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*Book review*

**REFRACTORY ORGANIC SUBSTANCES  
IN THE ENVIRONMENT**

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Lüdemann, M. Spiteller (Eds.)  
Wiley-VCH, Weinheim, ISBN: 3-527-30173-9, 2002, XXXIII+546 pags.

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**Refractory organic substances in the environment**, edited by Wiley-VCH is dedicated to the memory of Dr. Ulrich de Haar, former Secretary of the Senate Commission for Water Research of the Deutsche Forschungsgemeinschaft (DFG), for brilliance, enthusiasm and creativity in all his work.

This book begins with a presentation of the significant progress in isolation and general characterization of refractory organic substances using the ROSIG Priority Program, the analytical methods, mass balance of the isolates, spectroscopic characterization in the UV and Visible range, together with the size-exclusion chromatography.

The first part of the book includes the element determination and its quality control in fractions of refractory organic substances and the corresponding original water samples. There are presented some aspects concerning the flame and graphite atomic absorption spectrometry (FAAS, GF-AAS), inductively coupled plasma mass spectrometry (ICP-MS), inductively coupled plasma isotope dilution mass spectrometry (ICP-ISMS), instrumental neutron activation analysis (INAA), total reflection X-ray fluorescence spectrometry (TXRF).

In the second part are discussed some structural investigations as:

- Heavy metal and halogen interactions with fractions of refractory organic substances separated by size-exclusion chromatography;
- Characterization of refractory organic substances and their metal species by combined analytical procedures;
- Application of nuclear magnetic resonance spectroscopy to structural investigations of refractory organic substances;
- Structural characterization of refractory organic substances by solid-state high-resolution  $^{13}\text{C}$  and  $^{15}\text{N}$  nuclear magnetic resonance;
- Quantification of substructures of refractory substances by means of nuclear magnetic resonance;
- Nuclear magnetic resonance spectroscopy investigations of silylated refractory organic substances;

- Isotopic evidence for the origin and formation of refractory organic substances;
- Analytical pyrolysis of humic substances and dissolved organic matter in water;
- Characterization of refractory organic substances by HPLC/MC;
- UV-VIS spectroscopy and the potential of fluorescent probes;
- Stationary and time-resolved fluorescence for refractory organic substances characterization;
- Structural characterization of refractory organic substances;
- X-ray microscopy studies of refractory organic substances;
- Fractionation of refractory organic substances by electrophoresis;
- Occurrence of amino acids, carbohydrates and low-molecular-weight organic acids in refractory organic substances;
- Serological characterization of refractory organic substances by serotyping;
- Chemical and spectroscopic data of the reference samples – comparison and evaluation.

The third chapter presents the biochemical and biological characterization of some refractory organic substances into a clear and logical order as follows:

- formation, utilization and transformation of some refractory organic substances by aquatic microorganisms;
- effect of microorganisms on the formation and transformation of iodine species of refractory organic substances;
- the influence of refractory organic substances on bacterial colonization and diversity patterns;
- influence of refractory organic substances on enzyme activity in-vivo and DNA damage of aquatic microorganisms;
- effects of dissolved organic matter on the bioconcentration of organic contaminants and on reproduction in aquatic invertebrates.

Some aspects of molecular interactions are presented in chapter 4 and include:

- sorption of dissolved organic matter on soil particles and its dependence on their surface-charge properties;
- dissolved organic carbon in seepage water – production and transformation during soil passage;
- refractory organic substances in aggregated forest soils – retention versus translocation;
- refractory organic substances from organic amendments in soils – formation, translocation and interaction with xenobiotics;
- analysis of the binding of amitrole and anilazine to aquatic and terrestrial refractory organic substances;

- sorption and chemical reactions of polycyclic aromatic hydrocarbons with dissolved refractory organic substances and related model polymers;
- Investigation of the interactions between polycyclic aromatic compounds and refractory organic substances with stationary and time-resolved fluorescence and absorption spectroscopy.

Six years of cross-disciplinary scientific study of the properties of a uniform set of samples of refractory organic substances are summarized in this book and include sources sampled as brown water lake, soil seepage water, ground water, a secondary effluent from a waste water treatment plant and wastewater lake from a brown coal processing plant. Each sample was isolated by use of a common technique before being made available to the cross-disciplinary research teams.

This book represents a basic and fundamental report concerning the general and particular aspects on refractory organic substances isolation and analysis technique. It is the most important collection of scientific reports and an encouraging platform for young scientists who wish to devote their careers to addressing the many fascinating and unanswered questions about the properties and roles of refractory organic substances in the environment.

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