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Theory and simulation of acoustic interaction forces between small particles in an ideal fluid HENRIK BRUUS, Department of Physics, Technical University of Denmark, Denmark, GLAUBER T. SILVA, Instituto de Física, Universidade Federal de Alagoas, Brazil — We present a theoretical expression for the acoustic interaction force between small spherical particles suspended in an ideal fluid exposed to an external acoustic wave as used in, say, microchannel acoustophoresis. The acoustic interaction force is the part of the acoustic radiation force on one given particle involving the scattered waves from the other particles. The particles, either compressible liquid droplets or elastic microspheres, are considered to be much smaller than the acoustic wavelength. In this so-called Rayleigh limit, the acoustic interaction forces between the particles are well approximated by gradients of pair-interaction potentials with no restriction on the inter-particle distance. The theory is applied to studies of the acoustic interaction force on a particle suspension in either standing or traveling plane waves. The results show aggregation regions along the wave propagation direction, while particles may attract or repel each other in the transverse direction. In addition, a mean-field approximation is developed to describe the acoustic interaction force in an oil-in-water emulsion.

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