

Criterion for ultra-fast bubble walls: the impact of hydrodynamic obstruction

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The Bodeker-Moore thermal friction is usually used to determine whether or not a bubble wall can run away. However, the friction on the wall is not necessarily a monotonous function of the wall velocity and could have a maximum before it reaches the Bodeker-Moore limit. In this talk, I compare the maximal hydrodynamic obstruction, i.e., a frictional force in local thermal equilibrium that originates from inhomogeneous temperature distribution across the wall, and the Bodeker-Moore thermal friction, where the former is studied in a fully analytical way, clarifying its physical origin and providing a simple expression for its corresponding critical phase transition strength above which the driving force cannot be balanced out by the maximal hydrodynamic obstruction. For a large parameter space, the maximal hydrodynamic obstruction is larger than the Bodeker-Moore thermal friction, indicating that the conventional criterion for the runaway behavior of the bubble wall must be modified.

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