INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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SHORT ABSTRACT

In this thesis, the flow and heat transfer in slug flow regime in small diameter channels under different conditions have been studied using computational fluid dynamics (CFD) using volume of fluid (VOF) method to capture the gas-liquid interface. The hydrodynamics of slug flow for a range of bubble volumes for equivalent sphere radius close to 1, between 0.72-1.55, keeping all other parameters constant has been studied in a periodic unit cell consisting of a gas bubble and two halves of adjacent liquid slugs in a frame of reference moving with the bubble. It is observed when a long bubble is followed by a shorter one, they coalesce and form a longer capsular bubble. The hydrodynamics during the bubble approach and growth of the bubble after merger has been studied in a frame of reference moving with the longer bubble.

The effect of change in bubble volume and shape has been investigated on the heat transfer without phase change. Two-phase flow of ethylene glycol and air has been simulated for the cases of sudden expansion and contraction of the channel in a laboratory frame of reference and the bubble dynamics at the area change has been studied. Flow and heat transfer in the slug flow regime subjected to a pulsatile flow has been studied for different frequencies ranging between 1-100 rad s^{-1}.