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Bubble formation and collapse on the ridge and groove of a solid surface DONGHYUN KIM, DAEGYOUM KIM, Department of Mechanical Engineering, KAIST — The dynamics of a single bubble collapsing near a ridge-patterned structure are investigated experimentally to find how the ridge pattern affects the damage on structure by the collapsed bubble. When a bubble formed by sparking electrodes in water collapses above the ridge of the structure, a bubble-splitting jet or a structure-ward collapse with strong reentrant jet occurs depending on the geometry of the structure surface. The boundary which divides the two collapse modes is derived theoretically using a potential flow model, and it is in excellent agreement with experimental results. Meanwhile, when a bubble collapses above the groove of the structure, water flows entrained from the tops of neighboring ridges collide with each other before reaching the bottom of the groove. Because part of the kinetic energy is dissipated in the form of a pressure wave by the collision, the strength of the bubble reentrant jet, which is a major cause of cavitation erosion, is expected to reduce accordingly. The effect of the reentrant jet on surface erosion is confirmed by our simple test for damage assessment.

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