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Control of cavity bubble in water entry using laser-induced cavitation[1] KYUSEONG CHOI, NAYOUNG KIM, GUWON SEON, WONTAE HWANG, HYUNGMIN PARK, Seoul National University — We investigate how the cavity attached to the metallic sphere in water entry changes when laser is irradiated. The sphere (radius, R=1, 2mm) is roughened (0.1-1μm in size) to generate a cavity even at a relatively low impact speed (Uo=1.5-3.3m/s). By varying the height of dropping position and irradiation time, that is speed and surface temperature (To=110-350°C) at the impact instant, we measure the cavity dynamics with a high-speed camera (the water is at room temperature). In the case of a shallow seal (R=1mm, Uo=1.5m/s), we classify two regimes of cavity growth (To=170-240°C) and destruction (To>240°C). In the destruction regime, microbubble emission boiling happens, so the cavity bubble is destructed to numerous microbubbles. In the case of a deep seal (R=1mm, Uo=3.3m/s), the slight cavity growth occurs at To=130-150°C and considerable destruction of cavity bubble at To>170°C. At a transient of To=150-170°C, the deep seal changes to shallow seal with a slight destruction of cavity. As a change of cavity dynamics, the forces acting on the sphere is varied, which is estimated from measured cavity geometry and sphere trajectory. Finally, we suggest a mechanism of cavity growth and destruction according to Uo and To.

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