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Droplet Merging by Use of Droplet Velocity Difference due to Viscosity or Size Difference[1] BYUNGJU JIN, YOUNG WON KIM, JUNG YUL YOO, Seoul National University — We observe that two droplets of the same size but of different viscosities are merged by velocity difference induced as they are transported with the carrier fluid. Further, it is noted that two droplets of the same viscosity but of different size can be readily merged. Thus, the objective of the present study is to propose a simple and highly efficient nanoliter- or picoliter-size droplet-merging method which uses velocity difference induced by droplet viscosity or size difference in a microfluidic channel. To make viscosity difference, the mass ratio of water and glycerol is varied. Two droplets of the same size or of different sizes are generated alternatingly in the cross channel by controlling flowrates. For the quantitative measurement of the velocity difference of the droplets, micro-PIV is used. This droplet merging method can be used to mix or encapsulate one target sample with another material, so that it can be applied to cell lysis, particle synthesis, drug discovery, hydrogel-bead production, and so on.

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