Numerical analysis of thermocapillary flows over the substrates with topography

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When a temperature difference appears along a gas/liquid interface, a surface tension gradient causes thermocapillary flows, the direction of which orients from a low-surface-tension region to a high-surface-tension region. However, only a few studies are done so far for substrate with topography in spite of its practical significances. Two-dimensional finite element computations are conducted to investigate the heat transfer and fluid flows over the substrate with sinusoidal topography. In the present work, the buoyancy force inside the layer is negligible, and a low capillary number is considered such that the interface is assumed to be flat. We observed changes in aspects of the heat transfer depending on Marangoni number, and the changes in flow patterns ensue.