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Back-and-forth micromotion of aqueous droplets in a dc electric field TOMO KURIMURA, MASATOSHI ICHIKAWA, Kyoto University, MASAHIRO TAKINOUE, Tokyo Institute of Technology, KENICHI YOSHIKAWA, Doshisha University — Recently, it was reported that an aqueous droplet in an oil phase exhibited rhythmic back-and-forth motion under stationary dc voltage on the order of 100 V. Here, we demonstrate that the threshold voltage for inducing such oscillation is successfully decreased to the order of 10 V through downsizing of the experimental system [1]. Notably, the threshold electric field tends to decrease with a nonlinear scaling relationship accompanied by the downsizing. We derive a simple theoretical model to interpret the system size dependence of the threshold voltage. This model equation suggests the unique effect of additional noise, which is qualitatively characterized as a coherent resonance by an actual experiment as a kind of coherent resonance. Our result would provide insight into the construction of micrometer-sized self-commutating motors and actuators in microfluidic and micromechanical devices. [1] TK, MI, MT and KY, Phys.Rev.E 88, 042918 (2013).

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