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Thin film interferometric mapping of microlayer dynamics during the growth process of single vapour bubble under nucleate flow boiling regime. GULSHAN KUMAR SINHA, ATUL SRIVASTAVA, IIT Bombay — The enhanced heat transfer associated with nucleate boiling is explained by two widely accepted heat transfer mechanisms; micro-convection and microlayer evaporation. Various researchers postulated that when a vapor bubble grows quickly on a solid heated substrate, it traps a thin layer of superheated liquid between bubble base and heated wall. This thin liquid layer evaporates and feeds vapor bubble to sustain its further growth. This thin liquid layer is of the order of micron and hence termed as microlayer. Heat transfer through microlayer evaporation contributes significantly to the overall heat transfer rate from the heater surface. The present work reports one of the first attempts to map the real time dynamics of microlayer during formation of single vapor bubble under subcooled flow conditions using the principles of thin film interferometry. Flow boiling experiments have been performed in a vertically oriented channel with water under atmospheric pressure conditions. Thin film interferometer and the corresponding data reduction algorithm have been developed in-house to elucidate the real time dynamics of microlayer in terms of interferometric fringes and quantify the microlayer thickness with time and Reynolds number.

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