

Cavitation Bubble interaction with hard and soft matter: from erosion to nucleation

Professor Claus-Dieter Ohl

Department for Soft Matter, Institute for Physics,
Otto-von-Guericke-University, Magdeburg

Date: Friday, October 27, 2023 15:00-16:00

Venue: Faculty of Engineering Bldg. 2, Room 31A

Abstract:

While single non-spherical cavitation bubble dynamics have been studied for decades in stagnant liquid, their dynamics in flow and next to a boundary has received very little attention. Interestingly, already a low velocity background flow can enhance the wall shear stress by an order of magnitude and affect the bubble dynamics to large extend. This is particularly important for understanding cavitation erosion. We will show that erosion from cavitation bubbles is not related to the jet impact or some axisymmetric energy focusing. It is actually the opposite; erosion results from the loss of axisymmetry and beautifully demonstrates the complex yet striking nature of cavitation bubbles collapses. Only in recent years attention to the dynamics of cavitation bubbles in elastic materials has gained momentum, which was driven by the need to understand bubble dynamics for medical applications. The gross difference to a liquid is that in elastic solids shear waves may be generated that transport deformation energy to distances much larger than the local strain field. We will show that two shear waves with different orientation are generated when a bubble collapses in an elastic solid non-spherically. At last I would like discuss the nucleation of cavitation from elastic waves at liquid-solid interfaces and their potential applications of energy focusing, nanocavitation, and carving out material.



Professor Claus-Dieter Ohl
Department for Soft Matter,
Institute for Physics,
Otto-von-Guericke-University,
Magdeburg