The Summer Undergraduate Research Fellowship (SURF) Symposium
2 August 2018
Purdue University, West Lafayette, Indiana, USA

Characterization of Bubble Detachment Process

Wentao Zhong, Weixiao Shang, Puyuan Wu and Jun Chen
School of Mechanical Engineering, Purdue University

ABSTRACT

Detachment of gas bubbles and its subsequent rise in liquid affect the chemical and petrochemical system significantly. Also, the principal of bubble detachment is very important in the study of cavitation and many electrochemical devices. Understanding the transport and transfer process in gas-liquid phase can help to better estimate the interfacial area and thus improve the device performance. Planar Laser Induced Fluorescent (PLIF) was applied in the experiment to measure the velocity field of bubble's detachment from the glass tube in a water tank. The water tank was seeded with small particles that obeyed fluid dynamics and can emit fluorescent when illuminated by a specific laser. A high-speed camera was used to capture a sequence of digital images with particles on it. Cross-correlation algorithm was applied to calculate the velocity field by analyzing the differences between two successive pictures. The experiment shows that the velocity magnitude around the bubble increases as the bubble detaching from the outlet. Streamlines from the tip of the bubble to the tail of the bubble was also observed. The result sheds light on the principal of the detachment process which helps in many engineering systems.

KEYWORDS

Bubble detachment/formation, PLIF, velocity field