QUALITY MONITORING BY PHYTOREMEDIATION OF AGRICULTURAL SOILS USING A MATHEMATIC MODEL

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Abstract: *The mathematical model presented highlights those features of the object of modeling which, on the one hand, informational, and on the other hand, accept mathematical formalization. To determine the specific mathematical model monitoring, the application manages measured data, obtained parameters and its structure. Determination of structure and parameters of nonlinear models generally can be done interactive. Developed mathematical models specific of monitoring will be called in the process of determining the optimal decision. The application takes the limits concerning land evaluation standards. Outputs will be measured and graphically display through model results and their difference also.*

Key words: *mathematic model, phytoremediation, nonlinear parameter*

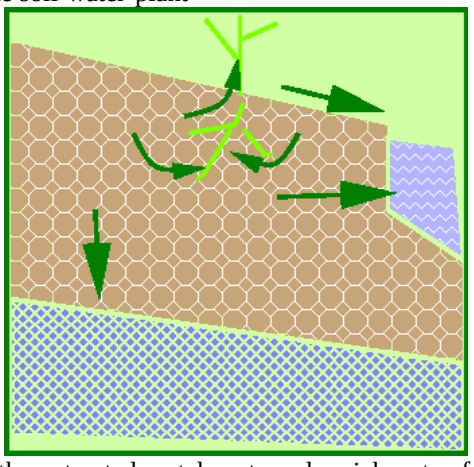
MATHEMATICAL MODELING IN PHYTOREMEDIATION

Phytoremediation is a remediation technology of contaminated soils with the help of plants.

Mainly rely on the ability of plants to extract metals from aqueous environment of the soil through the roots.

Develop a mathematical model of phytoremediation technologies used in design should take into account and limit the dominant processes involved in the transfer of metals from soil to plant roots.

The purpose is to calculate amounts of metal removed from the soil by the plant. Movement of metals in the soil-water-plant



Plants can store the extracted metal roots and aerial parts of the plant can be released into the atmosphere in the process of sweating.

Metals involves the movement of water to groundwater and surface waters. Some of the pollutants are taken by plant roots.

Of the solid pollutants can pass into the fluid phase, the desorption of the fluid phase metals are fixed in the solid phase absorption.

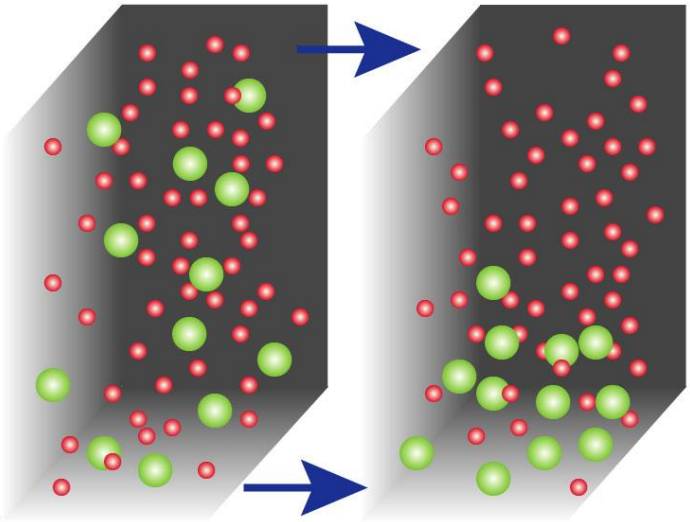
The ground-water-pollution-roots

The ground-water-pollution-roots is modeled as a continuous medium composed of a solid phase and fluid phase.

Fluid phase is solution of water-soluble forms of the metal and particulate matter. The solid phase comprises solid particles which are in contact.

The structure of the solid phase is such that there is a vacuum, the pore space that can be occupied by the fluid phase and the roots of the plants.

Plant roots with the solid phase are generally considered property.



Development of a local micro-scale model is no practical use for at least two reasons:

– spatial configuration and processes can not be determined, and

– number and configuration variables make it impossible to solve complex spatial, numerical and analytical system of equations.

Under these conditions the models used are mediated models.

Through mediation any physical quantity attached to a phase is defined at any point in space. In this way we have a new concept porous medium whose state is described by a set of physical size and chemical properties.

Basic equations governing the time evolution of the state quantities The extraction of metals from soil with the help of the plants is mediated by the presence of water in the pore space.

From the solid metals are released into the fluid phase.

Of all the chemical species of the metal present in the fluid phase is available only part of the plant.

Available fractions are taken roots with aqueous taking this process is called passive transport.

There are situations when taking stimulates plant available fractions, this process is called active transport.

This fungus on plant roots can affect the amount of metal taken from the plants. Fluid phase is a mixture of immiscible fluids, fluid phase components are soluble species of metal / metal contaminants.

The components of mixture may be subject to phase transformation, a phase state is measured by the concentration in the aqueous phase.

Concentration of phase change due to processes:

– convection and diffusion;

– absorption-desorption,

– changes within the aqueous solution;

– taking phase of the plant roots.

Overall fluid phase is a chemically inert fluid.

Conditions fluid phase is described by pressure phase component mixtures and concentrations.

The solid component contains contaminating metals, in contact with water they are released into the fluid phase.

Status of this phase is measured by the volume occupied in the porous metal concentrations content.

Plant roots form the porous component that takes some of the existing metals in the fluid phase.

Root-liquid medium interface is treated as permeable membrane such that the surface area of contact is an important feature of the distribution of the roots in the system.

Status of this component is described by a distribution function in the porous roots.

For the different methods of determining the components of the ground different results are obtained depending on the solubility of the extraction solvent chosen.

The soil is an environmentally important factor because:

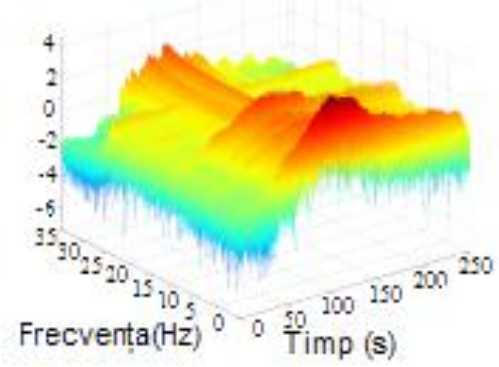
– is closely correlated with the climate of a region through configuration, the nature and structure of;

– its quality depends on the formation and protection of sources of groundwater and surface water;

– determine vegetation growth and development, thus influencing indirectly the human diet, and

– has a decisive role in the settlement pattern, ensuring optimal construction of housing, social and economic development of human settlements.

Contaminated soils in the vicinity of pollution sources. As the height of the exhaust stacks polluting increase contamination of land adjacent to the source of pollution decreases as the level of contamination, but the region will expand contaminated surface.



The soil contamination depends on rainfall.

They wash pollutants atmosphere and deposited them on the ground, but also wash and soil pollutants circulation helping to envoys; rains favor and depth of soil contamination. Like air and water, soil is an environmental factor with great influence on health.

The soil is closely correlated with the geographical position of the region, both through configuration, the nature and the structure. The quality of the soil depends on the formation and protection of water sources and underground. Increases soil and vegetation development, influencing, directly, human nutrition.

"Soil quality standards as the main purpose demarcation upper limit concentrations of pollutants, limit above which human health can be affected by the balance of ecosystems."

Awareness of important risks through the admissibility threshold set according to quality is the first step in providing pollution.

The Romanian legislation, technical standards for soil protection is confined to the maximum admissible concentrations only some slightly soluble salts and ions some potential for mineralization.

CONCLUSIONS

Soil functions are to provide along with air and water, plant nutrients and rooting medium for growth and physical.

Soil pollution is any adverse change in the physical, chemical or biological, with direct implications on vegetation, animals, or on human health.

Soil is one of the environmental factors which, by function, plays a role in transmitting some epidemiological pathogens.

REFERENCES

1. MICULA - ROTARIU, LIA, Curs de matematică şi statistică economică, vol 1, Ed. Agroprint, 2009

2. MICULA - ROTARIU, LIA, Curs de matematică şi statistică economică, vol 2, Ed. Agroprint, 2009.

3. Horgan, G. W. (June 1998). (1998). "Mathematical morphology for soil image analysis". European Journal of Soil Science 49 (2): 161–173. doi:10.1046/j.1365–2389.1998.00160.x.

4. Mendiola J., Moreno J.M., Roca M., Vergara–Juárez N., Martínez–García M.J., García–Sánchez A., Elvira–Rendueles B., Moreno–Grau S., López–Espín J.J., Ten J., et al. Relationships between heavy metal concentrations in three different body fluids and male reproductive parameters: a pilot study. Environ Health. 2011 Jan 19; 10(1):6. Epub 2011 Jan 19.