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Effect of subcooled temperature on the nucleate pool boiling[1]
HYUNSUP KIM, HYUNGMIN PARK, Seoul Natl Univ — Boiling is a common but complex method to dissipate a large amount of heat. To understand the physics involving the heat transfer during pool boiling, the vapor bubble dynamics and flow field of surrounding liquid are experimentally investigated in this study, focusing on the effect of subcooled temperature (ΔT_{sub}). High-speed two-phase particle image velocimetry measurement is performed under the subcooled condition (ΔT_{sub} = 2-15°) when a polished flat stainless steel plate is heated to maintain a constant temperature located on the bottom of the water tank. A growth of bubble in subcooled condition is also analytically modeled based on the heat transfer by micro evaporation, heat diffusion, and condensation. In a highly subcooled condition (ΔT_{sub} >8°), small-sized bubble departs from the wall and rapidly shrinks by condensation. Both bubble velocity and aspect ratio are peaked shortly before the complete dissipation. However, in less subcooled condition (ΔT_{sub} <8°), the bubble departs in larger size (2 - 3mm), and is significantly deformed by liquid inertial force. Induced by the exchange of surface elastic energy and kinetic energy, the bubble velocity and aspect ratio fluctuate while the departed bubble is rising.

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Hyunsup Kim
Seoul Natl Univ

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