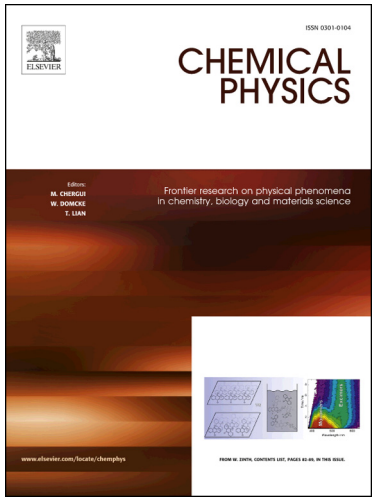


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# Condensation on solid surfaces with amphiphilic micro-nanostructures by Lattice Boltzmann simulation

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## Abstract

The chemical properties and topography of solid surfaces exert a large effect on droplet condensation efficiency. Some scholars have devised a kind of amphiphilic microstructure with hydrophobic top and hydrophilic bottom, and their experiment results show that surfaces with this kind of amphiphilic microstructure can effectively reduce the size of condensed droplets and enhance condensation. In this paper, the Lattice Boltzmann method (LBM) is utilized to investigate this experiment numerically, and a corresponding conclusion is obtained. Further, nanostructures are added to this amphiphilic microstructure, and two kinds of amphiphilic micro-nanostructured surfaces were designed. The results by numerical studies demonstrate that the wettability of nanostructures on the top of amphiphilic micro-nanostructures are critical to condensation efficiency. Amphiphilic micro-nanostructured surfaces with hydrophilic nanostructures (amphiphilic micro-nanostructure I) possess better condensation efficiency than amphiphilic micro-structured surfaces and amphiphilic micro-nanostructured surfaces with hydrophobic nanostructures (amphiphilic micro-nanostructure II), which can significantly enhance droplet condensation. The findings of this paper provide guidance for the optimal design of surface structures to promote condensation.