KEYNOTE LECTURES
A New Class of Therapeutics; Sulfur Amino Acid-Taurine & Analogues in Human Welfare

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Abstract:
Taurine (Amino Ethane Sulfonic Acid) was discovered more than two hundred years ago from animal sources. It is distributed in both mammals and non-mammals and its content is high in several tissues. For more than a century and a half, taurine was regarded just as an end product of sulfur metabolism. Recently, taurine has been rediscovered and its beneficial effects in processes like epilepsy, hypertension, congestive heart failure and diabetes has been well documented. It was patented and found some clinical utility but being an amino acid, therapeutic use confronts limitations like restricted permeability and more. This necessitates the development of pro-Drugs (analogues) mainly derivatives of taurine exploiting the methylene chain, functional group amino as well sulfonic. A number of route and paths have been used to incorporate amino moiety in heterocycles resulting Quinazolones, Imidazoles and several others in the similar fashion sulfonic group has been incorporated in sulfone, sulfonamide and others. A large number of taurine derivatives have been reported in the literature with partial to marked activity. Taurine derivatives like taltarimide, acomposite and tauromustine, are already in the market as anticonvulsant, anti-alcoholic and anti cancer agents. Many other analogues are effective in experimental models. The in-depth analysis of these analogues and their biological actions can provide certain clues for further consideration. In the presentation attempts have been made to provide synopsis, synthesis and symbiosis of chemical and biological actions, which may provide future guidance and facilitate further research in this area. The successful journey of these heterocycles to clinical utility is a healthy and happy sign and an index of bright future in alleviating such suffering.

Skeletal Fluorosis in People of Thar Desert: Ignorance or Environmental Dilemma

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Abstract:
A vast majority of people of ‘Thar Desert’ is affected by dental/skeletal fluorosis that is a bone disease caused by excessive consumption of fluoride. In advanced cases, skeletal fluorosis causes pain and damage to bones and joints. In fact, the fluoride ion demonstrates versatile nature, as its concentration in optimum dose (0.5 to 1.0 mg L$^{-1}$) in drinking water is beneficial to health and excess concentration (> 1.0 mg L$^{-1}$) causes serious health effects on human being. Normally, the fluoride exposure in the environment and human body has been observed through water, food, industrial effluents, drugs, cosmetics etc. However, drinking water is the major source of daily intake of fluoride. The long–term intake of excess of fluoride through food and beverages may be one of the causes of dental and skeletal fluorosis. Ground water is the major source of drinking
water in rural areas of Pakistan and in some parts of the country especially ‘Thar Desert’ area, where the ground water is contaminated with excess of fluoride ion (> 1.5 mg L$^{-1}$), which is a great concern to the public health. Herein, the latest survey of ‘Thar Desert’ and water quality analysis reports along with remedial endeavors taken by some researchers and well wishers will be discussed in detail.

**Novel Cleanup Process for the Petroleum Contaminated Soil**

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**Abstract:**

Crude oil contaminated sites are considered as serious environmental issue throughout the world. Current research has been carried out to explore the potential of plant derived natural surfactants (saponins) for the cleanup of crude oil contaminated soil. The process of soil washing was designed and optimized using statistical modulation. Concentration of saponin along with pH, temperature and agitation speed was optimized for the maximum removal of petroleum from the self contaminated soil. Our results indicate that under optimized conditions saponin is successful to recover 86 % of the crude oil from the contaminated soil. Therefore, we strongly recommend the application of the natural plant based surfactants for the removal of hydrocarbons contamination from the soil.

**Extraction, Characterization and Application of Coal-derived Humic Substances as Soil Conditioner**

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**Abstract:**

Indigenous coal samples of four different regions (Lakhr a, Thar, Badin and Balochistan) were characterized for proximate analysis, ultimate analysis, heating value and point of zero charge using standard methods. The amounts of total humic acid and free humic acid were estimated by titration method. The yield of total humic acid was ranged from 31.21 – 53.40 % and free humic acid was ranged from 29.40 – 51.34 %. The humic substances were extracted using alkaline extraction after optimization of different parameters. The yield of humic substances estimated was economically insufficient for exploitation. Pretreatment of the samples with nitric acid has been performed to improve the yield significantly. Humic materials were characterized by chemical analyses (water content, ash, fulvic acid, and carboxylic acid), and UV-Visible spectroscopy (degree of humification). The properties of the isolated humic acids were compared with the properties of humic acids prepared from other coals of the world. Coal-derived humic substances were applied on agricultural soil to assess the potential for the improvement in water holding capacity of soil. Significant differences (P < 0.05) in water retention capacity between the treated soil and control were observed. Statistics was applied to study the significant correlations between the quality parameter of coal and humic substances.
Analytical Chemistry and Automation

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Abstract:

Analytical chemistry may be considered the general approach to the study of materials whose properties we wish to investigate and understand, and it is of little consequence which methods we use to attain our end. Today's analytical chemistry is a co-ordination of chemical analysis with physical, biological and statistical methods to describe the relationship between analytical chemistry and automation is at the same time to describe the present position of both these fields, each of which strongly influences the other. Automation is concerned with the use of systems in which at least a part of the human power of decision is eliminated—by a combination of mechanization and instrumentation. Automation consists of multiple things but in general results from a desire to speed things up so that more analyses can be done per day. Basically, automation is an attempt to gain more time, or at least get better use out of what little we seem to have. The use of automation in routine analysis has become popular in medical, industrial and academic laboratories. In industrial process automated process are used to control one or more variables in the industrial process. By automating the routine analysis, the analyst is free to devote time to the unusual analysis, which requires human flexibility and initiative.


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Abstract:

The possibility of preparing interlocked molecules was probably suggested as early as the beginning of 1900 century by Willstätter but it was not until 1960 that these molecules of complex architecture (i.e., catenanes, rotaxanes and knots) have steadily moved from the realm of scientific curiosity into more practical world of supramolecular chemistry and became the subject of scientific inquiry.

From last two decades catenanes aroused great interest for their structural and dynamical properties. Their most fascinating feature is rather large freedom for motions of their sub units, which shuttle and rotate relative to each other without breaking covalent bond and can be positioned in their location and orientation through the influence of external stimuli. We are interested to learn how this mobility will affect the material properties, if this [2]catenane is a unit of a polymeric chain. We have synthesized large rings and its catenanes.
Nanostructured Materials Using Metal Nanoparticles as Building Blocks – From Synthesis to Applications

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Abstract:

Nanostructured materials have recently been recognized as an important class of materials whose properties can be tuned by controlling their nanoscale features. Among various other techniques, the controlled assembly of nanomaterials is an attractive and a powerful approach to design and fabricate nanostructured materials with potential applications in various disciplines. We have reported several simple and reproducible protocols to prepare fairly size-controlled metal nanoparticles in the range of ca. 1-100 nm, using various reductants/stabilizers in aqueous/organic media with a fair control over their size, shape, dispersity and surface chemistry. We have then demonstrated the use of these metal nanoparticles, especially gold, as building blocks to design/synthesize new nanostructured materials such as composite thin films, porous metal foams, inorganic oxide – metal nanoparticle hierarchically porous composites, nanowires, porous microwires, porous nanoballs, nanochains, and nanoscale circuit patterns etc., which have potential applications in sensing, catalysis, forensic science, antimicrobial products development, and environmental remediation etc. Recently we are also focusing more on subnanometer metal clusters and their applications in solar/fuel cells, sensing, bio-imaging, drug delivery and catalysis in collaboration with various national/international counterparts. This talk would thus be an overview of our research activities on the synthesis of new nanostructured materials with diverse applications.

Climate Change and Food Security-Yield and Quality Responses of Carrot, Radish and Turnip to Elevated Atmospheric Carbon Dioxide

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Abstract:

Future concentration of carbon dioxide in the atmosphere is very important from economic and environmental point of view, but its effect on the nutritional and chemical quality characteristics of root vegetables is still unclear. In the present study the impact of elevated CO$_2$ (1000/400 µmol mol$^{-1}$) was studied on yield and chemical quality characteristics of three root vegetables, carrot (Daucus carota cv. T-1-111), radish (Raphanus sativus cv. Mino) and turnip (Brassica rapa cv. Grabe). The yield of carrot, radish and turnip increased by 69, 139 and 72% respectively when grown under elevated CO$_2$ conditions. Among the proximate composition, protein, vitamin C and fat contents were decreased significantly for all the three root vegetables while sugars and fibers were increased. Response of vegetables to elevated CO$_2$ in terms of elemental composition was different for the vegetables with decrease in many important minerals.
Elevated CO$_2$ decreased most of the fatty acids especially essential fatty acids in root vegetables. Most amino acids were also decreased by elevated CO$_2$. It was observed that elevated CO$_2$ increased the yield of root vegetables but many important nutritional parameters including protein, vitamin C, minerals, essential fatty acids and amino acids were decreased in these vegetables.

Effect of Inoculation of Hydrocarbon-Degrading and/or Plant-Growth Promoting Bacteria on Phytoremediation of Diesel Contaminated Soil

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Abstract:

Bacterial-assisted phytoremediation has great potential for the remediation of soil polluted with petroleum hydrocarbons. Inoculation of plants with pollutant-degrading and/or plant growth promoting bacteria is one of the options to improve phytoremediation process. The aim of this study was to assess whether inoculation with different bacterial strains, possessing hydrocarbon-degrading and/or plant growth-promoting activities, affects plant growth and hydrocarbon degradation. Carpet grass (Axonopus affins) and maize (Zea mays) were vegetated in diesel contaminated soil and inoculated with different rhizo- and endophytic bacterial strains, Pseudomonas sp. ITR53, Pseudomonas sp. MixRI75, Pseudomonas sp. ITRH25, Pantoea sp. BTRH79, Burkholderia phytofirmans, PsJN, individually as well as in combination. Data analysis revealed that bacterial inoculation enhanced plant growth and hydrocarbon degradation, however, strains possessing hydrocarbon degradation and/or plant growth promoting activities performed differently. Maximum plant growth and hydrocarbon degradation was observed by inoculating plants with consortium of five strains and was correlated with bacterial persistence in the rhizosphere of both plants. Between two tested plants, more hydrocarbon degradation was observed by the carpet grass than maize plant, with and without bacterial inoculation. This study revealed that inoculation of plants with mixture of different strains, possessing different beneficial characteristics, is a more suitable approach for the remediation of hydrocarbon contaminated soil, however, compatibility between different bacterial strains should be considered.