

# Training on “Hands on Advanced Instruments of water Quality testing”



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## **Training Report on “Hands on Advanced Instruments of water Quality testing”**

The undersigned was nominated to attend the training programme on “Hands on Advanced Instruments of water Quality testing” during 2 - 6<sup>th</sup> December 2013 organized by Environmental Hydrology division, National Institute of Hydrology, Roorkee. The programme was sponsored by Ministry of Water resources, Govt of India.

Scientific staff from various organizations such as NIH, IITR, JNU delivered lectures and hands on training on advanced instruments. The training programme threw light on overview of the water quality testing and monitoring instruments to have full knowledge of the latest advancements taken place in analytical instrumentation with focus on concepts and practices.

The programme started with registration on 2<sup>nd</sup> December 2013 at 9.30 am followed by inauguration by Er. R.D. Singh, Director, National institute of hydrology, Roorkee. On the first day, Dr. C.K Jain delivered the lecture on Water Quality Monitoring Programme which involved water quality problems in India, sampling procedures involved during monitoring, water quality characterization and Issues and ground water contaminants, classification of water bodies etc.

Prof Sanjay K Jain from NIH, Roorkee delivered lecture on applications of Remote sensing and GIS in water Quality studies which included resolution in remote sensing, Concept of Image, Digital Terrain Models, estimation of rainfall distribution, various techniques of remote sensing as tools in monitoring of water quality advantages and limitations of remote sensing approach.

Dr. Dutta from Department of Chemistry, IIT Roorkee, delivered the lecture on Atomic Absorption Spectroscopy. He explained about the need and concept of elemental analysis by Atomic absorption method. He also discussed about ICP-MS instrumentation and principle, methodology followed, advantages and disadvantages of ICP-MS. He

briefed about mass analyzers for ICP-MS along with sample collection, preparation and analysis. Typical application areas for ICP-MS and ICP-OES was explained.

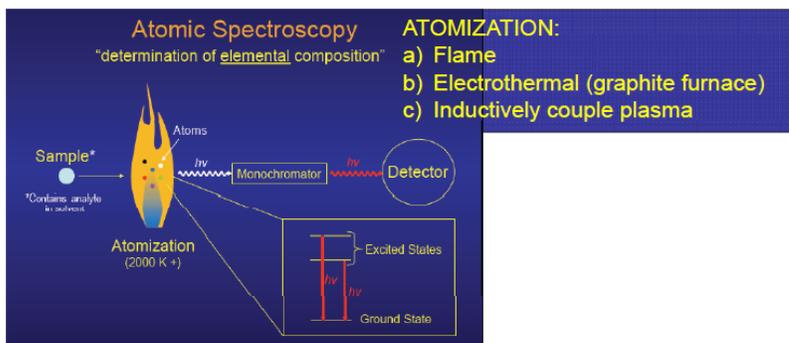
On second day dated 3<sup>rd</sup> December 2013, Er. R.D. Singh, Director, NIH, Roorkee, delivered the lecture on the “Status and Strategies for Management of Water Resources in India” which highlighted India’s water demands for various uses, sources of water pollution, major water quality issues in India, water supply and sewage disposal status in class I cities, waste water generation and treatment in class II towns of India; River Action Plans. He also discussed about the policies, laws adopted for water quality management, Impact of climate on water quality and important issues concerned with water resources management.

Laboratory session was arranged by Dr. M.K. Sharma from NIH, Roorkee on AAS.

## Atomic absorption spectroscopy (AAS)

The technique of AAS consists of two steps:

- a) conversion of an analyte molecule into its gas-phase atoms (atomization),
- b) subsequent absorption of radiation by these free atoms.

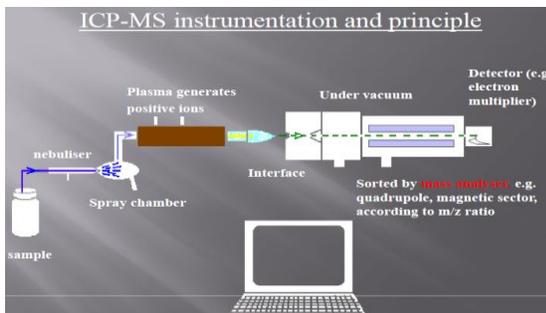


### AAS

and then we moved on to **Central Building Research Institute** where a laboratory session was arranged on principle and operation of ICP-OES.



**ICP-OES**

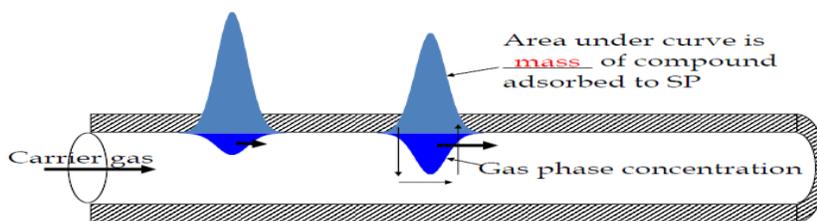


**ICP-MS**

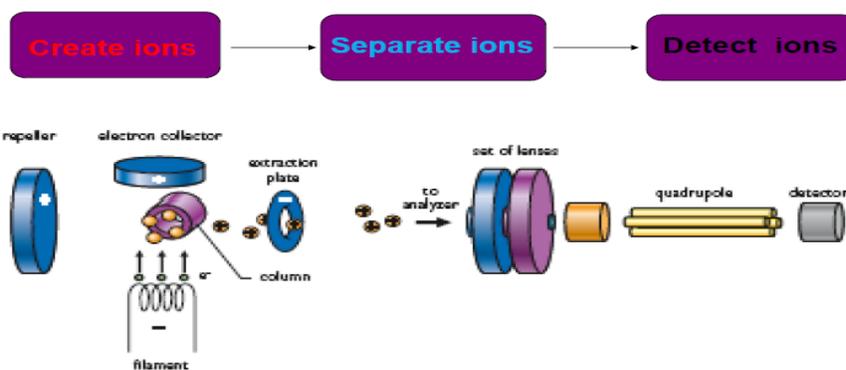
We again returned to NIH to attend the laboratory session on water sample analysis for Pesticides in GC. They discussed about the sampling, principle of GC, solvent preference, steps involved in pesticide analysis, different detectors used in GC and their function and calculation.

**Theory of Operation**

- Velocity of a compound through the column depends upon affinity for the stationary phase



**How does a mass spectrometer work?**



**GC column and working principle of Mass spectrometer**

On third day dated 4<sup>th</sup> December 2013, we visited IC lab at NIH, Roorkee. They were using IC of DIONEX Model that could analyze Anion and Cations simultaneously with two columns installed in it. The official incharge explained about the principle and operation of Anion and Cation analysis. They discussed about the Chromeleon software used in IC. We prepared the sample and kept for analysis of both the ions. IC staff explained about the importance of suppressor and detectors in IC.



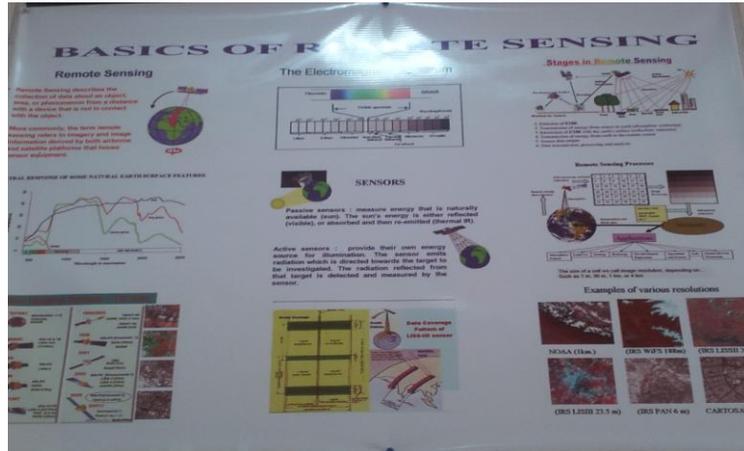
### **Ion Chromatography**

Next we moved on to Nuclear Hydrology Laboratory at NIH, Roorkee. Dr. M. Someshwar Rao explained about the instruments involved, application of isotopes in hydrology and water resources and water quality assessment.

A lecture was arranged on GC-MS on the same day by Prof. Naseem Ahmed from Dept of Chemistry, IIT, Roorkee. The lecture highlighted on classification of chromatography method, principle involved, components of GC, theory of Operation, different detectors involved and their uses advantages and limitations of GC-MS. He also focused on the importance of FID detector for organic compounds detection. Uses of mass Spectrometry in GC, working principle of it were also discussed.

On the fourth day dated 5<sup>th</sup> December 2013, field visit was arranged to STP, Haridwar. Staff explained about the treatment plant, its efficiency, inlet, outlet BOD and COD values, treated water usage etc.

On fifth day dated 6<sup>th</sup> December 2013, we visited GIS and remote sensing Lab in the morning and Dr. Sanjay K. Jain explained about the applications of remote sensing and GIS in water Quality studies. He also discussed about study area selection from Toposheet, Geo referencing, Image processing and Classification, different softwares available for GIS.



### Remote sensing

Next we moved on to Continuous flow Isotope Ratio Mass Spectrometer with elemental Analyzer Lab at NIH, Roorkee. Scientist working on it explained about the working principle and uses of it in hydrology, soil science, environment and geology, measurement of radio isotopes.

Dr. Sudhir Kumar from NIH, Roorkee, delivered the lecture on “Application of Nuclear Techniques for Water Quality Assessment”. He gave information on classification of Isotopes, Isotopes used in hydrology, isotope effects in precipitation, applications in surface water, GW hydrology, Water Quality Assessment, Agricultural watersheds, site identification for hazardous waste facilities.

There was a last lecture on uncertainty measurement and its incorporation in water quality by Dr. Dinesh Mohan from School of Environmental Sciences, JNU. He spoke about Good Laboratory practice, importance of documentation in Government and industry that serve as legal documents. He discussed about NABL and measurement of uncertainty, difference between error and uncertainty, the ISO guide to the expression of

uncertainty in measurement, types of uncertainties and some basic statistical methods for uncertainty evaluation.

There was valedictory function at the end of training programme in presence of Organizer Dr. C.K Jain NIH, Director Er. R.D. Singh and Sc 'C' Dr. M.K. Sharma from NIH Roorkee. Certificates were issued by Er. R.D. Singh and the Session ended with Vote of thanks by Dr. M.K. Sharma.

Logistics: The logistics arranged by the Training Institute were of good quality and satisfactory.

Utilisation of knowledge gained in training Programme: By attending the training programme we are able to learn operation and maintenance of the advanced Instruments used in laboratory purposes that helps in discharging day to day official activities more efficiently.

(B.S.ANUPAMA)