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Effects of wakes and surface contamination on instantaneous mass transfer from a bubble to the surrounding liquid YOSHINORI NOBATA, Graduate School of Engineering, Shizuoka University, TAKAYUKI SAITO, Research Institute of Green Science and Technology, Shizuoka University — The effects of wakes and surface contamination on instantaneous mass transfer from a zigzagging bubble to the surrounding liquid are discussed. A zigzagging CO2 bubble was captured with high spatial resolution by a pair of high-speed cameras, and the instantaneous changes in volume and surface area of the bubble were obtained from the images by our originally developed method. The instantaneous mass transfer from the bubble to surfactant-contaminated water was reduced, compared with that of the same-size bubble in pure water. In the surfactant-contaminated water, the surface tension of the bubble-liquid interface decreased. In association with the bubble ascent, the adsorbed surfactant was accumulated on the rear of the bubble. This non-uniform distribution of the surfactant on the interface caused the Marangoni flow on the bubble surface. As a result, the Marangoni effect attenuated the bubble motion and the vortex shedding. On the other hand, in pure water the shedding of hairpin vortexes from the bubble rear was very active. The hairpin vortexes transported the CO2-rich liquid away from the bubble. These indicate that the vortex shedding promotes convective transportation of CO2 and induced the enhancement of the instantaneous mass transfer.

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