

Utilizing Powder XRD Technique to Analyze Polluted Soil

Ashish Chauhan^{1*} and Bharti Mittu²

¹Small and Medium Pharmaceutical Industry Centre (SMPIC), Mohali, Punjab, India

²Central Instrumentation Department, NIPER, Mohali, Punjab, India

*Corresponding author: Ashish Chauhan, Small and Medium Pharmaceutical Industry Centre (SMPIC), Mohali, Punjab, India, Tel: +918665802345; E-mail: aashishchauhan26@gmail.com

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Editorial

Soil is an indispensable resource of the earth ecosystem. It is an amalgamation of organic matters, minerals, gases, liquids and organisms that supports life. Soil acts as a medium for the plants growth, a habitat for soil organisms, a recycling system for nutrients and organic matter and a regulator for water that plays a vital role in balancing the ecosystem.

Due to increase in the rate of consumption of resources with the radical increase in population, urbanization, large-scale industrialization, consumerism, industrial effluents are continuously discharged in wastewater. Owing to it, all the natural resources are in danger and polluted. The use of chemical pesticides, fertilizers, chemicals and pharmaceutical effluent has spoiled the soil to meet its dead end. The most lethal pollutants are bioactive chemicals causing creeping death.

There are various analytical techniques for the analysis of soil to evaluate the properties and its nutrient value. Some of the test are soil moisture content, soil pH, electrical conductivity, organic matter (loss of ignition to estimate organic matter in non-calcareous soil), light fraction, water soluble organic carbon, microbial biomass C&N, available ammonium nitrate and nitrite by colorimetry, cations exchange capacity (CEC), exchangeable sodium percentage, sodium adsorption ratio, exchangeable cations by Atomic Absorption Spectrometry, texture analysis by hydrometer, Carbon, Nitrogen and Sulphur content by elemental analyzer, anion by ion chromatography [1,2].

The drastic changes and advancement in the science and technology has developed various sophisticated analytical techniques to characterize the soil. Recently, many new techniques have been reported to access the soil. Some of these techniques are TG-IR (a combination of Thermogravimetric Analyzer and Infra Red Spectroscopy), Ultra Pressure Liquid Chromatography (UPLC), Fourier Transformer Infra Red Spectroscopy (FTIR) and Inductive Couple Plasma Mass Spectroscopy (ICP-MS) etc.

Powder XRD technique is a versatile technique that has immense applications. It is the prime instrument for the solid state

characterization and soil mineralogical analysis. It is a tool for the identification of minerals in rocks and soils. Clay fraction of many soils is crystalline. Its usefulness extends to coarse soil fractions as well. Due to pollution the soil properties such as mineralogical and chemical compositions, texture, arrangement of particles get altered. Immobilization of soil contaminants can be screened by XRD. X-ray diffraction pattern of a pure substance is like a fingerprint of substance. No two minerals have same spacing of inter atomic planes so the angle at which diffraction occurs can be used for its identification. A comparative study of the standard diffraction pattern of the soil with the test pattern can elucidate the difference.

XRD is the simple, easy, less time consuming means to evaluate the soil for its contamination. By the comparisons of the peaks intensity and peak positions the qualitative and quantitative analysis can be done. The technique has wide scope that remains unearthed for its use in soil characterization [3-6].

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