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Droplet dynamics during condensation on tailoring nanostructured surfaces.[1] HUA-YI HSU, CHUN-CHI LI, SHIH-YAO HUANG, Department of Mechanical Engineering, National Taipei University of Technology — Liquid condensation from the atmosphere on a solid surface is commonly found in nature. To enhance energy conversion, nanostructured surfaces is with high potential to utilize the water generating applications. In this work, the droplet condensation on the tailored surface has been investigated by a 2D phase field model which is favorable to study the interfacial dynamics under microscopic scale. To model the liquid extracted from the air, both liquid and vapor are initially coexisted in random distribution. Spinodal decomposition process is then used here in which the fluid starts from an unstable thermodynamic state, and the homogeneous phase separates into coexisting phases spontaneously. Initially the small liquid droplet generated along the nanostructured surface and gradually merged into a coalescence droplet. By analyzing the droplet formation, the phase change dynamics can be studied and its relation with the spatially distributed structures on surface. The overall performance enhancement created by surface nanostructured was examined in comparison to a flat surface. Our understanding of this work provides more insights into the nanostructured surface topography on mass and heat transfer to improve the energy efficiency.

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