Oral Presentation

by

Students

CNBO-1

Lead Ion Selective Electrode for Environmentally Green Chemical Processes

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Abstract

The Ion selective electrodes are one of the most extensively used analytical tools in recent past. Reason for this can be attributed to low investment and operational costs, rapid speed of analysis, good accuracy and sensitivity. No sample preparations are needed and the electrode can successfully function in coloured and viscous samples. They can easily be miniaturized for on line continuous analysis of water samples. Ion selective electrodes find many applications in the field of industry, environment monitoring, biological and clinical chemistry and many more related areas. The fabrication of chemical sensors using polymer matrices offer unexplored possibilities in the field of environmental pollution abatement to remove hazardous species like mercury, lead and cadmium. The main objective is to develop polymer membranes with good absorption properties for metal ions, which are further used for fabrication of Ion selective electrodes. Method of using chelating polymer matrices is a green analytical method as it does not involve the use of toxic chlorinated organic solvents, which are used in conventional techniques like liquid-liquid extraction and other analytical techniques. Our aim is to develop degradable material so as to make the process electrochemically green. An organic membrane sensor was fabricated using Styrene-Acrylonitrile (S/A) copolymer as an electro active phase. Preliminary investigation with the membrane exhibits promising selectivity for lead (II) ion and the same can be estimated in the concentration range of $1x10^{-6}$-1 $x10^{-8}$ M at pH 4-7. The potentials generated across the membrane are reproducible and the response time is less than a minute. The electrode works well even in a partially non aqueous medium. The effect of surfactant and detergent on the working of Pb (II) selective electrode was also studied. It was found that potential remains unchanged even in the presence of appreciable amount of surfactant while it changes with increase in concentration of detergent. It was used as an indicator electrode in the potentiometric titration of Pb (II) ion with sulphuric acid. Estimation of metal ions in the polluted water of a local river can be successfully achieved with this membrane. As a result our fabricated electrode offers an excellent example of successful application of green and sustainable chemistry by reducing toxic chemicals.

Key Words: Styrene-Acrylonitrile, copolymer, lead, Ion selective electrode, potential, membrane, sensor

CNBO-2

Screening of Soil Actinomycetes for Antimicrobial Compounds

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Abstract

Microbial pathogens are developing resistance against existing antibiotics. There is an urgent need to discover and develop new therapeutic compounds with unique modes of action. Actinomycetes account for 70-80% of secondary metabolites available commercially. In an attempt to discover novel antimicrobial compounds from soil, actinomycetes were isolated from diverse ecological habitats. Isolates were screened for antimicrobial activity against five pathogenic microorganisms: *Staphylococcus aureus*, *Bacillus cereus*, *Escherichia coli*, *Candida albicans* and *Fusarium oxysporum*. Primary screening of strains was performed to estimate the hit rates by rapidly screening a large number of samples and provided sufficient data to initiate the subsequent secondary screening program. Ten actinomycetes showing substantial antibacterial activity and representing different ecological habitats were selected for further studies. Bioactive compounds were extracted from culture broth using ethyl acetate extraction method and concentrated to a powdered form. Known concentrations of the compounds were prepared and subjected to secondary screening methods. Screening method was extended to determine the minimum inhibitory concentrations (MICs). Spectrophotometric analyses of the samples were performed to determine their tentative chemical nature. An accurate estimation of the chemical moiety/moieties present in the compounds is currently being made by using thin layer chromatography (TLC). The results of the studies will be presented later.

Key Words: **A**ctinomycetes, antimicrobial compounds, primary screening, secondary screening, minimum inhibitory concentration, spectrophotometric analyses, thin layer chromatography

CNBO-3

A Laboratory Study on the Larvicidal Efficiency of Ethanolic and Petroleum Ether Extracts of Three Peppercorns Against an Indian strain of Dengue Fever Mosquito, *Aedes aegypti* L. (Diptera: Culicidae)

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Abstract

The various measures for the control of the mosquitoes have almost failed posing serious threat to human beings. Chemical control; though the most popular, quick and immediate method of control; imposes adverse effects on the environment, non-target population and the human beings. Further, the development of resistance to these chemicals has limited their use leading to recurrent disease control failures and the resurgence of mosquito-borne diseases. This forced us to explore alternate, simple, safe, inexpensive and sustainable ways of mosquito control which offer adequate levels of mosquito control and pose fewer hazards. Keeping this in view, the present study was performed with the phytochemicals extracted from plants having an advantage of being effective, economical, environmental friendly, safe to the natural enemies, harmless to non-target organisms and possessing limited chances of development of resistance. Present investigation employs the dried peppercorns of the three varieties of the pepper plant (Family: Piperaceae); Long pepper, *Piper longum* L., Black pepper, *P. nigrum,* and White pepper*, P. nigrum*. The peppercorns were powdered and soaked in ethanol and petroleum ether for 96 hours. The extracts were separated and concentrated to dryness at 60 °C with the help of rotary evaporator. These extracts were evaluated for efficacy against early IV instar larvae of *Aedes aegypti* mosquitoes using larvicidal bioassays following WHO protocols. The ethanolic extracts were found to be highly effective against *Ae. aegypti* exhibiting excellent larvicidal potential. The highest larvicidal efficiency was established from the ethanolic extracts of *P. longum*, followed by White *P. nigrum* and Black *P. nigrum*, with LC_{50} values of 0.248, 0.356, and 0.405 ppm, respectively and LC_{90} values of 0.605, 0.758 and 0.801 ppm, respectively. On the other hand, the petroleum ether extracts of all the three peppercorns did not exhibit significant larvicidal activity. The components in both the extracts were identified and compared to recognize the component possessing larvicidal potential against *Ae. aegypti* larvae. Observations of morphological alterations on treated IV instar larvae under light microscopy revealed that most organs, except anal papillae, had a normal structural appearance that was similar to controls. The structural deformation of anal papillae probably led to their dysfunction, which may be intrinsically associated with the death of the larvae. The inert granules/tablets containing the larvicidal pepper extracts are being formulated and experimented for use in the fields. This study affords some evidence regarding the action site of the pepper extracts and suggests their potential in developing new types of larvicides used for mosquito control.

Key Words: *Aedes aegypti*, larvicide, pepper, ethanol, petroleum ether, extract, anal papillae

CNBO-4

Fabrication of Polyaniline Nanostructures on Glass Substrate

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Abstract

The world of nanotechnology, the realm of atoms and nanostructures, is a world so small that cannot be seen even with a light microscope. Nanotechnology deals with anything measuring between 1 to 100nm. At the atomic scale, elements are at their most basic level. On the nanoscale, we can potentially put these atoms together to make almost anything. Nanoparticles and nanomaterials have unique mechanical, electronic, magnetic, optical, and chemical properties (change in melting points due to increase in surface area), opening the door to enormous new possibilities of engineered nanostructures and integrated nanodevice designs. Examples include high-density data storage, molecular electronics, quantum dots and spintronics. In this project, micro- and nanostructures of doped polyaniline are grown directly on a ground glass surface. An *in-situ* vapor phase chemical oxidative polymerization directed by the oxidant, which has been pre-deposited on the ground glass surface, is used to obtain the micro/nano structures. The morphology of these structures is studied using optical microscopy and field emission scanning electron microscopy. Formation of different types of one-dimensional nanostructures like tubules, fibers, wires and even ribbon-like structures is indicated. The structures obtained have wide range of size distributions and different geometries.

Key Words: Nanoscale, polyaniline, spintronics, nanodevices, optical microscopy, scanning microscopy

CNBO-5

Triglyceride based Waterborne Polyesteramide

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Abstract

Green chemistry and clean technology revolution has provided an alternate mode for the scientists and industrialists to develop polymers for clean environment. Not only water-borne and hyper-branched polymers but also green technologies like UV/EB curable, microwave assisted synthesis play a vital role towards this end. In present work, triglyceride-based water-borne polyesteramide [TWBP] was synthesized by simple route through microwave irradiation. The resin was synthesized in situ directly from triglyceride. The chemical reactions which involve in the conversion of triglyceride to TWBP are amination followed by condensation. Structure of the polymer was established by FTIR, ^{1}H-NMR and ^{13}C-NMR spectral techniques. Solubility tests showed that the resin was soluble in polar and non polar solvents. Thermal stability of the resin was determined by TGA. The studies revealed that TWBP can be used in the formulation of "green coatings" exhibiting superior film properties with low/no emission of hazardous volatile organic compounds.

Key Words: Polymers, polyesteramide, triglyceride, resin, microwave irradiation