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Selective droplet transport over asymmetric sawtooth surface microstructures YAERIM LEE, The University of Tokyo, GUSTAV AMBERG[1], Royal Institute of Technology, JUNICHIRO SHIOMI, The University of Tokyo — Manipulating the motion of small droplets is of significant interest for a broad range of applications including microfluidics, digital lab-on-chip platforms, spray painting and coating. In this study, water droplets of a few microliters were placed on a surface patterned with micron sized asymmetric sawtooth ridges. When the surface is subjected to symmetric horizontal oscillations, the droplets may move to a well-defined direction. The travel speed is shown to be strongly dependent on droplet volume, oscillation frequency, and surface pattern properties. The maximum travel speed could be estimated theoretically, and these were found to be in reasonable agreement with experiments for the smaller droplets (2 μl). We predicted how the droplet travel speed depends on droplet volume, oscillation frequency, and the estimated wetting resistance derived from the contact line friction and the detailed surface geometry. It is found that the droplet travel speed is significant in a rather narrow frequency range around the eigenfrequency. The frequency range of droplet transport was found to be narrower for larger droplets (6 μl), thus making the transport more selective. Altogether we demonstrate a selective droplet transport at a controllable speed.

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