

**ANDRÁS MAKÓ - HILDA HERNÁDI**

**PETROLEUM PRODUCTS IN SOILS: RESEARCHES IN  
SOIL PHYSICS  
(BOOK REVIEW)**

Slightly over the second part of the 20<sup>th</sup> centuries, parallel with the development of chemical industry and the spreading and widely use of engines, the pollution of subsurface environment had been turned up as those undesirable but attached attributes. Hazardous materials, such as petroleum products leaked out from the tanks and technological cables, might pollute the ecological systems like soils and groundwater which are essential environmental resources. The former offers the main part of victuals, the latter provide significance proportion of drinking water for the mankind - in Hungary this rate is over 90 per cent.

From the respect of thickness, upland is similar to a thin wax layer on the skin of an apple. Soils in this thin layer, formed as an interfacial zone by the geological, climatic and biological processes and by other factors, are essential for terrestrial life. In this dynamic equilibrium between inorganic and organic word, soils are considerably vulnerable. Soil formation and degradation processes, for example erosion, are continuously act and run nowadays, as well. Shift in soil formation processes, be it ever so small or short, might have significant effect and may change for thousands of years the present condition. To diminish the impacts of degradation processes is particularly important for mankind. We must ensure the protection of soils and their quality, as far as possible. Furthermore, we have to prevent soil from pollution and protect them, in time. Soil fertility is an individual characteristic feature; we could not substitute or replace it with anything else.

In a wider sense, the defence against pollution is an important scope of soil protection. Amongst the organic chemicals, which may contaminate the subsurface environment, petroleum products might cause the main part of soil pollution. Accidental surface release and improper disposal of petroleum products (e.g., jet fuel, refinery wastes, diesel, etc.) and volatile organic solvents are recognized as an increasingly troublesome threat to soils and groundwater.

Understanding the behaviour of these chemicals in the subsurface to limit their interaction, migration and the accumulation processes are indispensable to identify and assess the rate of pollution, and to develop cost-effective methods for remediating polluted sites. This claims interdisciplinary approach. Besides the knowledge of petrogeology, the experimental results of the connected disciplines, such as hydrology, chemistry, mineralogy and microbiology is required.

The hydrocarbon pollutants are present in liquids that are immiscible with water rather than in aqueous phase or adsorbed on solids. Accurate prediction of the movement of non-aqueous phase liquid (NAPL) as a separate phase in vadose and groundwater zones is a prerequisite to the development of simulation models describing the migration and fate of organic contaminants in the subsurface.

The advanced expectations and their contiguous severity in environmental protection and the widely use of petroleum products add increasing importance to the subject of this book, even now. The contents of this book range from topics in basic soil and fluid properties which might affect the migration, transport and degradation of NAPLs in soils, to the measurement and estimation methods of soil water and NAPL retention and conductivity. It deals with measurement of air permeability, as well as degradation processes and it contains a short issue on the recently used transport models, respectively.

The objective of this monograph, with the title "Petroleum products in Soils: Researches in soil physics", is to provide give introspection in soil physical concern of environmental pollution with organic liquids with special regard to petroleum products (Figure 1.). In this book you could familiarized with the environmental respect of soil pollutions caused by NAPLs.



Figure 1. The book sleeve of the monograph

In Chapter 1, after a short presentation about the properties and attributes of petroleum products, the soil and fluid properties and environmental parameters which influence the NAPLs migration and adsorption are summarised. Moreover, subchapters entertain with the main processes that determine their fate and transport in soils.

In Chapter 2 the organic liquid vapour adsorption on soils is presented. Besides, the recently used measurements and the policy of this research field were shown, respectively.

Chapter 3, 4 and 5 deal with various methods to determine the organic liquid retention and conductivity of soils, that may be the most important soil properties as input parameters for organic liquid transport simulation models. In subchapters we could get acquainted with the theoretical and practical experiences in the first measurement and modelling researches as well as the application of the up-to-date technical achievements and their advantages and drawbacks. The authors are focusing on the tools and the scientific background of a quick, exact suitable estimation method for the determination of the above mentioned soil properties. In these days, parallel with the development of simulation models, growing necessity is experienced for these statistical approaches.

This book introduces a number of promising new methods like the application of pedotransfer functions and measured air permeability values in the course of prediction the oil retention or organic liquid conductivity of soils.

Chapter 6 makes ourselves familiar with the main types of soil pollution models. Furthermore, some of them used in home practice are mentioned (MOFAT /MOTRANS and HSSM model).

Last, in Chapter 7 the factors which have influence on chemical and microbiological degradation of NAPLs in soils were summarised. The bioremediation technologies and the application of microorganisms to remove NAPLs from soils is a really promising facility nowadays, as well as in petrol industry and in environmental protection. This chapter deals with the main microbiological degradation processes. Besides, in subchapters you could read about the species, that engage in the degradation of NAPLs and enzyme catalysed processes applied in remediation technologies in case of an oil pollution, respectively.

Microbiological processes by mean of changing the pollutants composition and the microbial produced biosurfactants may affect the physical and chemical properties of soils such as the organic liquid retention and conductivity, as well. Biosurfactants, and their

environmental impact, which are nowadays more and more challenging topics, were also mentioned by the authors.

This monograph is not just a theoretical summary but also contains the experiences in scientific literature and the results of research carrying on over more than two decades, at University of Pannonia. Probably it may kindle the interest of scientists working in this fast improving scientific field of soil physics or in directly or indirectly connected other disciplines. Moreover, adumbrate collected studies of methods in measurement and estimation methods in soil physics. Scientific references might give a sight for the researchers and for enquirers on environmental protection and soil protection, as well.

Last, but not least we want to take this opportunity to present the table of contents of the monograph.

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