






# Combining neutral scalar and isothermal Shan-Chen lattice Boltzmann method to simulate droplet placement on a wall in isothermal and non-isothermal states

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<https://doi.org/10.1016/j.jtice.2024.105350>

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## Abstract

### Background

In the current article, two-phase thermal fluxes are created by combining the thermal model of the neutral scalar model with the two-phase Shan-Chen model of the lattice Boltzmann method (LBM).

### Methods

The different intermolecular powers for the isothermal Shan-Chen model show how a droplet would be placed on a wall. By raising the droplet intermolecular power parameter, the surface area increases and becomes wet. Next, the isothermal Shan-Chen method and the neutral scalar method are combined to investigate multi-phase thermal problems. The droplet placement on the hot wall is therefore done at relatively high Rayleigh numbers. By raising the Rayleigh number, the isothermal lines within the droplet's interior gradually become less ascending and less descending until they eventually achieve a uniform state when it is placed against a hot wall. Additionally, the channel's Rayleigh-Bénard convective heat transfer is enhanced by increasing the Rayleigh number.

### Significant findings

Natural convection in the enclosures can be used in solar collectors. As the Rayleigh number increases, the average Nusselt number ( $Nu_{avg}$ ) rises as would be expected. The results demonstrate that LBM is a practical method for simulating multi-phase thermal flows.