



Book review

**ENVIRONMENTAL CHEMISTRY
A Global Perspective**

Gary W. vanLoon, Stephen J. Duffy
John Wiley & Sons, Inc., Hoboken, New Jersey,
ISBN: 0-471-15985-9, 2003, XIV+229 pags.

The second edition of the book of Gary W. vanLoon and Stephen J. Duffy - *Environmental Chemistry. A Global Perspective* - is a description of the chemical properties of the natural world and of concentrations of contaminants. It is focused on the processes that operate within and between various environmental compartments and the ways in which human activities interact with the natural processes. The book has been written to provide the chemical basis for understanding our surroundings, the global environment. Emphasis is done on the composition of the natural environment, the processes that take place within it, and the kinds of changes that come about as a result of human activities.

The book is structured into three parts: the Earth's atmosphere, the hydrosphere and the terrestrial environment.

At the beginning of the first part, in Chapter 2, the atmosphere-composition, pressure and regions are discussed. After that, solar influence on the chemical composition of the atmosphere, types of atmospheric reactions (photochemical and free radical reactions, especially), and calculations in atmospheric chemistry are presented.

Chapter 3 treats stratospheric chemistry. Some concerns about stratospheric ozone including UV-B radiation danger to humans, measuring ozone in the atmosphere and stratospheric ozone concentration are done. Next, the formation and turnover of ozone together with processes for catalytic decomposition of ozone are discussed. Also, the properties of chlorofluorocarbons (CFCs), the Montreal Protocol and replacements for CFCs are resumed. The same chapter threat about other reactions involving stratospheric ozone, with Antarctic and Arctic “ozone hole” formation.

Chapter 4 deals with aspects of tropospheric chemistry. After some considerations about smog (classical and photochemical), the chemistry of photochemical smog is investigated. So, the chemistry of hydroxyl radical production, oxidation of hydrocarbons and volatile organic compounds like as alkenes, alkynes, aromatics are analysed.

Exhaust gases from the internal combustion engine as a major anthropogenic source of atmospheric pollutants are discussed. Also, fuel combustion and reformulated gasolines, engine design and catalytic converters for emission control are analysed, that because the amounts of emission products generated depend on fuel composition and engine design.

Chapter 5 is the subject of precipitation chemistry. First, the rain composition as result of equilibrium between water and various gaseous species in the air are discussed. Next, the atmospheric production (and removal) of nitric acid (day-time and night-time nitrogen oxide chemistry) together with the atmospheric production of sulphuric acid (including oxidation of reduced sulphur species, oxidation of sulphur dioxide by homogenous and heterogeneous reactions, catalytic enhancement of sulphur dioxide oxidation, alternative fate of atmospheric sulphur compounds). In the same chapter are presented other acidifying agents in precipitation and some similarities and differences between rain, snow and fog chemistry. Also, some methods of minimizing emissions of nitrogen and sulphur compounds are briefly discussed.

In Chapter 6 are made a comprehensive approach about atmospheric aerosols. Thus, are discussed the principal sources of aerosols (sea spray, dust, combustion products, polyaromatic hydrocarbons (PAHs), condensation aerosols, organic condensation nuclei), aerosol concentrations and lifetimes and air pollution control for particulate emissions.

Chapter 7 is an overview about chemistry of urban and indoor atmospheres. Are presented some data regarding principal atmospheric pollutants in urban areas, a case study on the air quality (Mexico City), the factors affecting indoor air quality and common indoor air contaminants, especially radioactivity, volatile organic compounds, emissions from indoor combustion and indoor particulates.

In Chapter 8 are considered the ways in which global climate are influenced by atmospheric chemistry. At the beginning are presented composition of the Earth's atmosphere and energy balance. After that, a description of the greenhouse gases and aerosols together with relative importance of the changes in greenhouse gas concentrations are made. Radiative forcing, global warming potential, energy resources and greenhouse gas consequences are also, the subject of this chapter.

With Chapter 9 begin the second part of the book, reserved to hydrosphere. Thus, principal reservoirs of water, physical and chemical properties of water and concentration units for aqueous solutions briefly are presented.

Chapter 10 deals with distribution of species in aquatic system. Because the species distribution for an element or compound depends on the nature of the chemical and the particular environmental conditions in which it is found, are discussed single and two-variable diagram (pE / pH) for calculation of some species.

In Chapter 11 are made considerations about gases in water. Thus are discussed the case of simple gases, like as oxygen, gases that react with water

(carbon dioxide) and, related to the last case are treated alkalinity and its relation to environmental issues, measurement of alkalinity and its environmental significance.

Chapter 12 is subjected on organic matter in water. The origins of organic matter in water, environmental aspects related to aqueous organic matter and, also, the properties and interactions of humic material are presented.

Chapter 13 is reserved to metals and semi-metals in the hydrosphere. Besides the occurrence, nature and significance of metals and semi-metals in the hydrosphere, a classification of metals are made and are discussed aquo complexes of metals, complexes of metals with humic material, metal complexes of ligands of anthropogenic origin, bioavailability of metals in natural waters and associations. Also, is exemplified the behaviour in the hydrosphere of calcium, copper and mercury.

Chapter 14 treats environmental chemistry of colloids and surfaces. Surface properties of colloidal materials, the origin and nature of surface charge are discussed, then two quantitative descriptions of sorption processes are made and phosphorus environmental chemistry is detailed.

In Chapter 15 the microbiological processes are presented. At the beginning, a classification of microorganisms is made, followed by the description of microbiological processes namely carbon cycle, nitrogen cycle and sulphur cycle.

Chapter 16 treats about water pollution and wastewater treatment chemistry. Definitions of pollution, concepts of toxicity and some water quality guidelines (drinking water and water for irrigation) are offered. Also, are briefly presented the characteristics and treatments for urban wastewater: chemical coagulants for turbidity and phosphate removal, nitrogen removal from wastewater, advanced microbiological processes.

The third part of the book begins with Chapter 17 and is reserved to terrestrial environment. Soil formation with physical and chemical weathering and soil formation as a complex process are presented together with soil mineral and organic matter composition.

In Chapter 18 are discussed the soil properties. Thus the physical properties (particle size, texture, structure, permeability) and chemical properties (total elements, available elements, cation exchange capacity, soils with variable charge and soil pH) are presented. Also, some considerations are made on the soil profiles (a Canadian Spodosol and a tropical Alfisol) followed by environmental issues associated with soils like as: nutrient loss from soil by leaching, nitrate pollution from agriculture in the United Kingdom, nutrient loss by erosion, reactions with acids and bases, geochemical reactions and biological processes that neutralize soil acidity, acid sulphate soils, salt affected soils and trace metals in soils.

Chapter 19 deals with the chemistry of solid wastes. At the beginning are presented the types of bulk solid wastes and their disposal. Then are discussed aspects related to solid wastes from mining and metal production (benign tailing deposits, tailing from sulphide ore deposits, red mud), organic

wastes (direct disposal of animal wastes on the land, composting, sewage sludge, small-scale biogas synthesis) and mixed urban wastes (landfilling, incineration).

Chapter 20 is focussed on the organic biocides. Are presented a classification of these compounds and are detailed their chemical stability or destruction by photolytic and non-photolytic reactions, hydrolysis, oxidation. Also, are made some discussions about rates of degradative reactions as function as: the nature of biocides, temperature, moisture and soil/water properties (pH, organic matter and inorganic species) followed by kinetic calculations. In the same chapter are discussed about the mobility of biocides (aqueous transport and vaporisation) and leachability.

In Chapter 21, at the end of the book, are made some considerations about the Earth's future related to humans, atmosphere, water and soil and, also, about the complex environmental challenges.

It must be remark that every chapter contains at the end a few problems relate to discussed subjects.

The book of Gary W. vanLoon and Stephen J. Duffy named "Environmental Chemistry. A Global Perspective" is builds on the fundamentals of physical, organic and inorganic chemistry and contains a comprehensive and rich material needed to obtain a general view on our environment. It deals with chemical principles operating in the natural and altered environment, examples are chosen from all the continents and may contribute to understanding that is needed to maintain and restore the good Earth.

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