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*Book Review*

**SONOCHIMIA IN EPURAREA ENERGO-INTENSIVA A APELOR  
(*SONOCHEMISTRY IN ENERGO-INTENSIVE WATER  
AND WASTEWATER TREATMENT*)**

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This volume proposes two main scientific directions: an overview on the ultrasonication process, comprising basic knowledge and principles for understanding how this process works and an assessment on possibilities of using ultrasounds- especially in energo-intensive treatment of water and wastewater. The book is structured on four chapters, with focus on the chemistry of ultrasounds and its applications in environmental protection, as a possible efficient treatment for pollutants removal from water and wastewater.

The environmental issues of water resources usage and pollution and especially of wastewater production are briefly discussed in the first chapter, which offers the starting point of this scientific approach and underlines the necessity of finding new methods and treatments in order to overcome the technological and economical constraints of water and wastewater treatment.

The second chapter brings into attention 3 important aspects related to the physics of ultrasounds: the ways of ultrasounds emission, the physical laws that describe oscillations and acoustic waves and specific measures that intervene in the ultrasonication process. The classification of devices that are able to emit ultrasounds, with special references on ultrasonic transducers, short descriptions about the way of functioning and also about the materials that can be used for producing them are specified in this chapter. Also, the equations that describe the acoustic waves and, in particular ultrasonic waves, are explained and the most important phenomenon like sounds travelling through

different media and the extinction and absorption of ultrasonic waves are mentioned.

The following chapter, which is also the widest of the book, deals with the chemistry of ultrasounds. The chemical transformations start with the initiation of acoustic cavitation, a phenomenon that provides conditions for chemical reactions to occur and the possible reaction pathways and products are presented. A series of factors can influence acoustic cavitation such as: the frequency of the ultrasound, the intensity of the ultrasonic wave, the acoustic pulse, the solvent viscosity and other factors (temperature, pressure, the nature of the gaseous media). Another important issue of the third chapter refers to the equations that describe the state of the acoustic cavitation, which are thoroughly described. After explaining the fundamentals of the acoustic cavitation, the authors present the evolution of concepts in sonochemistry with emphasis on the chemical reactions that take place during the irradiation with ultrasounds, in liquid-liquid systems, homogenous or heterogenous, and the effects on different types of materials. The ultrasonic applications in microbiology, in metallurgy or to cryogenic liquids are specified.

Chapter four reviews possible applications of ultrasonication in water and wastewater treatment, for the removal of organic pollutants: phenol and phenolic compounds like halogenated phenols, nitrophenols; benzene and its compounds: ethylbenzene, chlorobenzene; complex dyes; pesticides; pharmaceutical precursors; surfactants and others; and inorganic pollutants such as: carbon sulphurate, ammonium, cyanide, and metals deposited

on different supports. Ultrasounds are reported to be able to improve also the biodegradability in conventional process of aerobic or anaerobic oxidation, to destroy foams, to enhance the adsorption and ionic exchange processes, to break the ozone bonds, to offer an alternative for cotton whitening, to raise the mass transfer of oxidation agents in electrochemical processes.

Another important aspect is the way that ultrasounds can be actually used as a feasible technology for water and wastewater treatment at a larger scale. Ultrasound baths, ultrasonic transducers and different types of sonoreactors with different features are designed, dealing with both the technological and the economical constraints of this process.

This volume is addressed to chemical engineers, chemists, and physicians and also to specialists that work in the water and wastewater treatment field and in environmental protection. Most of the chapters are illustrated with quality images, and representative charts and tables. Moreover, the information offered here is easily accessible and well structured, allowing the reader to get a very good perspective on this and vast domain.

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