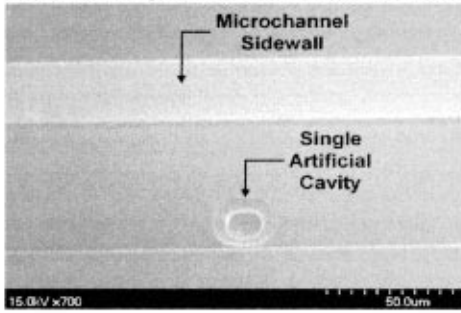
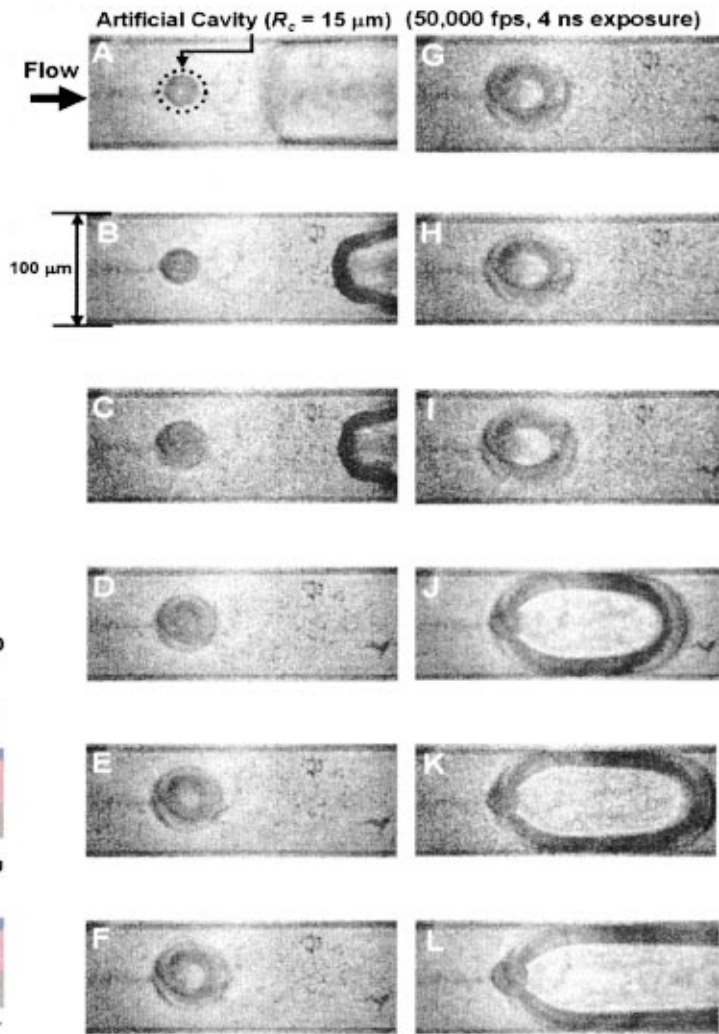


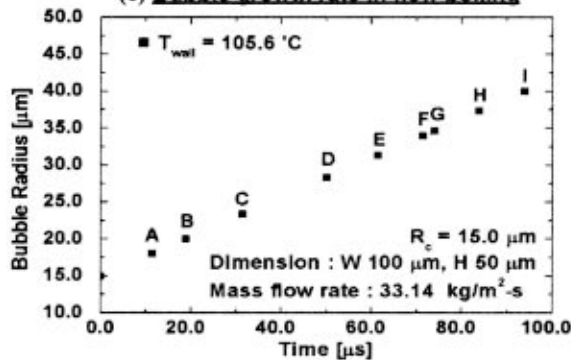
(a) SEM Image of fabricated artificial cavity



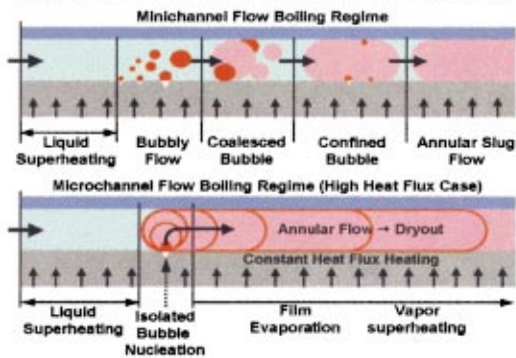
(b) Sequential images of bubble nucleation in flow boiling



(c) Bubble growth rate in flow boiling



(d) Schematics of flow regime in flow boiling



Microscale bubble nucleation from an artificial cavity in single microchannel

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Bubble nucleation of flow boiling from a single artificial cavity has been visualized in a microchannel. Visualization uses 4ns pulse light at 532nm wavelength from two resonance Nd:YAG lasers for the illumination. And in order to take two sequential images, a progressive scan digital CCD camera with straddling technique at 50,000 frame per second. An integrated MEMS device is fabricated for the investigation. The device is composed with a single microchannel ($D_h = 67\mu\text{m}$), a single artificial cavity (Radius of Cavity (R_c) = $15\mu\text{m}$) (a), visualization window,

Pt-line heater for constant heat flux condition, and Pt-RTD temperature sensors on both sides. The visualized sequential images (b) are applied to map the bubble growth (c). The map (c) shows that the bubble growth rate is quite linear ((b), A-I) until the bubble forms as an annular flow ((b), K and L). A single bubble from a cavity explosively grows and fills whole downstream of channel without coalescence and confinement with other bubbles ((b), K and L). (d) schematically shows the difference in the flow regime development between meso- and micro-scale flow boiling.