

Volatile nature of liquid–liquid phase transition in dense hydrogen

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Liquid–liquid phase transition (LLPT) in dense hydrogen has been extensively investigated during the last decade. Theoretically the possibility of phase transition in non-ideal plasma has been predicted many years ago [1]. However up to now there is no direct experimental evidence of such a transition. LLPT in dense hydrogen at temperatures $T \lesssim 2000$ K has been discovered using first–principle simulations [2, 3]; in all predictions the phase boundary of such a transition has a negative slope. Very recent simulation papers [4, 5] claim that LLPT is situated at even lower temperatures (less than 1250 K) or even doesn’t exist. In this presentation we analyze the properties of LLPT and its “volatile” character; in particular, we consider the miscibility of molecular and atomic (plasma) phases of hydrogen and the probability of phase boundary formation. The possibility of LLPT experimental observation in dense hydrogen is discussed. The work is supported by the Russian Science Foundation, grant No. 20-42-04421.

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