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Prediction of maximum spreading time of water droplet during impact onto hot surface beyond the Leidenfrost temperature

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Abstract

Author keywords

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Abstract

When a water droplet impacts on a heated surface in the film boiling regime, it will spread, recede, and finally bounce off from the heated surface . These unique liquid-solid interactions only occur at high surface temperatures. Our main objective in this research is to measure the maximum spreading and residence time of the droplet and the findings were compared to theory. We focused our study in the film boiling regime. Brass material was selected as the test surface and was polished until it became a mirror polished surface . The temperature range for this experimental work was between 100 °C up to 420 °C. Degassed and distilled water was used as the test liquid. The high speed video camera recorded the images at the rate of 10,000 frames per second (fps). As a result, it was found that the experimental value of maximum spreading and residence time agreed closely with the theoretical calculation. A new empirical formula that can be used to predict the maximum spreading time in the film boiling regime is also proposed. © 2021 The Authors

Author keywords

Droplet impact ; Film boiling regime; High speed imaging analysis; Maximum spreading ; Residence time

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