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Study on a liquid jet with cavitation bubbles¹ AKIHITO KIYAMA, YOSHIYUKI TAGAWA, Tokyo Univ of Agri & Tech — A focused liquid jet is important in medical applications such as needle-free drug injection systems. A method for generating a liquid jet by laser-induced shock wave is proposed. However, there are some problems. Hence we examine another method for generating a focused liquid jet. We drop a liquid filled test tube on the rigid plate, leading to the emergence of a jet. Within certain experimental conditions, the jet velocity in our experiment agrees well with the semiempirical relation proposed by Tagawa, et al., (2012, Phys. Rev. X) and Peters, et al. (2013, J. Fluid Mech.). In other conditions, we find that the jet velocity remarkably increases. In order to understand the jet velocity increment, we use two high-speed cameras: One records motion of a jet. Another films cavitation bubbles inside a liquid bath. We categorize jets into three types based on their shape and the existence of cavitation bubbles. We find that the jet with cavitation bubbles is much faster than that without cavitation bubbles. For elucidating the mechanism of jet velocity increment, we discuss the effect of pressure wave, which propagates in a liquid bath. We propose a model for describing these phenomena and verify it experimentally.

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