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Novel propulsion of active colloids by self-induced field gradients with potential for cargo transport[1] ALICIA BOYMELGREEN, GILAD YOSSIFON, Technion, TOUVIA MILOH, Tel Aviv University — Localized electric field gradients, induced by the dual symmetry-breaking of an asymmetric particle adjacent to a wall are shown to potentially drive particle motion, even in a uniform field. Since the driving gradient is induced by the particle itself, we have termed this propulsion mechanism "self-dielectrophoresis" (sDEP), to distinguish from traditional DEP where the driving non-uniform field is externally fixed and particle direction is restricted. It is also shown that sDEP driven particles are natural cargo carriers, since the localized gradients can also trap and release targets selectively and on demand. This phenomenon is specifically characterized for Gold-Polystyrene Janus spheres, including the establishment of a non-dimensional parameter marking the critical frequency at which sDEP dominates low-frequency ICEP– evidenced by a reversal in particle direction. Additionally we demonstrate that localized gradients can transform the translating Janus particles into an externally controlled, mobile floating electrode with the ability to collect, transport and release a target sample a target 1/50 of its size. It is also shown that calculated control of the frequency enables selective sorting and transport – if the driving frequency is aligned with the positive-DEP (pDEP) response of a specific "target" and negative-DEP (nDEP) of any other contaminants, only the former will be transported with the Janus sphere.

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