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Rheotaxis of droplet swimmers in confinements[1] RANABIR DEY, CAROLA BUNESS, BABAK VAJDI HOKMABAD, Max Planck Institute for Dynamics and Self-Organization, CHENYU JIN, University of Bayreuth, 95440 Bayreuth, Germany, CORINNA MAASS, Max Planck Institute for Dynamics and Self-Organization — Biological microswimmers commonly navigate confinements having liquid flows, e.g. locomotions of spermatozoa through the reproductive tract and bacteria in the gut. The directed motion of the microorganisms in response to the gradients in external flow velocity is called 'rheotaxis'. Recently, rigorous efforts have been made to understand the rheotaxis of microorganims, specifically bacteria. In contrast, there is little quantitative understanding of rheotaxis of artificial microswimmers. Here, we elucidate the swimming dynamics of a common type of artificial microswimmer, i.e. active droplets, in micro-confinements having Poiseuille flow. We experimentally quantify the rheotaxis of these droplet microswimmers, intrinsically undergoing Marangoni stress dominated 'self-propulsion', in response to varying velocity gradients. The active droplets exhibit unique oscillatory rheotaxis in a confinement, which we try to understand using a hydrodynamic model. The latter takes into consideration the hydrodynamic interactions of a finite-sized swimmer with the confining walls. We strongly feel that detailed understanding of artificial active matter rheotaxis will make significant contributions towards better design optimization for practical applications.

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