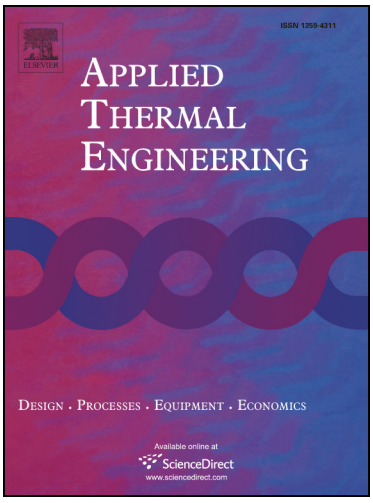

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Nucleation and sliding growth of boiling bubbles on locally heated silicon surfaces

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Abstract: In this work, nucleate pool boiling is investigated experimentally on smooth monocrystalline silicon substrates with or without cavities. Different from the previous studies, the substrates are locally heated by an H-shaped titanium thin-film heater deposited on the back surface of the substrate. High-speed infrared thermography (HSIR) synchronized with high-speed video (HSV) is used to measure wall temperature evolutions and record bubble dynamic behaviors. On the basis of HSIR images, the variation of bubble locations on the wall is precisely located. The results show that the boundary of heater changes bubble dynamics significantly. For the first time, a very interesting bubble sliding from the nucleation site to the heater boundary is observed on the substrates with or without cavities. However, this phenomenon was never observed on infinitely larger heated substrates. The transient evolutions of wall temperature indicate that an asymmetric temperature profile occurs beneath the bubble due to bubble sliding. The asymmetric temperature