Local and global solvability of interface problems for fluids of different types near the equilibrium

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Abstract

The problem on the evolution of a bubble in an incompressible continuum is analyzed in the spaces $W_2^{l,l/2}$. A local existence theorem for the problem is proved in the case of non-negative surface tension without the restrictions on the viscosities and the densities imposed in [1]. The elimination of these restrictions was first obtained for the problem with zero surface tension in [2]. Next, global unique solvability is established for the problem without surface tension forces on the interface and with small data, the liquids being located in a container. The proof is based on an exponential global estimate for a generalized energy in a linear problem [3]. The case where a drop is surrounded by a gas may be studied in the same way.

The problem on the motion of two compressible barotropic capillary fluids separated by a closed interface was studied in [4], [5] where local solvability was also obtained with restrictions on the fluid viscosities. These restrictions are discussed and a way to eliminate them is presented.

Keywords: Compressible and incompressible fluids, surface tension, Navier-Stokes equations, interface problems.

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