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Spherical Two-phase Interface in a Near-critical Fluid. Gradient Approach

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On macro-scales the liquid-gas interface is classically modeled by a surface of discontinuity. However, on micro-scales, there is a transitional region, where the properties are changed continu-ously. This makes reasonable a description of two-phase system, including the interface, within a hydrodynamic approach. In this approach, the new term proportional to density gradient is added to the internal energy. Near the critical point, where there is no strong difference between liquid and its vapor, the gradient approach is quite reasonable. Based on this approach we considered the formation of new phase nucleus in a closed cav-ity; and analyzed its stability. The results are in agreement with classical Laplace approach, while considering the states far from the critical point. In near-critical region, the results are proved to be intriguing. It is shown that within the framework of one-dimensional problem the system remains single-phase and homogeneous even for negative values of mechanical compressibility.

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