

Book Review

Cavitation and High – Voltage Plasma Technologies

Theory, Experiment, Innovative Proposals

Book Author: S. L. Tsyfansky

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2008, 528 p., ISBN 978-9984-032-554-5 (in Russian with Summary and some material in English)

Reviewer: Dr. Leonas Zubavičius

Vilnius Gediminas Technical University,

J. Basanavičiaus str. 28, LT-03224 Vilnius, Lithuania

E-mail: leonas.zubavicius@mf.vgtu.lt

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This book is devoted to in depth studies of the phenomena inherent to cavitation and high – voltage plasma processes. The problems of acoustical cavitation as well as hydrodynamic cavitation and also high – voltage plasma phenomena are analyzed simultaneously in this research monograph. Common features and phenomena inherent to cavitation and high – voltage plasma processes are emphasized. Mathematical and experimental methods are used for theoretical analysis and for development of practical applications of cavitation and high – voltage plasma technologies. A variety of nonlinear effects and their practical applications are demonstrated and discussed.

The book presents a review of nonlinear effects and of mathematical modeling of complicated nonlinear systems. A number of vibration devices and technologies are developed including protection from vibrations, nonlinear vibration diagnostics and vibration identification, vibration methods of measurement of flow of fluid, vibration diagnostics of cracks in thin walled structures and in rotors. When analyzing the problem of acoustical cavitation it is shown that a cavitation bubble is a nonlinear mechanical oscillator, generator of waves and exhibits a number of other nonlinear effects. Theoretical methods of calculation of acoustical cavitation are presented and various ultrasound devices are described. When analyzing hydrodynamic cavitation occurrence of complicated flow patterns with rotations and the phenomena taking place in them are investigated, also similarities of flows and types of cavitation are presented and the main types of hydrodynamic cavitation devices are described. The nature of cavitation destruction of metals and organic materials is investigated and also applications in nanotechnology and other fields are presented. Methods and devices for investigation of cavitation include the measurement of quantity of gases in fluids and also the use of acoustical methods. Characteristics of noises taking place during the phenomena of cavitation are described. A number of nonlinear effects during the high – voltage plasma discharge in fluid are investigated, nonlinear differential equations describing the physics of the effects are presented and their solution is performed. A number of new created devices are described including high – voltage plasma pulse exciter of vibrations, devices for cleaning of ships and of parts of engines. Cavitation processing of fuel with water and a number of nonlinear effects taking place during this process are analyzed. New types of lasers for measurement of distances with very high precision are proposed. The activation of water using

nonlinear effects of cavitation and high – voltage plasma technologies is investigated. Methods of production of fertilizers and building materials together with industrial equipment recommended for their production are described.

New methods of mathematical modeling of vibrations of complex nonlinear mechanical systems, new qualities of solutions of nonlinear differential equations obtained by the author are published in a number of research monographs and papers, the author holds many patents. Professor S. L. Tsyfansky is head of Scientific – Research Laboratory “Nonlinear Effects of Vibrating Systems” of Riga Technical University, has numerous awards for his scientific achievements and is a Full Member of the New – York Academy of Sciences (USA).

This book is recommended for mechanical and electrical engineers, physicists, specialists in high – voltage plasma equipment, engineers in hydrodynamics, ecology and biology.