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"*This is the first outstanding book focusing on the comprehensive features of ultrafine bubbles (UFBs). It covers their versatile aspects such as history, fundamentals, and latest applications, and in particular, their existence, stability, and radical formations. It is strongly recommended not only for researchers but also beginners interested in UFBs and wishing to gain new knowledge on the emerging UFB science and technology.*"

Prof. Emer. Kiyoshi Yoshikawa
Kyoto University, Japan

"*This book is the bible of UFB research, discussing the characteristics, generation methods, and industrial applications of UFBs, as well as mechanisms of their various effects.*"

Prof. Takashi Hata
National Institute of Technology, Kochi College, Japan

UFBs are gas-filled bubbles having a diameter smaller than 1 μm. They are sometimes called bulk nanobubbles because these are not on a solid surface but inside a bulk liquid (water). They are already being used in commercial processes such as cleaning and plant cultivation. However, many mysteries still exist with respect to UFBs, such as mechanisms of stability, OH radical formation, and biological and medical effects. This is the first book on UFBs that reviews researches done on them. It is helpful for students and researchers interested in the fundamentals of this emerging field and its applications, including cleaning, biological, medical, and dental ones.

Koichi Terasaka is a professor at the Department of Applied Chemistry, Keio University, Japan. He is also chair of the Union of Fine Bubble Scientists and Engineers, director of the Fine Bubble Industries Association, and expert of ISO/TC 281 (fine bubble technology) committee. He is a chemical engineer who has been involved with bubble engineering since the 1980s and has recently been working on industrial application of UFBs.

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Wataru Kanematsu is a former principal research manager at AIST. He is involved in research on characterization of UFBs and UFB-containing liquid. Industrial standardization of characterization technology is another technical interest for him.

Nobuhiro Aya is a supervisory innovation coordinator at AIST. His scientific interests are focused mainly on fine bubbles and fine particles and also on methodological issues on combination and integration of various technologies and improvement of industrial/social usage of technologies. He is also the committee manager of the ISO/TC 281 (fine bubble technology) since its establishment in 2013.

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