



CONTRIBUTIONS TO THE FLUID DYNAMICS AND PHASE TRANSITIONS AT LOW TEMPERATURES

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ABSTRACT

The parametric modeling of phase transitions and analysis of the role of an intermediate liquid state in irreversible relaxation processes at low temperatures were performed [1]. As an example, one can consider the systems with two stable states ($L1$ and C that means liquid and crystalline, respectively, and the third one – intermediate fluid state, namely $L2$). Such $L2$ state has been experimentally discovered in supercooled liquids [2-4]. The models include one order parameter and three control parameters in the Landau-type kinetic general potential of 6th degree, and have been developed to study the impact of both asymmetry (heterogeneity) and external field on phase transitions in the presence of an intermediate fluid state. First of all, the intrinsic dynamics are studied, and the mean transition time is calculated. We noticed that the presence of the intermediate liquid state may indeed enhance the nucleation rate, and, furthermore, an increase in the heterogeneity of system accelerates the transition dynamics, while the presence of an external field would increase the mean transition time. In the previous work [5], analytical solutions were also obtained according to the Descartes-Euler method for solving polynomial equations. Depending on the values of its control parameters, the potential has one, two or three possible minima, and the problem dealt with the construction of the equilibrium phase diagrams. It is also worth mentioning that the presently obtained results are general and suggest a complete set of different transition scenarios in the entire parameter plane.

Keywords: fluid dynamics, phase transitions, relaxation time

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