

# Self-propelled janus droplets for gene extraction and controlled cargo delivery

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We report the existence of a new type of self-propelled Janus droplets, that are obtained from the spontaneous phase separation between two fully miscible fluids (water/solvent) in the presence of surfactants which are preferentially soluble in the solvent phase. At start, the related self-propulsion mechanism is generated by a Marangoni flow mediated by the solvent dissolution into the oily phase. During this motion, the droplets are absorbing a large amount of surfactant. This dynamic surfactant adsorption leads to spontaneous water/solvent demixing and the formation of Janus droplet. We characterize the hydrodynamics properties of these microwimmers during their different stages of evolution. Interestingly, the squirmer properties evolve in time from a weak pusher to a neutral squirmer and potentially to a dimer of neutral squirmers. Finally, we used this active system as a smart carrier to extract genes in situ and delivering them at a target location. (Submitted)