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Understanding the coupled mechanisms of microlayer evaporation and single vapor bubble dynamics SURYA NARAYAN L., ATUL SRIVASTAVA, Deptartment of mechanical engineering, Indian Institute of Technology Bombay — Results of an experimental study conducted to understand the role of microlayer evaporation process towards single vapor bubble growth from a heated substrate subjected to constant heat flux (50 to 80 kW/m^2) conditions have been presented. Quantitative visualization of the bubble growth process has been conducted through simultaneous use of two optical techniques, a) rainbow schlieren deflectometry (thermal field and dynamics of the vapor bubble) and b) thin film interferometer (microlayer evaporation). Three distinct stages of bubble growth process have been observed; a) initial growth (hemispherical vapor bubble and expanding microlayer), b) transition growth (microlayer with flattened periphery), and c) diffusion growth (receding contact line and microlayer with a dry spot). Analysis of thin film interferograms showed that the contribution of microlayer evaporation towards the bubble growth process is no more than $\sim 15\%$. While, the localized heat flux dissipation rates in the microlayer are found to be ~ 1 MW/m^2. Experimental results also showed the presence strong coupling between the bubble dynamics and the microlayer evaporation process.

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None

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