Hiroya Muramatsu et al., J Chromatogr Sep Tech 2018, Volume 9
DOI: 10.4172/2157-7064-C3-046

The relationship between the acoustic-cavitation bubbles' behavior and the fluctuating motion of particles spherically flocculated by 20-kHz-ultrasound irradiation in water

Hiroya Muramatsu[1], **YiJin Tan**[1] and **Takayuki Saito**[2]
[1]Shizuoka University, Japan
[2]Research Institute of Green Science and Technology - Shizuoka University, Japan

Aiming at industrial processes, some ultrasound separation techniques have been proposed due to their advantages of non-contact. These previous techniques used MHz-band ultrasound because of its high directionality. An ultrasound separation technique using kHz-band proposed by us is very rare. We found out an intriguing phenomenon: by irradiating 20-kHz-band ultrasound into water, dispersed particles were flocculated into a suspended spherical particle swarm (SFPS). We have revealed this unique flocculation mechanisms. The acoustic cavitation oriented bubbles (ACOBs) play an essential role in the SFPS formation. Our newly developed technique is able to be applied to liquid/solid separation. Precisely controlling the ultrasound irradiation and manipulating the SFPS through a simple apparatus, we succeeded in classifying the particles by their diameter. The flocculated particles were repeatedly discharged and captured from/by the SFPS. This fluctuation has to be elucidated and restrained for industrial application. In the present study, we aim at the relationship between the ACOBs and this SFPS's fluctuation. Since directly visualizing the ACOBs behavior inside the SFPS is impossible, we focused on the sonoluminescence which is fast and feeble light emission from the ACOBs. First, we measured the sonoluminescence, as an index of the ACOBs' activity, inside/outside of the SFPS via optical fiber probing. We quantified the periodical fluctuation of the intensity of the sonoluminescence. Second, we visualized the SFPS, and analyzed the SFPS's characteristics via image processing. By the comparison of these results, we discuss the influence of the ACOBs' activity on the SFPS.

Biography

Hiroya Muramatsu is a PhD student at Shizuoka University. His three papers were published in high-quality journals. His research interests are multiphase flows, chemical engineering and development of optical-based measurement science and technology.

muramatsu.hiroya.15@shizuoka.ac.jp