



SELF ORGANIZATION OF BUBBLES IN ACOUSTIC FIELDS



Friday, December 6, 2019 | 11am - 12pm
2164 Martin Hall, DeWALT Seminar Room

Guest Speaker

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ABSTRACT

Computational simulation of the complex interactions of acoustic fields with multiphase materials has significantly advanced and is now revealing new mechanisms, which could not have been predicted via the simpler analytical models which were used in the past. In particular, when the void fraction in a bubbly liquid becomes significant, the acoustic field causes the bubbles to change their position, which in its turn modifies the acoustic properties of the medium leading to a restructuring of the acoustic field. This is known as a self organization phenomenon. In this talk, we will report on the modeling and explanation of self organization observed in bubbly liquids, and a long program of theory, simulation, and experiment which was conducted by the author and his colleagues. In addition to confirming the existence of the previously experimentally observed phenomena such as clustering and filamentation of bubbles, a novel effect was first discovered in simulations and then confirmed by the experiments. That was the formation of "shock waves" of void fraction, or acoustically induced transparency (AIT). The joint computation/experimental program revealed the variables in parameter space necessary to achieve different modes of bubble self organization. Potential applications of the self organization effects in materials science and microgravity are discussed.

BIO

Nail Gumerov, a research scientist at University of Maryland Institute for Advanced Computer Studies, received his Ph.D. degree from the Lomonosov Moscow State University in fluid mechanics in 1987. He also received his Sc.D. degree in physics and mathematics in 1992. He has resided and worked in the U.S. since 1993. He also collaborates with the Bashkir State University in Russia (the Center for Micro and Nanoscale Dynamics of Dispersed Systems) as a scientific advisor. His research interests are broad and include modeling and scientific computing related to applied mathematics, fluid mechanics, acoustics, electromagnetism, plasma physics, nanoscience, and more. He has authored more than 200 research publications, including an extensive monograph on the fast multipole methods (Elsevier, Oxford, U.K., 2005), and more than 70 papers in scientific archival journals. He serves as an associate editor for the Journal of the Acoustical Society of America. More information is available via his home page:

<https://users.umiacs.umd.edu/~gumerov/>.

