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A study on cavity collapse for utilizing green implosion energy HYUNHEE LEE, ARDIAN GOJANI, TAE-HEE HAN, JACK YOH, Seoul National University — The mechanical energy generated by laser-induced implosion and the dynamics between non-condensable gas and liquid are studied experimentally and numerically. We have designed a micro implosion piston (MIP) to utilize the energy of implosion for inducing a piston motion. The MIP has the shape of a cone and is filled with liquid at room temperature and a high pressure ($\sim$ 6 bars). Focusing of a high power laser pulse inside the MIP leads to creation of several bubbles that expand and collapse with successive rebounds. The bubble-liquid interaction develops a micro- jet that destroys the symmetry of the bubble. This bubble implosion motion, induced by the pressure gradient across the cavity wall produces high pressures wave within a few nanoseconds. These pressure waves are affected by different conditions such as the distance between the bubble and piston head, the dimension of the MIP, and the pressure at which the MIP is driven. The radius of the bubble is measured by double exposure photography, while pressure histories are measured by hydrophones. We investigate the relationship between the radius of the bubble, the overpressure of the secondary shock wave and the motion of the micro piston, and compare it to numerical simulations. The aim is to reach a state inside the MIP that would cause a sustainable and efficient motion of piston through cavity collapse induced high pressure pulses.

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