

Abstract Submitted
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Remote Powering and Steering of Self-Propelling Microdevices by Modulated Electric Field RACHITA SHARMA, ORLIN VELEV, North Carolina State University — We have demonstrated a new class of self-propelling particles based on semiconductor diodes powered by an external uniform alternating electric field [1]. The millimeter-sized diodes floating in water rectify the applied voltage. The resulting particle-localized electroosmotic flux propels them in the direction of the cathode or the anode depending on their surface charge. These particles suggest solutions to problems facing self-propelling microdevices, and have potential for a range of additional functions. The next step in this direction is the steering of these devices. We will present a novel technique that allows on-demand steering of these self-propelling diodes. We control remotely their direction of motion by modifying the duty cycle of the applied AC field. The diodes change their direction of motion when a DC component (wave asymmetry) is introduced into the AC signal. The DC component leads to redistribution of the counterions near the diode surface. The electric field resulting from this counterion redistribution exerts a torque on the dipole across the diode, causing its rotation. Thus, the reversal of the direction of the electroosmotic flux caused by field asymmetry leads to reversal of the direction of diode motion. This new principle of steering of self-propelling diodes can find applications in MEMs and micro-robotics. [1] S. T. Chang, V. N. Paunov, D. N. Petsev, O. D. Velev, *Nat Mater*, 6, 235-240 (2007).

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