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Cavitation at the air/water interface induced by CO_2 laser: formation, dynamics and mechanism MAN HU, FENG WANG, DAOSHENG DENG, Fudan Univ — We report CO_2-laser-induced cavitation at the interface between air and water, since strong photo-thermal effect of water occurs at the infrared wavelength. Using high-speed camera, we record explosive evaporation and the evolution of cavitation at the interface. By analyzing the growth dynamics of cavitation at various experimental conditions, we identify two stages of its growth associated with different mechanisms correspondingly. One stage is an initial faster expanding process driven by the influx of dissolved gas expelled from the surrounding water due to laser heating; and the other stage is a subsequent slower isobaric expanding process related with liquid properties. More quantitatively, we find that the evolution of cavitation at first stage is characterized by scaling law with an exponent of 1/3 for its diameter as a function of time, while its evolution at the second stage can be well described by Rayleigh-Plesset theory. This study of interfacial cavitation due to photo-thermal effect might have implications for solar-steam technology and infrared-laser surgery as well.

Man Hu
Fudan Univ

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