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Out of the Press

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Peer-reviewed Journal Articles

DFST

Ultraviolet photoelectron spectroscopic study on the interface electronic structure of the L-cysteine on Pd surface

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Abstract

L-cysteine is one of the most versatile biomolecules with a unique metal-binding ability. L-cysteine has an outstanding role in the bioelectronics field as a linker between proteins of biomolecules and metal electrodes of the inorganic metals through multiple functional groups. The interface electronic structures between L-cysteine with metals deserve further investigation for applications in bioelectronics. However, the interface electronic structures of L-cysteine and metals have not been well understood. We have previously reported the existence of a new state between the highest occupied molecular orbital (HOMO) of L-cysteine and the Fermi level of the metals for L-cysteine/Au(111), L-cysteine/Ag(111), and L-cysteine/Cu(111) using photoemission spectroscopy and attributed the formation of the new state to an interaction of the d band with HOMO of L-cysteine. In this study, the electronic structure at the interfaces of L-cysteine on a Palladium (Pd) surface is investigated by ultraviolet photoemission spectroscopy (UPS) using synchrotron radiation including work function, secondary electron cutoff (SECO), and HOMO onset; the position of an interface state, charge injection barrier, and ionization energy are estimated. It is observed that thin-film spectra of L-cysteine on Pd surfaces in the valance top region are different from the L-cysteine thick films, and this can be attributed to an interaction between a sulfur-originated state of L-cysteine HOMO with Pd d orbitals. Also, a 0.6-eV SECO shift is estimated due to the charge transferring between L-cysteine and Pd. The results of SECO further confirm the weakening of the Pd–sulfur bond with increasing L-cysteine coverage on Pd.

About the Journal

Surface and Interface Analysis

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Effects of insecticide Profenofos and herbicide MCPA on leaf litter decomposition in tropical streams: a microcosm study

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Abstract

Agricultural pesticides are known to significantly impact the non-target aquatic communities and key ecosystem processes of stream ecosystems such as litter decomposition. The unresolved questions are remaining of how such stressors interact to alter ecosystem structure and function, and how impacted ecosystems are able to maintain their ecological balance. Hence, this paper discusses the effects of the insecticide Profenofos and herbicide MCPA on Ficus racemosa and Panicum maximum litter breakdown in 40 days of indoor microcosm systems. Litter breakdown rates were analysed in microcosms treated with pesticide concentrations of 0.010, 0.025, 0.100, 0.250, 1.000 mg/L and in control tanks with no pesticides. The results of the study indicated a significant alteration of litter breakdown rate of MCPA-treated tanks compared to the control tanks in terms of reduction percentage of dry weight, remaining organic matter content, microbial community sporulation, and remaining nutrient content ($p < 0.05$). The herbicide MCPA accelerated the structural impairment of leaf material by destructing the leaf material. No significant differences were observed between Profenofos-treated leaf packs and control leaf packs ($p < 0.05$). Aquatic hyphomycetes have degraded the applied Profenofos by consuming the nutrients from the litter. These alterations were modulated by the litter quality and microbial colonizations on leaf materials. The findings of the study emphasize the effects of pesticides on the structure and functional properties of lower levels organisms in the ecological food chain and the importance of considering indirect effects of pesticides in ecological processes.

About the Journal

Int. J. Environ. Sci. Technol.

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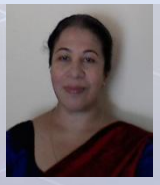

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Bioremediation of Pesticide-contaminated Soil: A Review on Indispensable Role of Soil Bacteria

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Abstract

Scientists have identified a plenty of bacterial strains having ability to degrade pesticide residues accumulated in the environment. Due to wide variation of chemical properties of pesticides, a single strain may not be versatile. Hence, identification of bioremediation ability of various bacteria is important. This review focused on understanding and explaining the role of soil bacteria having pesticide detoxification ability. Previous research articles, book chapters and literature on bioremediation ability of different soil bacteria were reviewed and various strains of soil bacteria having bioremediation ability, mechanisms behind microbial bioremediation, factors affecting bioremediation and limitations and recent advancements of bioremediation were identified. Based on identified research gaps, further perspectives were introduced. The results revealed that plenty of soil bacteria having a bioremediation potential have been identified worldwide. As the major mechanism of bioremediation, the microorganisms consume pesticide contaminated in the soil as their energy or nutrient sources. Various factors such as Bioavailability, Substrate and Environmental factors effect on bioremediation potential. Biostimulation, Bioaugmentation, Biopiling, Composting, Bioreactors and Land farming are identified as popular bioremediation methods suitable for the bioremediation of pesticide contaminants. However, this technique still remains partially developed due to the lack of versatile microorganisms for detoxifying variety of different pesticides. As this is still a developing area, conducting further researches is timely important. Hence, reviewing literature and identifying already covered areas are important in mitigating the research gap. Therefore, focusing further research goals for the researchers is greatly helpful.

About the Journal

The Journal of Agricultural Sciences - Sri Lanka

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Conference Proceedings

DNR

Initial success of captive breeding and larval rearing of endemic fresh water food fish Systomus spilurus (Günther, 1868) in Sri Lanka

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Abstract

Systomus spilurus (olive barb or "Mas Pethiya") is a freshwater fish endemic to Sri Lanka, distributed in the south western, Mahaweli, dry and transitional ichthyological zones. It is a popular food fish across the country, reaching an average size of 600 g and included in the group of minor cyprinids in fishery subsector reports. With the local perception as a nutritive fish Species it has a considerable harvesting pressure on its existing stocks, leading to possible population declines. Hence, stock enhancement via captive breeding programs is necessary while no previous efforts are made in this regard. Therefore, the present study aimed at developing captive breeding and larval rearing protocols for *S. spilurus*. at the National Aquaculture Development Authority of Sri Lanka, Aquaculture Development Center, Dambulla. (7.8726˚ N, 80.6299˚ E). Wild caught *S. spilurus* was acclimatized in 6 x 4 x 0.5 m tanks in a flow through system. During acclimatization, adaptation and behavioral changes were observed in the morning and evening. Natural feeds were supplied first and gradually replaced with formulated diets (38% Crude Protein) fed at 2-3% of the body weight. With the onset of rains, the stage of maturity of both the males and females was examined, and the water quality parameters were recorded. Matured adults were selected, a commercial hormonal mixture was administered and then introduced into a 3m x 1.5m x 0.45m cement tank with coconut leaves as substrate, at 1:2 female/male ratio. Brooders were removed after laying completed, and embryonic development was photographically recorded. Our results provide first evidence of successful captive breeding of *S. spilurus* using sGnRH and domperidone, at the rate of 0.4 mg/Kg for females and 0.2 mg/kg for males. It further provides a larval rearing protocol for successful nursing of their larvae, where first feeding was done for 60 hours post hatch free swimming larvae using blended chicken egg mixture and continued for five days, followed by *Artemia nauplii* for another five days. Post larvae were then stocked in a 3m × 1.5m cement tank at water depth of 0.2m and were fed with daphnia, followed by formulated powered fish feed containing 38% of Crude Protein for 12 days, while monitoring the water quality parameters. Present results suggest a possible application of captive breeding and larval rearing of S. spilurus for conservation as well as commercial purposes.

About the Conference

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