particle properties, the decreasing density and Young's modulus increased as well as limiting velocity is promoted to particle deposition. With the increasing relative humidity, the liquid bridge between the contact surfaces increases the capillary force to reduce the normal restitution coefficient. The normal restitution coefficient first increase, then gentle and at last decrease with the increasing velocity due to the elastic-plastic impact of micro-particles. Furthermore, the restitution coefficient of hydrophilic particle varied significantly in relative humidity.

Keywords: Coal Combustion, Fly Ash Particle, Relative Humidity, Restitution Coefficient

Preparation and Properties of Carbon Fiber Reinforced Thermoplastic Matrix Composites for Wind Turbine Blades

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Abstract: With the increasing size of wind turbine blades, composites with light weight, high strength and modulus are highly required. In this work, in order to meet the enviromental requirement of material recovery, copoly(aryl ether sulfone)s (PPAESs) containing phthalazinone moiety were synthesized by high temperature solution polymerization, and carbon fiber reinforced thermoplastic matrix composites (CFRP) were prepared based on them by hot molding procedure. The structures of copolymers and the properties of composites were characterized. The results show that the number-average molecular weight of PPAESs is higher than 3×10^4, the molecular weight distribution index of PPAESs is between 1.61 and 1.90. PPAESs are soluble in polar aprotic solvents, such as N,N-dimethyl acetamide (DMAc). The resultant thermoplastic matrix composites exhibited excellent mechanical properties, with the bending strength, tensile strength and interlaminar shear strength of 1559 MPa, 2151 MPa and 83 MPa, respectively. Furthermore, the mechanical properties of the composites increase with the increasing of the content of phthalazinone structure in the matrix, which can be attributed to the increase of distortion and stiffness of molecular chain due to the introducing of twisted and non-copolanar phthalazione moieties. Overall, the excellent mechanical properties of CF/PPAESs composite materials provide the potential candidate for the wind turbine blade application.

Keywords: Carbon Fiber, Thermoplastic Composite, Mechanical Property, Wind Turbine Blades

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